



Consultative Group on International Agricultural Research

SCIENCE COUNCIL

**Evaluation and Impact of Training
in the CGIAR**

SCIENCE COUNCIL SECRETARIAT

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**CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
SCIENCE COUNCIL**

Evaluation and Impact of Training in the CGIAR

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Science Council Commentary on the Evaluation and Impact of Training in the CGIAR

April 2006

The Science Council discussed the report on the Evaluation and Impact of Training in the CGIAR at its 6th meeting held at WARDA in Cotonou, Benin after a videoconference presentation by the Chairman of the Panel, Dr Elliot Stern. The Science Council conveys its thanks to the Panel Chair and the two members, Dr Lucia de Vacarro and Dr John Lynam for the commitment they have shown to the study over an extended period of time and for a coherent and logical report that provides a strategic perspective to guide future training and capacity strengthening activities of the CGIAR. The Panel assembled a vast amount of information from 1990 to 2004 on past and current training activities in the Centers and, although as it points out the databases at the Centers were surprisingly deficient and variable, was able to synthesize them in a manner that enabled major trends and issues to be distilled. This provided a useful setting for the field visits, case studies and surveys that the Panel undertook.

The draft Panel report was shared with all CGIAR Centers and the comments received from several Centers were taken into account by the Panel. Unfortunately because of the short time available for finalizing the report not all comments were available for consideration by the Panel in the final report or for discussion at SC 6. The Center comments have, however, been further considered in preparing this commentary.

Panel's Findings

The findings and conclusions of the Panel appear logical and reasonably well founded, in spite of the lack of comprehensive data and systematic analysis on which they are primarily based. Commendably the Panel provides suitable caveats where biases and shortcomings in methods are evident. The major findings of the Panel are as follows:

Relevance and Quality of Training

- The most important single factor that has affected the evolution of training in the CGIAR over the past decade has probably been the increase in project funding and the reduction in unrestricted funds available for training per se. As a consequence, this has lowered the yield on the CGIAR's large investment in training and learning (currently about US\$30 million annually; estimated to be about US\$380 million for the 15 year period considered in this study¹) because of (a) difficulties in building a critical mass of scientists and multidisciplinary teams (b) difficulty in effectively funding higher degree studies when projects are of 2-3 years duration; (c) since projects have shorter time horizons, the training activities do not necessarily lead to greater relevance to the institutional or wider needs of the trainees; (d) reduction in pedagogic support to Center research staff; and (e)

¹ Based on the annual financial reports of the CGIAR Centers in Annex V of the report.

reduction in Centers' capacity to access, adapt, translate and disseminate existing training materials.

- There has been an increase in “informal” and short course training linked to collaborative research. Internationally recruited scientists spend on average 25 per cent of their time on formal and informal training activities and this has increased over the past five years. This may reflect the increasingly inherent role of training and mentoring in collaborative research for capacity strengthening.
- Based on a number of indicators for groups and individuals, formal training quality has been high. The most important determinant of trainee satisfaction is the extent to which their new knowledge and skills were put to use. Unfortunately in many instances this did not ensue. This emphasizes the need to ensure that candidates should be accepted only if suitable post-training provisions are made or are likely. Improved candidate selection procedures were considered by Center staff as one of the most important ways to improve quality.
- There has been an increase in the proportion of shorter training periods and a decline in longer duration training, both for group and individual trainees, with individual training being somewhat stable but involving an increasing proportion of higher degree students and women (40 per cent currently). There is a trend to much larger numbers from SSA than from other regions.
- In some Centers there has been a marked increase in group training involving extension officers and farmers.

Effectiveness of Training

- The effectiveness of CGIAR training as reflected by the perceptions of the persons interviewed and surveyed has been quite high and has been as much determined by the conditions of the NARS as by the relevance or quality of the training.
- There are a number of factors that have influenced training effectiveness: (a) changes in the NARS, with some getting stronger and their staff becoming peers of the Center staff and others getting weaker with different training needs; (b) donor priorities and funding arrangements in the CGIAR; and (c) changes in technology, e.g. information technology opening up the possibilities for virtual delivery of both training and training materials.
- The changes in funding sources available to training and consequent weakening of the Training Units in the Centers in the past ten years has been accompanied by a trend towards the decentralization of training away from headquarters to the regions and from group training to informal on-the-job individual training in the context of collaborative research projects. This has led to a loss of corporate knowledge and best practices, which has made it difficult to maintain consistently high quality standards. Quality assurance protocols for planning, managing and evaluating formal and informal training should be specified and followed routinely. These measures are needed to ensure the system's investment in training is used to good effect, and this requires enhanced training resources and expertise in the Centers.
- Related to the increasing trend to project-related training, some countries, including some of the poorest, have experienced a sharp reduction in training of all kinds. Hence there seems to be no clear relationship between the extent of poverty in a country and CGIAR training investment.

- Records kept are incomplete and inconsistent in many Centers and are not compatible among the Centers in the System. This seems to be one consequence of the decentralization of training and moving it increasingly to projects. In addition, incentives for systematic record keeping and using data for planning seem to have been limited.

The Evolution of Future Demand for Training

- The greatest future demand from NARS will be for capacity building through specialized short courses and individual non-degree and higher degree training, instead of generalized training; in this respect CGIAR could do more on e-learning and support to local universities.
- There is a need for improved coordination of training in the Centers along with enhanced pedagogic expertise.
- The amount of training outside the deemed comparative advantage of the Centers appears to be small, especially with individual training. Training in most Centers is closely defined by their research programs. The Panel considers this a legitimate definition of Centers' roles and they should not be expected to address the NARS' wider training and capacity building needs. It points out though that there is a risk that such an approach better meets the needs of stronger NARS at the expense of weaker ones and hence that specific training needs assessments of the latter should be conducted.

Observations on Findings and Conclusions

The SC is pleased that the Panel implicitly validates the approach that has been taken in the new System Priorities that training and other capacity building be closely linked to agreed priorities and research collaboration between NARS and the Centers. This is in spite of a perception in the report that TAC was not and the SC is not supportive of training and that this has contributed to the decline in unrestricted funding allocated by Centers to training. Certainly the SC agrees with the Panel that training of farmers and extension staff is best left to others with a clear comparative/complementary advantage, with the Centers focusing on scientist capacity strengthening with clear IPG attributes. It seems that this move by some Centers to train farmers and extensionists has been partly motivated by an imperative to focus training on "...downstream dissemination capacity as opposed to research capacity..". The substantial increase in the former in recent years is confirmation of the move by a number of Centers into the development arena, which has been criticized by the SC. In addition, related to these trends are the possible moral hazards associated with encouragement by some donors of the use of performance indicators such as training person-days, and reinforces the SC view that the performance management system must measure real outputs, outcomes and impact and thus create the appropriate incentives. The SC encourages Centers to define clear training and capacity building targets within their research projects.

The SC is not convinced that more systematic training needs assessments are required. By the Panel's own assessment, the Centers have done a good job of identifying the capacity strengthening needs of NARS within the context of trends towards increased consultations, collaborative research projects and partnerships. The SC accepts however that in this process

the weaker NARS may have experienced that their training needs are increasingly unmet. However in the SC's view, the Centers generally do not have a comparative advantage in supplying all the training that the weaker NARS may need. The Centers can however provide useful knowledge through e-based systems as an input for others to provide the training. Additionally, some of the countries with stronger NARS also have the largest numbers of poor people, require more formal scientist training and better capacity to use research for addressing poverty.

The Panel did not discuss the role and achievements of the Centers in providing training materials, and most notably did not mention the initiatives by the Centers in providing global knowledge via e-systems (for example the Rice Knowledge Bank of IRRI, the global training materials of IFPRI and from the erstwhile ISNAR). The report would also have benefited from more details on how the Centers can contribute to and strengthen University-based training in general, and in the context of the virtual university initiative in particular².

The Panel seems to overlook the fact that the reason why there may not be quantitative data on the increasingly important component of informal learning in the Centers may be because it is indeed *informal*. This makes it more difficult to document and evaluate per se. While the SC concurs with the Panel's criticisms of the poor state of documentation and evaluation of formal training, their recommendation for more explicit monitoring of informal learning would be more meaningful if they had provided some guidance on how the Centers might go about documenting and evaluating informal training. Indeed it would have been helpful had the Panel indicated what was a minimum data set for all types of training. The SC concurs with the Panel's notion that better documentation of informal training - where and how it takes place - would allow Centers better to incorporate informal learning objectives into research activities and plan these opportunities for addressing capacity building needs.

The study earns high marks as a strategic review of training in the CGIAR. However, as the Panel itself acknowledges, for various reasons it was not able to assess the impact of the investments in training the system has made (currently some US\$30 million annually) on the goals of the CGIAR. This is disappointing and raises the question of the value and desirability of undertaking a specific impact assessment of components of the program where the databases might allow such a study. Some of the country case studies in the Annexes to the main report would provide promising starting points. They cite assertions and anecdotal information on impacts, although causalities and attributions are not verified or documented for the most part. An important issue to be addressed in such a study would be the extent to which training by the CGIAR generates private benefits in the form of increased remuneration and advancement opportunities to the trainee, and what additional international public good benefits accrue over and above these to the institutions and the economy to where the trainee returns; and of course importantly to the poor. The high attrition rates of trainees after they return to their home countries and the recognition by NARS that investments in them can be lost to other institutions (see the Bolivia case in the Annex, p. 32), suggest that a large portion of the impacts of training might be private and not public goods. Of course the fact that countries might gain rather than individual NARIs in

² GOAFU, Global Open Agriculture and Food University

such instances does not imply that CGIAR investment in training is not appropriate from a NPG or IPG perspective. However these are researchable issues that deserve to be explored further by SPIA and the SC.

The case studies reported on by the Panel did not include any “strong” NARS. To the extent that training in the CGIAR has increasingly been research- and researcher-led, and most has emphasized host countries as pointed out by the Panel, then maybe the study has not adequately captured those NARS who have benefited most. The SC suggests this offers a further possible rationale for a follow-up study of the impacts of CGIAR training on a selective basis.

The Panel was concerned that most researchers thought there were few positive incentives for them to be involved in training. This would seem to be inconsistent with the figure of 25 per cent of time scientists are currently spending on training and with the sense that this is increasing. However due to the lack of comparable figures from other research institutions, it is not possible to reflect on whether this time is appropriate for capacity strengthening by the CGIAR system. The SC recognizes that some of the time spent on informal training activities with graduate assistants or NARS colleagues during research projects also counts as research time for the scientist, and in fact involves a leveraging of the researcher’s time in such a way that research progress is more rapid than if the graduate assistants or NARS colleagues were not present. Thus, the SC recognizes this “double counting” as a potential win-win situation for the trainees, scientists and Centers. The Panel made no attempt to separate these two intertwined products. However the SC believes that both outputs (capacity strengthening and research) and the subsequent outcomes are vital for the system. The SC will review the performance measurement system to ensure that both outputs are captured and rewarded.

The Panel notes the poor quality of the reviews of training undertaken by the Centers, with few conducted by outsiders and the focus being on outcomes rather than effectiveness, efficiency or strategies. EPMRs also did not in general focus on evaluating training. The SC will consider how the latter might be more effectively used to assess training strategies, plans and impacts and encourages the Centers to commission more external reviews of training using independent scientific peers and training experts so that EPMRs can be better equipped to address training in future.

The SC notes the Panel’s views on likely future demand trends from the NARS but was not able to discern from the report how these were derived by the Panel. It will be important for the Centers to assess these for themselves as they will undoubtedly vary depending on the NARS concerned and the Center’s programs.

Observations on Recommendations³

Notably absent from the recommendations is any that relates to comparative advantage of the CGIAR vis-à-vis other sources of supply for training. This is a key issue and one that the

³ The recommendations are paraphrased here in italics.

SC believes must receive further consideration. Some recent EPMRs have also raised this question.

The SC has the following comments on the 13 recommendations.

CGIAR System

1. *Formal and full recognition of training as an indispensable component of the CGIAR's activities, both for NARS strengthening and as a contribution to execution of Centers' research. Following this recommendation, at the investor's level, implies finding adequate resources.*

The SC endorses the Panel's reaffirmation of the importance of NARS capacity strengthening as an integral component, and not simply a by-product of the work and mission of the CGIAR.

2. *The System should develop a uniform set of criteria and indicators of training outputs and outcomes. An inter-Center focal group should develop such a set and present it for approval by all stakeholder groups.*

SC recognizes the inconsistencies and voids in information on training activities, outputs and outcomes and the fact that this results in a lack of adequate information on which to plan for the evolution of training in the System, to make it more effective and efficient in terms of the mission and goals of the CGIAR and in terms of supporting the System's new set of priorities. The SC endorses the formation of an inter-Center focal group with possible input from the SC in terms of criteria and indicators for quality and relevance.

3. *The System needs to come to grips with the issues associated with the increasing dominance of short term, restricted funding and the System should make provision to overcome the associated problems.*

SC recognizes the problems of organizing training related to the increasing restricted vs. unrestricted funding as part of a larger issue that needs to be addressed by the System's investors.

NARS

1. *NARS need to develop a clearer understanding of the areas of training in which the CGIAR has a comparative advantage. These areas relate to the Centers' research agenda.*

SC endorses this recommendation and suggests that Centers have a key role in clarifying their comparative/complementary advantages and at the same time can make contributions to the NARS through inputs related to identifying alternative sources of supply for non-CGIAR priority NARS training needs. This recommendation also emphasizes the importance of strengthening the "partnership" approach to training activities in recognition of the fact that System research priorities have been and will continue to be informed by NARS priorities.

2. *NARS need to make a stronger effort to clearly articulate their research and training needs. This can improve the effectiveness of cooperation with the CGIAR.*

While the SC recognizes the importance of such articulation of needs, it also appreciates that such specification often is difficult, particularly in the weaker NARS and/or where conflicting interests exist and adequate mechanisms for coordination and collaboration are missing. As with the CGIAR exercise leading to the new System priorities, the CGIAR can work with NARS to improve specification of training and capacity strengthening needs.

3. *NARS and Centers need to take greater care in selection of candidates for CGIAR training, to ensure that candidates chosen have appropriate qualifications and post-training institutional support and operational facilities.*

SC agrees with this recommendation and recognizes that some Centers already have in place fairly strict candidate selection procedures that could be shared more with NARS and among Centers.

4. *An implied recommendation is that the Centers should reduce their involvement in direct training of farmers and extension workers, except as an integral part of ongoing Center research.*

SC agrees with this recommendation, which is part of the larger debate within the System on the role of the CGIAR in production of IPGs and the optimum position for the CGIAR along the R4D continuum in different circumstances.

CENTERS

1. *Centers should adopt a strategic stance that involves:*
 - *Continuing to carry out training and promote learning compatible with their research priorities and develop strategies to do so in ways that strengthen (and sustain) NARS capacities*
 - *Taking into account characteristics of successful outcomes in the System, including: longer term commitment by Centers, longer term funding commitments, existence of local institutional support and leadership, a mixture of formal and informal training/learning activities; and other factors*
 - *Taking into account the need for special strategies for weaker, under-resourced NARS;*
 - *Taking into account the Panel's recommendation to give high priority to support for local universities and establishment of partnerships.*

SC endorses this recommendation, recognizing that some Centers already have developed well-articulated strategic stances with regard to training and have considered many of the factors that the Panel suggests are important. However because training outcomes generally are not monitored, Centers are not learning from both successful and unsuccessful outcomes. The SC believes that there is ample room for greater inter-Center cooperation and collaboration in developing improved strategies and training functions across the System, as well as good opportunity for increased inter-Center collaboration in actual training activities, in the same way that inter-Center collaboration in research is taking place, e.g., through Challenge Programs and other inter-Center programs.

2. *Centers should all develop appropriate quality assurance protocols to be applied at all stages in both formal and informal training; and activities should be subjected systematically to appropriate planning, monitoring and evaluation procedures, as in research.*

SC endorses this recommendation, which relates to the need for improved and more systematic information gathering and analysis procedures in the Centers. This inconsistency in, and lack of adequate data and information is a particular weakness that the Panel identified as a major one.

3. *The Panel provides suggestions on how the Centers can improve the efficiency and effectiveness of their training functions by taking advantage of opportunities for sharing experiences, best practice, functions and activities among Centers, e.g., through such mechanisms as the ICT-KM Initiative Online Resource Project.*

SC endorses the suggestion to take greater advantage of inter-Center opportunities to improve training and learning functions and activities of the Centers. In fact, the SC recognizes that the Centers already are moving in this direction and thus endorses such on-going activities.

4. *Ensuring better coordination within and among Centers where this will enhance quality and coherence.*

SC endorses this recommendation.

5. *To better cater for the heterogeneity of NARS and exploit the advantages of ICT such as e-learning, the Centers embrace the latter more explicitly.*

SC endorses this recommendation but notes that the Panel has not commented on the possible role of the Global Open University on Food and Agriculture in this context. It therefore would welcome the views of the Alliance Executive on the scope for the GOUFA to provide a vehicle for this.

6. *Closer coordination and cooperation among the Centers in strategic planning of training, assembly of data bases, development of courseware etc.*

SC endorses this recommendation.

In conclusion the SC encourages the Alliance Executive to consider the value and desirability of a System-wide Capacity Building Program to coordinate and share information among Centers on the training related functions mentioned in these Center specific recommendations, among other tasks.

Transmittal Letter

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27th March 2006
London

Dear Dr Pinstруп-Andersen,

Re CGIAR Training Study

On behalf of the Panel charged with this study, I am pleased to submit our final report to the Science Council of the CGIAR.

As you will be aware the Panel has engaged in an ambitious and wide-ranging review and evaluation in order to identify the contributions and impacts of training and learning within the CGIAR. We very much hope that our report will assist the Science Council in its future deliberations. We also hope it will prove helpful to all those within the System and in the NARS, whom we have met in the course of the study, and who are committed to further strengthening research partnerships between the CGIAR and the NARS through training and learning.

We would like to thank you and your colleagues - including those on the interim Science Council, who have offered wise counsel and shown us patience and courtesy throughout our work. Whilst it might be thought invidious to pick out any for special thanks, we would certainly wish to acknowledge the inputs received from Hans Gregersen, Jim Ryan and Ken Fischer who had the responsibility to steer the study. They did so throughout helpfully whilst showing proper respect for the Panel's independence. Finally I would like to acknowledge on behalf of all of Panel members the generous contributions made by Sirkka Immonen of the Science Council Secretariat. Her diplomacy, technical expertise and knowledge of the System have been invaluable.

I look forward to hearing how the study and its recommendations are taken forward in due course.

Elliot Stern,
Panel Chair

Evaluation and Impact of Training in the CGIAR

MARCH 2006

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SUMMARY AND RECOMMENDATIONS

This study was commissioned by the interim Science Council (iSC) to review training within the CGIAR as it contributes to capacity strengthening in the NARS. The purpose of the study was to evaluate the quality and relevance, efficiency and effectiveness terms of intermediate impacts in strengthening of the NARS and, to the extent possible, impacts in the CGIAR's goals. The study was expected to provide recommendations to help Centers, Donors, the NARS and the System to strengthen and plan their future activities in relation to training and capacity strengthening.

Several issues related to the scope and methodology of the study influenced its design. These issues are discussed in detail in the first Chapter, *Introduction*, and include i) defining training and in particular distinguishing it from learning that takes place informally in work-places and networks; ii) distinguishing training and learning effects from those of Center research and other outputs; iii) country and regional focus; iv) defining capacity strengthening; v) nature of CGIAR inputs and interventions – and distinguishing these from those of other actors; vi) how to judge 'impact'; and vii) scope of data collection. Information for the study was obtained from: existing Center records and surveys carried out by the panel of Center researchers; those in Centers responsible for training, trainees and Center research partners.

The changes in CGIAR context that have influenced the way training has been conducted and resources are discussed in the Chapter 2, *Factors shaping training and learning in the CGIAR*. The factors that have had major consequences for the orientation and provision of training across the CGIAR over the last 10 years include both those internal to the CGIAR System and the broader global changes in NARS, agricultural technologies and funding. Over this period, the NARS have become more differentiated; some gaining strength and taking a role of equal partners, whilst others were more fragile and under-resourced some even becoming weaker. Changes in funding and specifically the predominance of project funding, has forced Centers to adjust the organisation and delivery of training which has become increasingly decentralised to researchers. The role of 'training units' that coordinate training services and plan training provision has diminished. On balance, the panel considered that this trend has had a negative effect on NARS' institutional strengthening and has curtailed Centers' ability to fully exploit the considerable investments made in training and learning. New technologies and new public demands have shaped the training agenda to include new kinds of skills in advanced technologies and social sciences. The design of training, including new pedagogical approaches, communication technologies and informal ways of learning, have influenced the way training is now delivered across the CGIAR.

The Panel collected data for 15 years (1990-2004) on group and individual training and its analysis and conclusions are presented in Chapter 3, *Training and learning activities in the CGIAR*. Data were available only for formal training and any quantification of informal training and learning was based on surveys and interviews. The Panel observed considerable deficiencies in the way training records had been collected and databases were constructed, which seriously hindered their use for evaluation purposes or for planning by

Centers themselves. Among the most notable trends discernable, there seem to have been increases in the numbers of group training events and numbers of participants. In some Centers, there has been substantial expansion in group trainee numbers, due partly to training involving farmers and extension workers associated with collaborative research with extension services and post production research. The increase in numbers may also reflect inclusion in records of more different types of events and better overall recording of, for instance, regional training away from Center headquarters. A more stable pattern over the years was observed for individual training. A high proportion of the trainees have come from host countries of the Centers, and a less than clear relationship between intensity of training and poverty levels was observed. Some individual countries, including some of the poorest have experienced a sharp reduction in training of all kinds. The relatively high proportion of developed country trainees was also notable.

The Panel analysed the data for themes to assess the comparative advantage of Centers as training providers and concluded that only a small proportion of the volume of training (in terms of trainee days) has been allocated to topics that are not within the Centers' research capacity and mandate. The themes of Crop Production, Crop Protection and Breeding have continuously been among the most common themes, while the themes of Social Science and Biotechnology have gained in relative importance.

The relevance of training to strengthening NARS' capacity is discussed in Chapter 4, *Relevance of Training and Learning*. The panel found that CGIAR Center training is broadly relevant to the capacity needs of NARS. They concluded that it is appropriate to assess training relevance within the context of the research agenda which centers share with the NARS (i.e. as opposed to a broader definition of NARS training and capacity strengthening needs). However, Centers are formally committed to capacity strengthening and many researchers within Centers as well as those with some responsibility for training and learning are evidently dedicated to helping NARS strengthen their research base. There were perceptions among researchers that relevance may have been reinforced in recent years by the decentralisation of training to Center researchers conducting collaborative research projects. However, the formal commitments of Center managements was not always so clearcut such that research relevance may not necessarily have led to institutional strengthening. Furthermore, where under-resourced NARS were dependent on Center support there might be at risk of distorting NARS research priorities and associated priorities for training in order to access resources. CGIAR collaboration with other agencies with a complementary but more development-orientated mandate is needed to address broader NARS' capacity needs, which are particularly challenging in Sub-Saharan Africa.

The issues of quality are discussed in Chapter 5, *Quality of training and learning*. Perceptions of training quality, gauged through trainee surveys were mostly very positive. Less positive judgements were associated with limited opportunities to apply newly acquired knowledge and skills. It is, however, difficult to extrapolate from past satisfaction ratings to present conditions when researchers are more in charge of planning and conducting training. There were limited quality assurance (QA) systems in place for training in some Centers. The weakness of QA systems is due to the reduction of the capacity of training units or functions and lack of pedagogic expertise among Center staff. Individual and informal training quality is not addressed or monitored by any explicit mechanism. There are many examples of good

practice in place at Centers related to policies, recruitment and selection of trainees, course guidelines, pedagogic support for researchers, collection of trainee feed-back and the use of quality assessment to improve training. To make training quality a priority issue, Center management, and indeed the CGIAR system, needs to communicate its support for training emphasising the importance of quality and provide incentives and funding for quality assurance.

In Chapter 6, *Efficiency of training and learning*, the Panel concludes that the pre-requisites for the efficient management and delivery of training and learning are not in place in most Centers. Examples of good practice are unevenly distributed. The most important deficits are inadequate pedagogic and coordination resources within most Centers and the absence of systematic financial and monitoring data. However, it should be emphasised that the true efficiency of training and learning is its contribution to the effectiveness and take-up of research. The Centers were unable to provide detailed data on the investment in different types of training and the trends over time. From System records and surveys, it was concluded that the investment by the CGIAR in training and learning through formal and informal means continues to be high. About 25% of researchers' time was estimated to be spent on these activities. However, there is no consistent coordination, backstopping, advice and support in all Centers for assuring the efficiency of training against the investments made. Likewise, the coordination between Centers is a problem especially in Africa where synergies could be achieved. There are instances where Centers have been efficient, for example by adapting specific training 'products' into generalisable 'global' goods thus achieving economies of scale in their production and use. However, it appears that due to the lack of coordination within and between Centers the allocation of resources to training that has taken place has not been always planned in the most strategic fashion. Closer cooperation with NARS is required to ensure that trainees not only come with the necessary pre-requisites prior to training but also have adequate possibilities of putting their training to use afterwards. Centers visited were clearly aware of their particular 'niche' as providers of training. These niches were consistently recognised by the NARS and in the opinion of the Panel constitute areas of genuine comparative advantage. In general, Centers provide training within their mandate "doing what they do best" – although the Panel questioned increases in volumes of 'farmer training' in some Centers and in some years. The Panel also concluded that Centers should avoid covering resource shortages in NARS out of project funds that cannot be sustained or select trainees without adequate preparation. To address the broader capacity issues, coordination with other stakeholders, especially governments, donors and universities is needed.

The Panel found no evidence to suggest that any single type(or types) of training were more efficient than others. They concluded that Centers should continue to provide a mixture of group and individual training activities, and achieve increases in efficiency mainly by fitting these more closely to trainee and NARS needs.

The Panel's approach to evaluating outcomes and impacts from training and its analysis and conclusions are presented in Chapter 7, *Effectiveness: Outcomes and impacts of training and learning*. The Panel found strong and consistent evidence of the effectiveness of CGIAR investments in training and learning. The case studies in seven countries across Latin-America, Asia, and Sub-Saharan Africa confirmed that CGIAR training has led to impacts for

individuals and institutions. Many of the leaders of national research in agriculture are Center graduates and the agricultural research agendas of NARI, government ministries and other NARS partners have been shaped by Center inputs. In particular CGIAR centers have contributed to the internationalisation of research – linking even fragile NARS partners to international scientific agendas.

Country studies and surveys of NARS partners confirmed the difficulty of separating out training and learning effects from those of research and indeed germplasm distribution. However, survey respondents' perceptions confirm that training was a significant contributor to positive outcomes from research. Country studies also confirmed the growing importance of informal training and learning alongside formal courses.

Contextual factors outside the control of the CGIAR limits the effectiveness of its contributions to capacity strengthening. There are regional differences in sustaining and using training and skills acquired with the Centers and institutional instability is an important limiting factor, particularly in the poorer countries. This is illustrated by 'WASTAGE' rates among trainees in some countries. However the success and contribution of CGIAR inputs have been striking even under the most adverse conditions, especially when working with innovative local partners and committed donors. The sustainability of the results of past investments in training and learning increases considerably when account is taken of a broader set of 'results' that go beyond intentions and objectives. Projects have left behind a large 'footprint' and many investments in training and learning have had unintended but with hindsight foreseeable positive consequences for NARS.

The serious problems faced by countries where NARS are weak and where Centers in isolation can only expect to have limited impacts, highlight the need for innovative approaches to capacity strengthening. These will need to better integrate training and learning with other capacity strengthening measures and coordinate the plans of more than one Center together with those of other key stakeholders – NARS partners, donors, governments, and universities.

Recommendations

Recommendations can be variously directed to the CGIAR System, the NARS and Centers.

For the CGIAR System, the Panel recommends:

1. Training should be fully recognised as an indispensable component of the CGIAR's activities, not only as a contribution to NARS institutional strengthening, but also as a contribution to the execution and refinement of the Centers' research. At the investors' level, full recognition implies finding, or helping to find, increased resources for basic training support functions in order to optimise yields on the major investment currently made and sustain the reach and effectiveness of collaborative research.
2. Given the investment of the System in training, simple but meaningful criteria and indicators of training outputs and outcomes should be defined and used at the System level, avoiding the current need to present the information in different formats to suit different stakeholders. The definition of these indicators might best be undertaken by an inter-Center focal group, but should be ratified and observed by all stakeholders.

3. The shortcomings of short-term project funding from the point of view of NARS institutional strengthening must be recognised, and provision made to overcome them as far as possible through integrated, longer term center-NARS-investor cooperation and commitments. Training in association with research project funding may be putting the weaker NARS at a disadvantage, and this situation should be revised periodically.

For NARS, the Panel recommends:

4. There should be a clearer understanding among NARS as to the areas of their training needs which can be covered by the CGIAR. These refer to the areas of their research agenda which they share with the Centers, and where priorities are set through mutual cooperation.
5. In some cases, the absence of clear policy and articulated research/training needs on the part of the NARS constitutes an obstacle to effective cooperation with the CGIAR. NARS and Centers should work closely to improve this, possibly by more active intervention at the highest policy level.
6. To safeguard the NARS' investment in training by the CGIAR, greater care must be taken to select candidates with appropriate qualifications in coordination with the centers, and to ensure adequate post-training support and operational facilities. For training to be effective it needs to take place in the context adequate institutional support and where necessary policy consistent.
7. For the CGIAR to support the NARS as effectively as possible, the Centers should not be drawn beyond the limits of their distinctive competence as research institutions, into activities which are the responsibility of national governments. In particular, their work should be complemented by the necessary efforts to ensure downstream dissemination of research products. In this context, the Panel would question the involvement of the CGIAR in the direct training of farmers and extension workers except as an integral part of ongoing Center research.

For the CGIAR Centers the Panel recommends:

8. CGIAR Centers should adopt a strategic stance with regard to the links and potential benefits to NARS of the training and learning activities that they undertake. To this end Centers should:

Continue to carry out training and promote learning compatible with their research priorities and mandates and develop strategies to do so in ways that strengthens NARS capacity. With regard to capacity building requirements which they cannot cover they should cooperate and enable these to be met by other agencies and stakeholders including international donors and national governments.

In developing their training strategies, take into account that cases with successful outcomes encountered by this Panel often had in common: long term commitment by the Centers; a long-term funding commitment; local institutional support and leadership; a mixture of formal and informal training/learning activities, designed to fit specific needs; the formation of multi-disciplinary teams and critical mass of scientists; a latent (or explicit) demand for the technology in question that meets identified needs. These 'conditions' for success are likely to be valid in many NARS scenarios today.

Weaker, under-resourced NARS will need special strategies if poverty alleviation objectives are to be met. Interventions at the highest policy level that will often also involve informal learning opportunities (e.g. through policy dialogue) and an emphasis on support for local universities through training and research partnerships may be the options with best potential for long term impact. Close inter-Center cooperation and the development of a common policy for capacity development including training should be considered in such cases. The current distribution of trainee nationalities should be revised at each Center to ensure it is justified on the basis of potential for poverty alleviation.

In general, the Panel recommends giving high priority to support to local universities, as probably the most sustainable contribution to capacity building through training. It should also contribute directly to elevating the pre-training preparation levels of CGIAR trainees. Various modes are already in practice, but the Center-north-south university partnerships have particular merits. Partnerships with teaching institutions will also help fill the Centers' gaps in pedagogic skills.

9. CGIAR Centers should ensure that formal and informal training and learning activities should be systematically submitted to appropriate planning, monitoring and evaluation procedures, as is research. To this end:
 - a) Quality Assurance protocols should be developed and applied systematically to all stages in planning, managing and delivering training and learning, including needs analysis and the routine specification of learning objectives in all projects.
 - b) In-country informal learning built in to projects should be supported by self-evaluation guidelines that can be applied by project partners on a continuing self-help basis.
 - c) Training quality should be systematically monitored and evaluated, routinely at the immediate post-training stage. Long-term follow up studies of outcomes and impact are only recommended strategically in samples of areas/projects. However if records are well-kept and systematized across all Centers the present prohibitive costs of follow-up would be dramatically reduced.
 - d) Training evaluations should be taken into account in staff performance ratings and used to support the integration of training into research planning and decision making.

Important gains in efficiency are foreseen from ensuring that every Center has access to some form of training and learning function and expertise however organised (the form will need to vary to fit Center mandates and circumstances). In some circumstances these 'functions' may be partly based within Centers and partly outside – e.g. shared among Centers or at a System level as with System's ICT-KM Initiatives Online Resource Project. These functions should:

- a) Provide scientists at each Center with access to expert advice on suitable pedagogic methods and delivery modes for training; retrieving, adapting and disseminating existing training materials; and making materials widely available on-line.
- b) Ensure the coordination of training activities across and between Centers where this will bring benefits of quality and coherence, for example by systematising needs analyses; facilitating inter-Center cooperation; implementing stricter candidate

- selection procedures (see above); targeting national universities for training and as partners in collaborative research projects; promoting learning alliances and center-north-south institutional collaboration.
- c) Given the heterogeneity of NARS, a variety of training themes, types and delivery modes should continue to be provided, with emphasis on fitting them more carefully to clients' needs, while making full use of ICTs and other contemporary methods. e-learning for example can be a valuable complement within many kinds of training and learning activities and alongside other forms of delivery – face to face, experiential etc. Specific e-courses can also be suitable for certain kinds of learners and for certain kinds of content. The yield from the learning and training resources of Centers will be better exploited in such ways.
 - d) Closer cooperation and coordination should be achieved in areas such as: strategic planning, including regional/country strategies; the preparation, cataloguing and delivery of materials; data base and financial recording system design to ensure a minimum essential set across Centers in compatible formats; Quality Assurance systems and related protocols; performance indicators; collaboration with other sectors of the CGIAR related to capacity building (e.g. Information, Communications groups), and exchange of best practices. A suitable inter-center mechanism (e.g. focal point) should be set up, with funding, in order to achieve these objectives.

1 INTRODUCTION

This section outlines the terms of reference and objectives of the study, gives some background and contextual information to training in the CGIAR, indicates some of the main design and implementation decisions made in the course of the study and outlines the main sections of the report that follow.

1.1 Study objectives

This study was commissioned by the interim Science Council (iSC) to review training within the CGIAR as it contributes to capacity strengthening in the NARS⁴. When commissioned, the study was seen as part of a broader strategic priority for the iSC: the role of the CGIAR in NARS strengthening.

The main objectives, as stated in the Terms of Reference (Annex I) are to evaluate:

- The relevance and quality of training activities carried out by the CGIAR;
- The efficiency and effectiveness of training; and
- To assess the intermediate impact of training in NARS capacity and, as far as possible, the impact of training on the ultimate goals of the CGIAR.

The study was always intended to be forward looking as well as building on past and recent experience. This was reflected in the expectation in the Terms of Reference that it would help Centers, Donors, the NARS and the System to strengthen and plan their future activities in relation to training and capacity strengthening. This future orientation was also emphasised by the two Standing Panels having oversight of the study during its design stage.

Against this background, the Panel⁵ defined the overall aim of the study as follows:

To assess how far and in what ways the CGIAR System has provided and can best provide training (based on scientific research) that strengthens NARS' capacity to undertake collaborative scientific research to realize the goals of poverty alleviation, food security and sustainable production.

1.2 Design and implementation choices and methods

A number of issues were identified in the course of designing and implementing this study that have shaped its focus and outputs. The main design and implementation choices were:

- *Issue:* Defining training.
- *Decision:* To include a full range of formal and informal training/learning activities in order to reflect the range of relevant activities that were encountered in preliminary

⁴ The term NARS has been interpreted throughout this report in the broad sense to include what is sometimes labelled NARES and NARDS. The diversification of NARS and the active participation in national systems of extension sector, NGOs, farmers' organisations and other development actors has been acknowledged in the study.

⁵ Biodata of the Panel members is given in Annex II.

investigations and pilot work. This includes learning which takes place in the course of collaborative research, and networking when intended to develop and support training and learning.

- *Issue:* Difficulty separating training and research and other Center inputs (e.g. germplasm supply).
- *Decision:* To retain a focus on training and learning but not exclude activities that are highly integrated with research and to try where possible to assess the value added or contribution of training and learning – whilst not expecting to attribute all results to training.

- *Issue:* Country and regional focus.
- *Decision:* To concentrate efforts in seven small to medium countries in three regions (LAC, SSA and the Greater Mekong Basin within Asia) as these represented the likely current and future locus of most CGIAR capacity development efforts and were manageable within this study's available resources. A pre-requisite for inclusion was that the country should have been a major recipient of CGIAR training, as indicated by the data base compiled for this study. Those selected were: Bolivia, Cameroon, Ecuador, Kenya, Malawi, Thailand, and Vietnam.

- *Issue:* Definition of capacity development.
- *Decision:* To define capacity development (consistent with current understandings) at several levels - in terms of individual capacities and skills; organisational capacities resources and management; and inter-organisational coordination and networking.

- *Issue:* What constitutes CGIAR inputs and interventions?
- *Decision:* To recognise the importance of context. Accepting a broad definition of training 'interventions' (see above) underlines that CGIAR interventions occur in a context of many actors which shape what is achieved and achievable.

- *Issue:* Focus of impact study element.
- *Decision:* To concentrate primarily on impact in relation to NARS' capacity and then, where possible, on impacts for farmers and CGIAR goals.

- *Issue:* Scope of data collection.
- *Decision:* To gather data at several levels – system-wide, centers, Country/NARS and partners – in order to cross check and be able to trace the factors that shaped outcomes and impacts.

The methods and data sources for this study have included:

- Assembling a data-base on training types, volumes and trends from 1990-2004;
- Secondary sources such as EPMRs, impact studies and other reports and assessments of the CGIAR;
- Case studies of 6 CGIAR Centers – CIAT, CIP, ICRAF, IITA, ILRI, IRRI. These were selected primarily on the grounds of their major contribution to training in the countries chosen for field work, but also because their location allowed travel costs for the study as a whole to be kept within the budget;

- Questionnaires to all researchers and training officers (or those responsible for training) in all CGIAR Centers;
- Questionnaires to those who attended group training in 2003 and as many trainees as possible who received individual training in the period 1993-2003;
- Questionnaires to partners for whom contact information was provided by Centers;
- Interviews and documentary analysis with the NARS at HQ and operational levels in 7 countries;
- Case studies in 7 countries of outcomes and impacts of training/learning including collaborative research that incorporates training or education or informal learning;
- Follow-up or 'tracking work' with CGIAR Partners and Trainees in 7 countries to ascertain the 'survival' of CGIAR trainees within the NARS;
- Feed-back from stakeholders on this report, at various stages of its preparation.

In estimating response rates to the questionnaires a number of caveats are in order. Researcher questionnaires were distributed via Centers and although the Panel is reasonably confident that it was sent to all on regular employment (*circa* 690) there may have been some variation in some Centers. The numbers cited below for trainees and partners refers to numbers distributed drawn from a much larger list. However the lists proved to be highly inaccurate, with many misspellings, old postal addresses and other inaccuracies. It became clear in the course of country visits that many to whom questionnaires were sent did not receive them. Granted these caveats estimated response rates were as follows: Center researchers 690 distributed via Centers, 338 received - response rate 49%; Center training officers and those with special responsibilities in that area, 40 distributed, 38 received - response rate 95%; ex-trainees 2850 distributed 359 received - response rate 12.6%; and partners in collaborative research projects 2470 distributed (nominated by Centers), 148 received - response rate 6%. The Panel concluded that the response rates was good for CGIAR staff but low for partners and trainees - as commonly found in studies of this kind (see Annex III). This probably introduces a positive bias into the results, the magnitude of which cannot be estimated, since those less interested in training or with negative experiences would have been less likely to reply. The bias may have been particularly strong in the case of the research partners, because they were named by the Centers and the less successful and less persistent ones would probably not have been included. Throughout the report, therefore, the Panel has been cautious about basing conclusions solely on evidence from the questionnaires, and tried wherever possible to corroborate from various additional sources the trends which they pointed up. Further analyses were conducted on the some of the survey results to detect the significance of differences due to various sources of variation (e.g. the effect of subject area on trainee satisfaction) using Chi-squared and other tests. Further statistical analyses were undertaken of those who were critical or negative to understand their responses. As has been found in other surveys, there is no reason to believe that the 'negatives' that did respond are atypical of the negatives that did not.

1.3 This report

This report focuses on findings drawing on all the main data sources. It is organised into six main Chapters. These cover:

- *Factors 'shaping' training and learning in the CGIAR:* The report begins with a description of the factors shaping training arrangements, organisation and priorities in the CGIAR over

the last 10 years. This includes changes in the broader context, funding arrangements and developing understandings about how training and learning can be supported in different settings.

- *Training and learning activities in the CGIAR:* Available aggregate data are then presented on trends in formal 'group' and 'individual' training. Estimates of the scale and importance of informal training are also given, based on researchers' reports of the time spent thereon, and on field study information.
- *Relevance of training and learning:* This section highlights what we are able to say about relevance, understood to include priorities and priority setting processes at Center level. This includes plan-making and consultation with NARS, as well as systematic feedback from NARS and trainees. The section draws on evidence from questionnaire surveys, case studies and country based fieldwork.
- *Quality of training and learning:* This section considers quality both in terms of the processes likely to ensure quality and evidence that such processes are used. It also draws on feedback obtained from ex-trainees as to their judgements of quality.
- *Efficiency of training and learning:* This considers how resources are deployed and how training activities are organised and managed. It draws primarily on Center and country visits conducted by the Panel, and on questionnaire survey results. Existing impact studies are used as a secondary source of information.
- *Outcomes and impacts of training and learning:* This section reports on the effectiveness of training. This includes intermediate 'impacts' of training and learning on NARES capacity, discernable effects for agricultural systems and farmers and where possible contributions to the CGIAR's own goals such as poverty reduction, food security and sustainable production. It draws mainly on the survey questionnaires, country reports and case studies conducted by the Panel, and refers briefly to existing training impact studies.

The final chapter draws together Conclusions and Recommendations. Conclusions are also highlighted at the end of each of the main report chapters. Supporting evidence from surveys, case-studies and country reports are included in the Annexes.

2 FACTORS SHAPING TRAINING AND LEARNING IN THE CGIAR

This chapter briefly sets the scene reviewing the factors that shape training and learning in the CGIAR. It describes:

- the CGIAR commitment to training and NARS capacity-building;
- how training is funded and organised;
- the institutional, funding and wider context within which training and learning is delivered; and,
- the evolution and differentiation in how training and learning is understood in the CGIAR.

The chapter introduces material at a general level that is analysed and discussed in greater detail in later chapters.

2.1 CGIAR commitment to training and capacity strengthening

System-level commitment

The CGIAR has a global commitment to strengthening National Agricultural Research Systems. This is reflected in its stated objectives which have evolved in the course of this study. When the study began these were stated as follows:

The CGIAR supports institution building and capacity building—globally, regionally and nationally—to strengthen the evolving international agricultural research community, and enhance the professional development of agricultural scientists in developing countries.

The latest version of these objectives as they relate to capacity building is stated in the New Research Priorities of the Science Council⁶ as follows:

The CGIAR priorities maintain the focus of the system on research. However, the conduct of international agricultural research, combined with the provision of world-class opportunities for capacity strengthening, is a comparative advantage of the CGIAR. Enhancing capacity in developing countries has been a major accomplishment of the CGIAR in the past. This approach will continue through program-related opportunities and through involving appropriate partnerships to enhance innovation and learning. Additionally, specific research on institutions is designed to identify the best means for policies and institutions to support new agricultural research and create pro-poor benefits.

This commitment is formally reflected in the mandates, objectives and activities of individual Centers and in particular in their training and education activities. This is especially so as in

⁶ System Priorities for CGIAR Research 2005-2015, CGIAR Science Council, December 2005.

the CGIAR there tends to be a close identification of training and education with capacity strengthening.

Linking Center research and capacity priorities

From Centers' own plans, objectives and other documentation, the primary purpose of training activities is to enhance developing country organisations, mostly NARS, to be more effective in independently and collaboratively conducting research for solving problems primarily related to agriculture, environment and economy. The Centers focus their training efforts globally and regionally depending on the mandate and focus of their research. However Centers also emphasise the aim to train within their specific area of competence and often the near term purpose is to improve capacity in that particular area of research and activity. So for example IRRI has a general objective to 'generate and disseminate rice related knowledge and technology of short – and long term environmental, social, and economic benefit and help enhance national rice research and extension systems' and sees training and education as central to delivering that objective. Scientists are aware about how training connects with their own research priorities: in the word of one, training is about 'helping (this Center) implement our research that we think is important for the country and has scientific value'. Balancing the needs of their own research and the capacity needs of NARS is one of the challenges for Centers that this study will highlight.

As many researchers also acknowledge, the benefits of engagement with NARS is not one way. Capacity building can variously create capacities to undertake research, give greater focus to research and help in the formulation of new research agendas. This is discussed in greater detail in Chapter 6, see especially 6.2.

Strengthening research capacity and potential 'partnerships'

The Centers aim at improving researchers' skills and knowledge about technologies and methodologies, enabling some at least to become trainers themselves in the future. Improving trainees' capacity to conduct further training is also highlighted by Centers. ICARDA states their aim is the 'enhancement of researcher capacity to identify and overcome constraints to production and understand the processes of technology transfer, adoption and farmer decision making'. Stated objectives include the enhancement of the development, dissemination, adoption and ultimately impact of technologies. One means for achieving this is to establish collaborative partnerships for research and technology development.

World Agroforestry Center identifies institutional strengthening as one of its four themes:

'We strengthen the capacity of institutions - local, national and regional - to participate effectively in generating and applying innovations in agroforestry, INRM, and environments for improved livelihoods.'

With regard to research systems and institutions it aims:

'to understand the bottlenecks faced by national institutions and to work out joint strategies and programs to address them.'

Training at CIP

CIP's training program is a vehicle for interaction and collaboration with a wide range of partners facilitating the achievement of the Center's objectives. It is strongly linked with the research agenda and responds to partners' needs for enhanced research skills and methods. It provides effective mechanisms for the introduction of technologies to achieve sustainable improvements in the productivity and utilization of CIP's mandate crops, potato, sweet potato, Andean root and tuber crops, and in the management of natural resources in the developing world.

The training program's aim is the creation of an international network of highly capable research scientists able to conduct independent studies, to offer skills training to others, and to collaborate effectively in the CIP global community of interest.

ICRISAT has as an intermediate goal:

'Building partner power: R&D partners empowered through enhanced and more relevant skills that include the ability to prioritize for impact, to implement interventions and to predict trends.'

A strong incentive for Centers is to build partnership between the CGIAR Centers and researchers and organisations, mainly in the developing countries. As one senior center manager put it: 'training is an investment in cooperation'. This also leads to a related purpose: facilitating partnership building between the organisations and researchers receiving training. Training is seen as a two-way process that 'helps the Center streamline its research priorities' (CIP). ISNAR specifically stated that the purpose of training is to understand behaviour and attitudes of those who contribute to research alliances. In addition to partnerships with developing countries, there are currently important efforts by Centers to promote South-North (e.g. CIAT- Makerere University – University of Florida) and South-South partnerships (e.g. joint appointments with Southern universities such as CIAT- University of Nairobi).

2.2 The changing context of CGIAR training

The differentiation of the NARS

Over the period under study the environment within which the Centers developed their training strategies and resource commitments changed significantly.

- NARS in some developing countries significantly strengthened their agricultural research capacity, and moved into newer areas such as molecular genetics and natural resource management. Dependency on external research expertise and support gave way in these NARS to stronger national capacity and nationally determined priorities. This is exemplified in this study in the cases of Thailand and Vietnam.
- Poorer developing economies underwent structural adjustment programs during the 1990's that significantly constrained government spending, especially in the area of

agricultural research. These reductions in resources were accompanied by reductions in agricultural research and in some cases the near-collapse of NARIs and public universities. These problems were compounded in many of the same countries by the toll of HIV/AIDS on agricultural research skills; and by the consequences of political conflicts and civil war.

- Periods of political instability especially in parts of Latin America and Africa, shifts in donor priorities (or in some cases capabilities given their own financial pressures) meant that capacities of these countries significantly weakened during the period. This included capacities within faculties of agriculture in the public universities.
- An important influence on the possibilities of CGIAR 'partnership' working worldwide, was the entry into agricultural research in the 1990s of new classes of institutions – mainly NGOs – often with little research experience, and consequently, making new demands of Centers for training. This was partly a matter of the changing role of the State following on from structural adjustment but it was also the consequence of the CGIAR, donors and NARS becoming more pre-occupied with 'impact' for poor farmers and consumers.

The implications of these contextual changes for the CGIAR were a much more differentiated NARI and NARS – some where capacity had increased, some where it had diminished; that had different needs for training in terms of sometimes more and sometimes less sophisticated skills; and where capacity strengthening includes Universities, NGOs and farmers organisations as well as NARI.

From core to project funding

One of the most potent 'shapers' of Center training over the period was the shift in funding from core resources to project-based funding. Thus:

'The ratio of restricted funding to total funding rose to 55% in 2004 from 35% in 1995. Conversely, in 1995, unrestricted funding dropped from approximately 65% of total funding in 1995 to 45% in 2004 due to the high increase in restricted funding

(Final Report, Task Force on Funding System Priorities, 2005)

The way that these system wide changes have impacted on particular Centers varies greatly. However the effect has been to reduce 'unrestricted' funds to as little as 29% for IITA and 30% for World AgroForestry Center (ICRAF) and to maximum levels of 50% and 46% for CIFOR and ILRI respectively. (See Annex IV on funding of CGIAR Centers).

At the same time there have been increases in overall resources available to CGIAR Centers (according to the *Task Force on Funding System Priorities*, an increase of 32% between 2000-2004) however most of this has been in restricted or project funds.

Detailed breakdowns of Center expenditure in terms of the deployment of core (unrestricted) funds to training are difficult to obtain given the way budgets and costs are recorded. However we were able to obtain figures for some Centers which demonstrate different patterns of resource allocation and these are discussed in various parts of the report.

The organisation of training

Changes in volumes and categories of funding had large effects on how training was organized, funded and implemented across the CGIAR. Most Centers found it difficult to fund training as a stand alone activity from restricted project funding. Most of the training funds were therefore incorporated into research project funding. However, this left little for core support to training units, particularly when the limited core resources were utilized to fund administration and longer term research areas such as genetic resources and breeding. Many Centers during this period changed their training organisation and in effect decentralised responsibility for training to research scientists relying on their ability to attract funding for training within their research projects. At present, most Centers retain a Training Units of some kind. Some Centers (e.g. IPGRI, ICRAF and IFPRI) have a capacity strengthening as a project within the MTP portfolio and some (e.g. CIMMYT and IRRI) have training within an MTP Project. However even Centers with Training Units and designated capacity strengthening and training programs may have limited capacity. According to survey data gathered from those responsible for Center training only 7 out of 15 Centers have staff with any qualifications in training, pedagogy or adult education. (The consequences of these organisational and capacity issues are considered in greater detail in various parts of this report – see especially Chapters on ‘Efficiency’ and ‘Relevance’.)

Decentralization of training to researchers and research programs was often accompanied by decentralisation of research and training to national and regional programs. For example:

- In the mid-1990’s Centers sought to devolve group training, particularly the so-called production courses, to national partners. Whilst this is seen as a response to resource cutbacks by some it is also viewed as a positive guarantor of the relevance of training to Center mandates by others. Devolution often involved training of trainers in a period of declining national resources. This did not always lead to the hoped-for results, unless the Centers themselves carried out the courses within the national programs. Many ‘devolved’ courses were taken back by Centers following initial difficulties.
- Survey results and Country and Center fieldwork have suggested that there has been a significant increase in country based (rather than Headquarter based) training which has, however, not been accompanied by the creation of new administrative systems to monitor and manage what was being delivered. This study has found little or no systematic information about country delivered training and learning – a point that is referred to throughout this report. It can even be argued that in-country training has not increased as much as it would appear – only that recording has improved. However respondents to the survey of Training Officers or ‘focal points’ suggest that in 6 of the 13 Centers which provided information over 50% of their training now takes place outside headquarters. This proportion has increased at 6 Centers, remained about the same in 5 and decreased in 2, during the last 5 years.
- In the 1990s there was also a trend across the CGIAR to create regional research programs, particularly in Africa where the major portion of research funding was being directed. This was intended to give Centers the potential to reach a wider cross-section of clients. It had the consequence of shifting much of the training and capacity building activities, particularly in the regional programs, to building what might be termed an ‘impact pathway’, that is the extension, farmer, and market capacities to have impact

with new technology. These trends shifted the focus of training towards extension-workers and farmers in addition to scientists employed in NARI.

Emerging issues shaping training

There were many other external 'drivers' shaping Center training profiles in more particular ways. For example Center based scientists cited:

- competition between developing countries;
- the biodiversity convention;
- the emergence of new technologies especially genomics;
- environmental pressures including drought and pesticides;
- producer-consumer market chains;
- the possibilities and potential of IT for training and learning dissemination, management and delivery.

All the items of the above list create new demand for training and in some cases shape how training was delivered.

2.3 The scope of training and learning

The word 'training' is generally understood as instruction or teaching within CGIAR discourse. Such instruction or teaching may take place in courses (in 'groups') or individually. However the system tends to downplay other learning opportunities that are important even in an instructional setting – e.g. interaction with fellow students in a course, experiential learning in a field station or the relationship with supervisors in a graduate degree program. (Chapter 3 has shown the importance of these activities.) There is certainly little explicit acknowledgement of learning that takes place informally, through learning by doing, work experience, learning in seminars and workshops, policy dialogue and in research mentoring or in practitioner networks. These types of learning are not generally monitored in CGIAR nor are they the subject of explicit learning management or quality assurance methods. One indicator of this is that quantitative and administrative data on informal learning is hard to find. This is despite the prevalence of many such learning opportunities in diverse settings among CGIAR Centers. Adopting a broader perspective is consistent with the findings of other studies of vocational training – especially in professional settings - where training and human resource investments are increasingly understood in terms of how and where people learn rather than in terms of what trainers provide.

It became clear in the course of pilot work that many of the benefits of training in the CGIAR derived from these broader expressions of 'learning'. The study has therefore consistently sought to focus on how and more importantly, where learning occurs. It is for this reason that the terms 'training and learning' are used extensively in this report. This emphasizes the importance of learning that takes place outside of formal instruction and which requires a shift in mind-set if issues of quality, relevance, efficiency and effectiveness are to be adequately addressed.

Analytically and based on the case material available it is useful to distinguish between the different 'learning strategies' adopted by Centers or more precisely its researchers and others

who are involved in training and learning activities. On occasions they may indeed be ‘instructors’ but at other times researchers pursue their learning objectives as managers of networks or collaborative research or as mentors. At the same time there are different learning modes - the ways that those we call ‘learners’ and those we call ‘teachers’ interact. Conveying technical content is very different from facilitating experiential learning or facilitating peer learning. Learning or training strategies and different learning modes also tend to take place in different settings and are likely to be appropriate for different learners or trainees. The table below begins to unpack some of these distinctions. It is a framework that has evolved iteratively – beginning from a curiosity about how learning occurs within and around what is called training in the CGIAR. However it was only during fieldwork and interviews that the particular expressions of learning and its delivery became clearer.

Table 2.1 The learning process adopted by Centers

Learning/training Strategies	Learning modes & settings	Who learns	Example
Instructional: The Center knows and the trainee needs to learn	Transmissive/didactic: courses in specialised settings – at (regional) HQ with experienced teachers	Usually the NARI scientist	Germplasm management; biotech techniques
Learning manager: the Center manages opportunities for learning	Mixture of didactic and experiential learning – learning by doing. Setting is more likely to be ‘in-country’	The NARI scientist and NARES - and to a limited extent, through research, the Center scientists. Latter lead in agenda setting	Plant breeding that combines a course element and a period on ‘station’ applying course knowledge; research assignments designed or allocated by Center to NARI
Mentor/advisor/seni or colleague: the Center supports learners	Collaborative/peer learning through joint research/activities/projects, mutual exchange between Center/NARS; mentoring and colleague exchange (both individual ‘visits’ and collective events – seminars, workshops). Technical advice	Both the NARES and Center - the learning agenda is initiated by both	‘Farmer participatory selection’ collaborative design and customisation of ‘tools’ methods or models
Network manager: the Center brings together related	Linking together diverse research and development projects so as to help them learn from each others’ experience/contexts and make explicit what they know. Meetings, workshops, conferences as learning settings	Limited or no initiation by CGIAR Center. Responsive or dialogical	Networks – made up of different projects/scientists in different countries to which CGIAR scientists are attached

The first column in the table concerns *training and learning strategies*. It progresses from the simplest training setting where those who need to learn are 'instructed' through to more facilitated and network-based strategies where there is less inequality between 'teacher' and 'learner'. The second column describes *learning modes and settings*. Learning modes progress from what in pedagogics would be described as transmissive or didactic (within instructional strategies) where teachers structure and deliver what they know, through to the more experiential and collaborative modes of learning that take place in work settings and collaborative networks. As this column also indicates these different modes are associated with different settings. Transmission is common in classrooms but advisory missions and joint seminars between Centers and NARS partners are more commonly associated with collaborative learning and exchanges amongst peers. The third column focuses on *who learns*. Here also it appears that there is a progression: from an instructional strategy where it is mainly the 'trainee' who learns, through to the more reciprocal learning that happens when Center based researchers working with NARS partners in networks and joint research projects. The final column provides some examples of where these different configurations of learning have been observed.

It is important to recognise that there can be no automatic assumption of 'progression' or 'development' moving down the columns in this table. NARS at early stages of their development may remain dependent on instruction and imported skills and know-how for a long time; and those NARS that have seen their development disrupted by political instability – as in Latin American case-study countries – or by fiscal setbacks, disease and conflicts - as in Africa - may move backwards from peer status and reciprocity to instructional learning strategies and more dependent modes of learning. Nor can generalisations be made even at the level of a single NARS. In some themes or disciplines a NARS may well be relatively strong whilst in others it may lack capacity. It is also true that when new techniques and methods emerge – as has been the case recently in biotechnology applications or post production/near to market methods –there is often a period when a NARS reverts to instructional learning and training strategies or perhaps again works within research projects designed by others.

What the table does suggest however is that NARS with greater capacity will tend to be more autonomous and provide CGIAR Centers with research colleagues rather than trainees and will learn collaboratively rather than through instruction. That is borne out by the results of this study especially when comparing Latin American, Sub-Saharan and Asian experience. Furthermore the table also suggests that there is a probable coherence across the rows. It is difficult to deliver an instructional strategy except through some kind of classroom (although this may come to be a virtual classroom in future as learning technologies and associated skills improve). It is also difficult to imagine collaborative and peer learning succeeding except in work based, joint research or network settings where there are opportunities for learning by doing.

2.4 Conclusions

Overall the changes in CGIAR context - driven sometimes by the CGIAR System and sometimes by broader global changes in NARS, agricultural technologies and funding - have had major consequences for the orientation and provision of training across the CGIAR over

the last 10 years in particular – although some of these developments have had a longer gestation period.

Among the most important changes:

- NARS have become more differentiated - previous Center 'trainees' in stronger NARS have become colleagues and peers whilst some NARS have become more fragile and under-resourced, their scientists still requiring basic training and support;
- Funding constraints have forced Centers to innovate in the organisation and delivery of training in particular through the decentralisation to researchers and to country-based partners;
- New technologies and new public policy concerns – many of them connected with the environment, international markets and poverty reduction - have required the training of successive cohorts of scientists in the technological and social science basics as well as in more advanced techniques;
- Alongside these contextual changes there have been major changes in training and learning – with an increase in informal learning and the growing importance of collaborative research, networks and peer learning alongside formal training courses, whether for groups or individuals.

Not all of this is evident from aggregate data collected at a CGIAR System level and can even be obscured by the way data is (or is not) collected. The next chapter draws together the data that is available on formal training. In subsequent chapters when questionnaire results are presented and discussed and NARS based case studies analysed, there will be more evidence to support this broader typology of training and learning in the CGIAR.

3 TRAINING AND LEARNING ACTIVITIES IN THE CGIAR

This chapter presents the data collected from the CGIAR Centers on group and individual training. The following aspects are described and discussed:

- data collection and problems associated with it;
- volume of training;
- gender and nationality of trainees;
- training themes;
- volume of informal training.

3.1 Data collection

Data collection began in 2001 during a desk study phase of the Training Study. During the Main phase, Centers were asked to provide records for training up to 2004. Records for the early 1990s in particular were difficult to obtain. Several Centers acknowledged that training records were not systematically collected. Data for training outside the headquarters were particularly patchy or altogether missing; and in some cases records had been compiled for annual or other occasional reports and not into central databases. Given the variable availability of specific data items and continuity of the data over the time period discussed in the following, the data should not be regarded as providing accurate results of CGIAR training, but rather as showing likely trends.

Data were originally collected on a large number of parameters. However, due to difficulties in obtaining them, the Panel opted for a minimum set of parameters which include the following annual information: number, length and theme of group training events; number, gender and nationality of group training participants; number, gender, type and nationality of individual trainees and the length and theme of study. To overcome the problems related to gaps in the records, the Panel considered relative data and trends rather than the actual figures when possible. In the trend analysis the Panel observed data in three periods: 1990-92 (considerable gaps in the data) and two six year periods, 1993-1998 and 1999-2004 (good data availability).

The largest gaps were in the records of nationality for group trainees, which were available only for 37.4% of participants. Records on the type of trainee in group training were not consistently recorded although such information was available for some Centers or was occasionally to be found in the title event. The most complete data sets were obtained from CIAT, CIMMYT, CIP, IITA, World Agroforestry Center (ICRAF), ICRISAT, IRRI [two data sets: headquarters (HQ) and in-country (IC)], ICARDA and IPGRI. Data were also available for the Systemwide program on Alternatives for Slash and Burn (ASB). IWMI did not originally provide any data, but some records on individual training were available for 2003 and 2004. CIFOR also did not provide data, and it doesn't view itself as a training Center in a conventional sense. CIFOR, however, provides capacity building both for individuals and through organising occasional group events. ISNAR, which in 2004 became a program of IFPRI, had training and capacity building as a major part of its agenda, but primary data on training were not available in a form suitable for analysis.

3.2 Volume of training

Group training

In 1990-2004 there are records for about 90,000 people who attended group events that Centers have included in the training data. Group trainees included 189 nationalities (see section 3.4). Considering that the records for the early years and, in some cases, in-country training are incomplete the total figure for group participants is certainly much higher than the records show. However, the records for some Centers include very different type of events, from formal group courses to conferences, meetings, field days and study tours, some of which, particularly in the recent years have had a large number of participants as discussed below. This makes an accurate estimation of the volume of group training impossible and complicates meaningful interpretation of the kinds of training carried out, and the types of trainees who were included. It is clear that group training of NARS⁷ staff through courses, workshops and seminars is considerably less than the total reported here.

In providing data, Centers did not use similar definition of training (for instance ICARDA and IPGRI data sets consist mainly of formal group training events) and this may be reflected in the increasing vs. stable trends in Table 3.1. In general, the number of training offerings remained at a similar level over 1990-2001 when the Centers organised on average 16 group training events annually. In 2002-2004 the average number of events was considerably higher, about 32 events per year. This reflects a genuine rise in the number of events carried out by ASB, CIMMYT, ICRAF and IRRI-in country (IRRI-IC) (Table 3.1), but also in the latter case, more accurate recording. The trends with group training have not been similar for all Centers.

IITA gradually brought group training to an end in 2001-03. At CIMMYT, ICRAF, and IRRI-IC, group training has increased in terms of number of events in 1999-2004 compared with the earlier years. ASB has also gradually increased the number of events since 1992 when records started. At these Centers, as also at CIAT, IPGRI, IRRI-HQ, WARDA and WorldFish the numbers of participants per event have increased in the last 6 years of the period observed. At CIP and ICARDA there has been a downward trend in the number of training events but the number of participants per event has remained similar. Only at ICRISAT there seems to have been a downward trend in the number of participants per training event.

The summary trends for overall numbers of training participants in group events are illustrated in Figure 3.1. The year 1994 is given as baseline because it is the first year with records from all 14 Centers and the ASB program.

⁷ NARS is here considered to include NARI, relevant government departments and institutions, universities, NGOs and the private sector. The sectors include agriculture, forestry and fisheries.

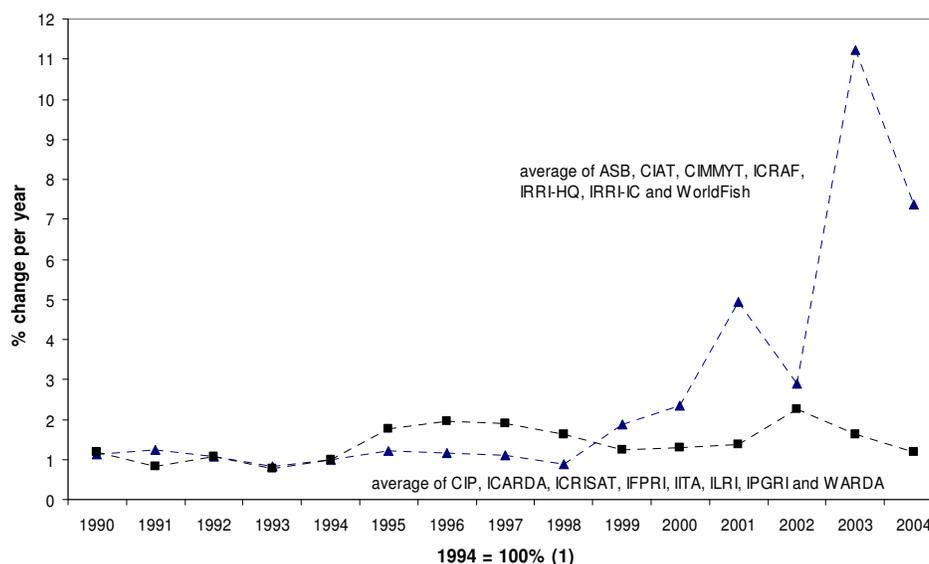
Table 3.1 Changes in group training events and participant numbers 1990-2004

	1990-1992	1993-1998	1999-2004
Events (annual average)			
<i>Increasing trend currently</i>			
ASB	..	10	21
CIAT	12	5	13
CIMMYT	9	14	41
IFPRI	..	10	14
ICRAF	8	8	47
IRRI-in country	8	23	54
WorldFish Center	..	26	39
<i>Stable or decreasing trend currently</i>			
CIP	46	47	40
ICARDA	41	39	31
ICRISAT	12	12	10
IITA	15	15	4
ILRI	11	4	4
IPGRI	5	22	17
IRRI-HQ	18	11	15
WARDA	4	6	6
Participants/event (annual average)			
<i>Increasing trend currently</i>			
ASB	..	9	28
CIAT	11	16	26
CIMMYT	20	17	26
ICRAF	22	23	30
ILRI	15	12	18
IPGRI	14	11	18
IRRI-HQ	16	19	28
IRRI-IC	29	22	26
WARDA	20	25	30
WorldFish Center	..	20	31
<i>Stable or decreasing trend currently</i>			
CIP	21	25	24
ICARDA	14	15	16
ICRISAT	11	10	6
IFPRI	..	21	22
IITA	17	16	18

In the recent years changes can be observed in some Center's training that are difficult to interpret as the increase may be due to a number of factors. At CIAT, CIMMYT, ICRAF, IRRI-IC, WorldFish Center and ASB total numbers of participants in group training have gone up in recent years and were on average 5.5 times higher in 1999-2004 than in 1993-1998. The sharpest rise was observed at ICRAF, ASB, IRRI-IC and WorldFish. In 2003-04, ICRAF trained over 4000 group participants annually, compared with an average of 150 in 1990-2001 (data for 2002 missing). ASB trained 700-1800 participants annually in 2001, 2003 and 2004, compared to an average 113 over the previous 10 years. IRRI-IC events involved 2300 to 8400

participants annually in 2002-2004, compared to 380 on average in 1990-2000 (data for 2001 missing) and, according to IRRI, the increase is due to systematic collection of records in recent years. WorldFish trained 1200-1500 participants annually in 2000-2002 compared to 330 on average in 1993-1999 (data for 2003 and 2004 not available).

Figure 3.1 Relative change in the number of group training participants



Some available records were omitted from the analysis because they represented what appears as exceptional kind of activity and involved very large numbers of participants. In addition to the IRRI-IC data considered here, the PETRRA⁸ network involved about 24000 participants in 2001-2003 in some 420 events. In 1994, WorldFish involved some 1100 farmers in a “farmers’ rally” and IRRI’s in-country training event of one day on integrated pest management involved 1440 participants. For CIMMYT, parallel recording in 2003 showed that group training targeted to NARS participants included 58 events and 1918 participants⁹, while a more comprehensive set of records covering a diversity of events and including, for instance farming family training, contained 141 events with 9600 participants.

These figures reflect the same phenomenon discussed above of including in training records wider range of events with larger numbers of participants from broader circles of stakeholders than in previous years. Events geared towards farmers and extension staff on hand and program, regional and international meetings on the other hand may have become more frequent, or at least more frequently recorded. It could be assumed that events involving very high numbers of participants were shorter than others, but records on event length are not consistently available in these cases.

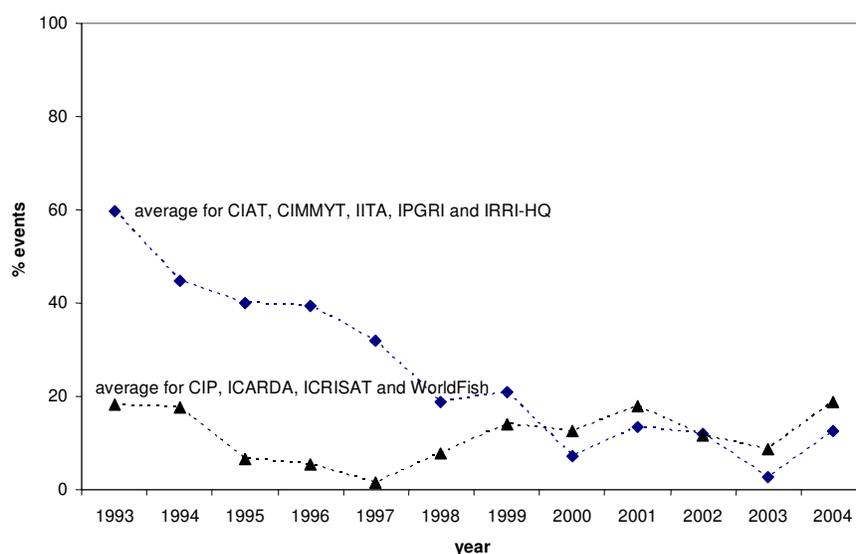
The sharp changes in trends in the recent years appear to reflect the inclusion in training records of a wider range of events with larger numbers of participants from broader circles

⁸ Poverty Elimination through Rice Research Assistance
⁹ Included in this analysis

of stakeholders than in previous years, particularly those geared to farmers and extension workers. An example taken from ICRAF shows that 29 of 171 events in 2003 involved 50 participants or more, and that farmers were identified as the participants in 10 of these, accounting for a total of 1300 trainees, but on average these events lasted less than 2 days. In 2004, one single training event, “Introductory agroforestry, nursery management and aspects of HIV/AIDS relationships with agroforestry” accounted for 555 participants. In WorldFish Center’s training data the peaks in 2000-2002 cannot be explained by increase in farmer training. Rather the records show a high proportion of workshops and meetings, which characteristically may have involved more participants than courses. For the earlier years, such detail on the nature of the events was not available.

Some of these increases, or possibly the more comprehensive recording, may have been triggered by the performance indicators used by the World Bank in 2003¹⁰, which included trainee days as one indicator and which were used for funding decision on a small part of the World Bank’s total allocation to the CGIAR. In any case, records of farmer and extension events and program, regional and international meetings involving very large numbers of participants influence the general data and make interpretation of trends difficult when differentiation of different kinds of training is impossible or cumbersome.

Figure 3.2 Long training events as % of total number of events



Length of group training events

Data on the length of group events were available for 98% of the records of 10 Centers for years 1993-2004, which were included in the analyses. Such data were available only for some events or not at all for IFPRI, ILRI, IRRI-IC and ASB. In the analysis, events longer than 30 days were considered long, and events of 10 days or less were considered short. In the first half of the 1990s several Centers (CIMMYT, IRRI, ICRISAT and IPGRI in particular) were offering long courses, which in 1999-2004 have accounted for only 10-20% of group

¹⁰ In 2004 and 2005 a CGIAR tailor made performance measurement system was introduced and volume of NARS training was not longer an indicator.

events (Figure 3.2). At the same short group training events (≤ 10 days) have become relatively more common in most Centers; at CIAT, CIMMYT, IITA (before group training stopped) and IPGRI. In the commodity Centers this trend may reflect the decline in long term breeding and production training.

Individual training

In 1990-2004 the CGIAR Centers trained about 13,000 individuals. Records for at least some of the years included in the study were available for 14 Centers. WorldFish did not have usable records for individual training. Records from CIFOR and IWMI were very limited and from WARDA covered only some of the parameters considered. Comparing the periods 1993-1998 and 1999-2004, the annual numbers have not changed with about 960 individuals per year. In the earlier years fewer individuals were trained, which may reflect gaps in records. Centers where comparison of the two periods shows more than 20% increase in average annual training of individuals comparing the two periods include CIP, CIFOR, ICRAF and ICRISAT. At CIMMYT, IITA and ILRI individual training has dropped more than 20% from 1993-98 to 1999-2004.

The training records for individuals include long term on-the-job and degree training and short term orientation and specialization training. Centers have classified individual training in varying ways. A standard¹¹ that was introduced by the IARC/NARS Training Group in early 1990s (database updated till 1996) has not been followed by other Centers except ILRI that was the host of the database. Furthermore, in some cases, depending on the status of the individuals, Centers included them in a visitor database, rather than in the training records.

Individual training has ranged from very short duration to several years. The length of is clearly correlated to the type of training. The shortest duration, ≤ 10 days stay, has increased among non-degree trainees. Training of 2 years or longer has decreased among degree trainees. More than 50% of the degree students for whom data were available, spent more than 1 year at the Center, but from 1990-92 the proportion of those spending more than two years at the Center has diminished.

Table 3.2 Changes in length of individual training

Length of stay	1990-92		1993-98		1999-2004	
	% non-degree trainees	% degree trainees	% non-degree trainees	% of degree trainees	% non-degree trainees	% of degree trainees
≤ 10 days	6.5	2.1	9.7	0.3	14.1	0.6
>10 days ≤ 30 days	33.7	0.6	25.3	1.2	24.6	1.4
1-6 months	45.7	12.8	44.3	17.7	43.3	19.6
6-12 months	8.2	13.4	13.2	15.1	12.0	25.2
1-2 years	5.3	18.9	5.2	17.7	4.5	17.4
over 2 years	0.7	52.1	2.3	48.1	1.4	35.8

¹¹ Graduate fellow, research fellow, senior research fellow, student associate, technical associate, visiting scientist.

Relatively complete records on degree and non-degree training were available for 5 Centers, and for 10 Centers data were available with gaps. The analysis of the 5 Centers' data show that the relative number of degree students has increased from about 40% of trainees in 1990 to about 60% in 2003.

3.3 Trainee gender

Data on gender of the participants in group training events were available for 8 Centers for most years (CIAT, CIP, ICRISAT, IFPRI, IITA, ILRI, IPGRI and IRRI-HQ) and for ICARDA in 2001-2004. In the period 1990-2004 the proportion of women increased from 17.1% to 20.7%. IPGRI (30%), CIAT (26.9%), IRRI (26.4%) and IFPRI (25.1) have trained relatively more women than the other Centers observed, while at ICARDA the proportion of women in group training is relatively low (15.7%; data for 2001-2004).

Among individual trainees (records available for 89%) the proportion of women has been considerably higher than among group participants and has increased from about 30% in 1993-98 to about 40% in 1999-2004. CIFOR, CIP and ICARDA have had the highest proportion of women (45-50 %), while at CIMMYT and WARDA female students have been less than 20% of individuals. There has been fluctuation from year to year, but in general the proportion of women has increased or remained the same in all Centers and at CIAT, CIP, ICRISAT about 50% of individual trainees were women in 2004 (at IWMI the ratio was also nearly equal at 43% women).

3.4 Nationalities trained

Nationality information was available for group trainees from 10 Centers¹² covering about 37% of all group trainee records and 59% of participants of these 10 Centers, and for 95% of the individual trainee records from 13 Centers. For some Centers individual records in general were available only for a few years (WARDA, CIFOR, IWMI). Overall, Centers have trained nationals from 194 countries. The distribution of nationalities by region and Center in individual training is shown in Table 3.3.

For group training the data on nationalities were too limited to permit meaningful conclusions. Particularly the absence of in-country training records in many cases renders the nationality information less useful, as it is likely that in-country training reaches different nationalities in different proportions compared with headquarters events¹³. The records from CIP, ICARDA and IRRI, where the volumes of group training were highest, dominated. The data suggest that CIAT, CIP, ICRISAT, and WARDA have trained predominantly host region nationals and also at ICARDA, IITA and ILRI host national were the largest group also less than 20% of trainees. In CIAT's case the extent of regional training in Africa for instance, is unknown. CIP's training records show more global reach in its group training than with other Centers: Only about 62% of the group training participants were from Latin America.

¹² 80-100%: CIAT, ICARDA, ICRISAT, IITA; 60-80%: CIP, ILRI, IPGRI, IRRI-HQ; 20-30% IRRI-IC, WARDA

¹³ IPGRI is an exception as it has only in-country training while records are centrally collected.

The second most common region for CIP's group training was Asia (19%) and about 12% of CIP's group trainees came from SSA.

Table 3.3 Distribution of nationalities of individual trainees by region and Center¹⁴

Center	n	Asia and Pacific	Latin America and Caribbean	Sub-Saharan Africa	CWANA	Developed countries
		%	%	%	%	%
CIAT	1608	2.7	77.9	3.0	0.3	16.0
CIFOR	132	24.2	11.4	13.6	0.0	50.8
CIMMYT	1962	29.1	29.1	24.6	7.5	9.7
CIP	1669	6.0	81.2	5.5	1.6	5.6
ICARDA	1681	2.0	0.0	8.5	85.1	4.4
ICRAF	627	14.1	11	56.4	0.3	28.1
ICRISAT	1736	61.2	1.3	23.4	4.3	9.7
IFPRI	189	14.3	3.2	63.5	1.1	18.0
IITA	837	0.5	1.0	86.1	0.6	11.8
ILRI	767	1.2	0.7	82.9	0.4	14.9
IPGRI	518	20.8	23.4	18.3	10.1	23.4
IRRI-HQ	1114	81.7	0.7	3.1	2.8	11.7
IWMI	38	34.2	0.0	36.8	0.0	28.9
WARDA	73	1.0	0.6	83.5	0.3	14.6
Total	12951	23.3	26.2	24.9	13.8	11.9

In terms of which Centers provided most group training in specific regions, the data show that IRRI, IITA, ICARDA and CIP have been the most prominent providers in Asia, SSA, CWANA and LAC, respectively. CIP also trained considerable numbers of group participants in Asia (16%) and SSA (15%).

Among individuals trained, nationals from LAC, SSA and Asian countries have been trained in approximately equal numbers (23-26%). It is noteworthy that the CGIAR Centers have trained nearly as high a number of individuals from developed countries as from the CWANA region. The proportion was highest at CIFOR, but in terms of numbers, CIAT led with some 250 developed country trainees, CIMMYT and ICRAF trained about 190 each and ICRISAT about 170.

The five most common nationalities for both group and individual trainees are listed in Table 3.4 for all Centers for which any records were available. The percentage of trainees from host countries is also shown.

¹⁴ CIAT, CIP, ICARDA, ICRAF, ICRISAT, IITA, ILRI, IPGRI, IRRI: data for 1990-2004
 CIMMYT and IFPRI: data for 1993-2004
 CIFOR: data for 1995-2004
 IWMI, WARDA: data for 2002-2004

Host country nationals account for a large proportion of Centers' group trainees although these results are likely to be influenced by incomplete data, particularly for in-country training. Individual records, however also show the predominance of host country nationals, which for CIAT, ICARDA, ICRISAT, IITA and ILRI accounted for 30-50% of trainees.

Judging by the data for individual trainees, training in the Asian, CWANA and Latin America regions has concentrated on one or two nationalities, namely India, Syria and Peru and Colombia, respectively. In SSA three countries, Kenya, Ethiopia and Nigeria account for 45% of individual trainees. USA, Netherlands, Germany and France account for 50% of the individual trainees from the developed countries.

Table 3.4 Predominant nationalities, including host country* of group and individual trainees

	Group training	Individual training
CIAT	Colombia (66.1%), Ecuador, Nicaragua, Venezuela, Peru	Colombia (47.1%), Brazil, Ecuador, Venezuela, Germany
CIFOR		Indonesia (25.4%), France, USA, UK, Brazil/Cameroon
CIMMYT		China, Kenya, Mexico (7.8%), India, Ethiopia
CIP	Peru (69.2%), China, Colombia, Bolivia, Uganda	Peru (25.4), Ecuador, China, Kenya, Chile
ICARDA	Syria (14.9%), Egypt, Iran, Afganistan, Morocco	Syria (41.3%), Iran, Ethiopia, Jordan, Egypt
ICRAF		Kenya (17.3%), Indonesia, Rwanda, Netherlands, Uganda
ICRISAT	India (40.4%), Myanmar, Bangladesh, Vietnam, Malawi	India (46.8%), Germany, Sri Lanka, Sudan, Vietnam
IITA	Nigeria (16.7%), Ghana, Kenya, Uganda, Mozambique	Nigeria (36.3%), Cameroon, Ghana, Benin, Belgium
ILRI	Ethiopia (19.0%), Kenya (13.8%), Tanzania, Uganda, Nigeria	Kenya (26.1%), Ethiopia (19.7%), Nigeria, Uganda, Germany
IFPRI	Kenya, Malawi, Bangladesh	Uganda, Malawi, China
IPGRI	Philippines, Bolivia, Malaysia, Mexico, Vietnam	Colombia, Kenya, Peru, Ecuador, India
IRRI	Philippines (22.0%), Cambodia, China, Bangladesh, India	Vietnam, India, Philippines (10.9%), China, Bangladesh
IWMI		Sri Lanka (15.8%)
WARDA	Cote d'Ivoire (52.0%), Guinea, Ghana, Mali, Burkina Faso	

* Percentage of host country national given in brackets

The countries chosen for visits and country study were also among those that had received a relatively high volume of individual and group training from more than one Center¹⁵.

The relative changes within each region are shown in detail in VI. The training of Indian nationals has increased and was in 1999-2004 nearly 50% of all Asians. Training of Chinese and Indonesians has also increased, while training of Vietnamese and Philippine nationals has decreased. In Latin America the relative increase has been highest in Colombia, while most others have decreased, including trainees from the countries chosen for case studies, Ecuador and Bolivia. In Sub-Saharan Africa the training of different nationals has remained at similar levels with a slight increase of Kenyans and a slight decrease of Ethiopians. In CWANA training of Syrians has decreased in relative terms in 1993-1998 and 1999-2004 as compared to 1990-1992 while training of Iranians increased.

All Centers have been training individuals in Asia and SSA. In terms of which Centers were involved in training in each region, individual trainees from Asia were trained by ICRISAT (34.4%), IRRI (29.7%) and CIMMYT (19.2%). The contribution of the other Centers ranged from 0.1% to 4.9%. In SSA WARDA and ILRI both trained 20.4% of the individual trainees, followed by IITA (16.9%), CIMMYT (13.3%), ICRISAT (9.5%) and ICRAF (8.8%). In Latin America, most individual training was done by CIAT (37.9%) and CIP (36.2%). Except for CIMMYT (18.5%) and IPGRI (4.7%) the contribution from other Centers was 1% or less. In CWANA ICARDA trained the vast majority of individual students (77.8%) followed by CIMMYT (8.8%), IPGRI (5.7%) and ICRISAT (4.1%). All Centers trained developed country nationals, CIAT (14.7%), CIMMYT (11.6%) and ICRAF (10.6%) being the biggest contributors.

3.5 Training themes

The training themes were analysed for group and individual training on the basis of the course, thesis or job title provided in Center records. Training was classified in 12 general theme categories: Agroforestry, Breeding, Biotechnology, Crop Production, Crop Protection, Genetic Resources, Livestock, Methods, Natural Resource Management (NRM), Post-harvest, Seed and Social Science. All training topics not specific to any particular area of research were classified under Methods. In individual training Methods accounted for a very small proportion (see section on *Themes in Individual Training* below).

Theme information was available for the majority of group events and individual trainings. Because both the group training events and the individual study periods were of highly variable length, the volume of training in the different themes was analysed as trainee days and as number of participants¹⁶. Total trainee days reflects the actual volume of training more accurately than the number of events or participants, while the latter is a better reflection of the breadth or coverage of the audience trained. The results of the group and

¹⁵ In Asia: Vietnam (4th most common nationality considering all records), Thailand (7th); Latin America: Bolivia (3rd), Ecuador (4th); in SSA: Kenya (1), Cameroon (8th), Malawi (9th).

¹⁶ Trainee days data for themes were available for 54% of the group and 76% of individual trainings; participants data for themes was available for 81% of the group and 78% of individual trainings. For group training the trainee days could not be calculated for IRRI and IPGRI. For individuals, the data on length were very limited from CIMMYT and ICARDA. Livestock is probably underrepresented, because records for ILRI seemed to be missing.

individual training are given in Tables 3.5 and 3.6, respectively. Data are presented in overall percentages for each theme for the period 1990-2004 as a whole, and then ranked in order of relative importance for three periods: 1990-1992 when records tended to be erratic, and in 1993-1998 and 1999-2004 when records were judged to be relatively complete. Details of themes by Center are given in Annex VII.

Analysis of the data by length of training gave similar results for group and individual training, but analysis by number of participants showed different themes as the most common ones, as illustrated in Table 3.5 for group training and Table 3.6 for individual training.

Themes in group training

As the data in Table 3.5 show, even in the absence of IRRI data¹⁷, there has been a clear predominance of Crop Production and Breeding in each of the three time periods in terms of trainee days, although the relative numbers of participants fell in recent years and also the volume of training in Breeding fell. Methods was important throughout, and ranked highest overall in numbers of people trained, accounting for 16.2% of the total training 1990-2004. The main change was the relative increases in terms of volume in Social Science (from rank 9 to 6 to 2) and Livestock (from rank 12 to 10 to 5) and relative decrease in Crop Protection (from 5 to 4 to 9). The change in livestock is partly explained by missing data on course length in the early years and by the events having been relatively long.

The most important changes over time in the coverage of people trained were the relative increases in Seed, Social Sciences and NRM, with decreases in Crop Production, Breeding and Crop Protection. Agroforestry became the second ranking theme in numbers of people trained in 1999-2004, due to the vastly increased training of ICRAF. In some cases the breadth of coverage was not reflected in the amount of time (i.e. trainee days) dedicated to the theme. This indicates that the nature of training may be different depending on the themes; training of Breeding, Biotechnology and Livestock involves more often long study periods for relatively few people with an aim at in-depth competence in the theme, while training of Agroforestry, NRM and Methods may have been more orientational, or aimed at enhancement of a particular skill or aspect of the theme. Genetic Resources, then, is a theme where the target audience is smaller than for the other themes.

A breakdown of the Methods category, shown in Annex VIII, indicates that Statistics/Data Management accounted for the highest numbers of participants and trainee days, especially if added to Experimental Design, which was classified separately. Together these sub-themes explained about 30% of the Methods category in terms of trainee days and numbers of participants over the whole period.

The theme Methods could be considered least associated with the research activities of the Centers. It has, however, remained a common theme accounting for over 11% of all group training in 1999-2004. The prevalence of this theme does not seem to reflect the shift of training function and funding to research programs as it has remained near the top among

¹⁷ Trainee days could not be calculated

group training themes as judged by participant numbers and even in terms of group training volume. In volume, the emphasis has been in methods, such as Research Management/Process, Experimental Design and Statistics/Data Management, where the Centers may have particular expertise and relevant orientation due to their research agenda. The Centers may be the sole providers also in themes such as Information Technology, Scientific Writing and Training & Education, which are among common Methods taught, even if these training themes may be completely removed from the Center's research focus.

Table 3.5 Relative importance¹⁸ of different themes in group training, in terms of trainee days (td) and numbers of participants (p)

	1990-2004		1990-1992		1993-1998		1999-2004	
	% td	% p	ranking (td)	ranking (p)	ranking (td)	ranking (p)	ranking (td)	ranking (p)
Crop Production	25.6	13.5	1	1	1	4	1	4
Breeding	13.4	5.8	2	5	2	8	4	7
Social Science	12.1	9.2	9	8	6	7	2	5
Methods	11.3	16.2	3	2	3	1	3	1
Crop Protection	6.4	8.5	5	4	4	3	9	8
Biotechnology	6.1	3.1	10	12	5	10	7	10
Livestock	6.0	1.2	12	11	10	12	5	13
NRM	5.9	12.7	8	6	7	2	6	3
Seed	4.6	8.7	4	3	8	5	8	6
Post-harvest	3.2	3.8	7	9	9	9	11	11
Genetic Resources	2.7	6.5	11	10	11	6	10	9
Agroforestry	2.0	9.4	6	7	12	11	12	2
Other	0.7	1.5	13	13	13	13	13	12

Themes in Individual Training

In individual training Crop Protection, NRM and Breeding were outstanding in importance, with little relative variation over the three time periods. In 1993-2004 Biotechnology ranked third in terms of participants. The main changes were shown in the decrease in the relative importance of Crop Production and Livestock. In contrast to the picture shown for group

¹⁸ Importance here refers to prevalence over the study period, and it is recognised that while themes may be of equal importance the target audiences are not equally large for each theme.

training, Methods was of only moderate importance for individuals, especially in terms of trainee days (3.2% of total trainee days).

Table 3.6 Relative importance of different themes in individual training, in terms of trainee days (td) and numbers of participants (p)¹⁹

	1990-2004		1990-1992		1993-1998		1999-2004	
	% td	% p	ranking (td)	ranking (p)	ranking (td)	ranking (p)	ranking (td)	ranking (p)
Crop Protection	18.7	17.3	2	1	2	1	1	1
NRM	17.3	12.5	3	4	1	4	3	4
Breeding	15.6	14.8	1	2	3	2	2	2
Biotechnology	11.1	12.5	6	8	6	3	4	3
Social Science	9.5	8.3	5	7	4	7	5	5
Crop Production	7.9	6.8	4	3	5	8	8	8
Agroforestry	6.0	3.4	9	12	8	9	6	9
Genetic Resources	5.8	7.3	8	10	7	5	7	7
Methods	3.1	8.2	10	5	10	6	9	6
Livestock	2.1	3.2	7	6	9	11	13	11
Post-harvest	1.5	2.0	12	11	11	12	10	12
Other	0.7	0.7	13	13	12	13	12	13
Seed	0.7	2.9	11	9	13	10	11	10

3.6 Informal Training

Informal training and learning has not been documented traditionally in the CGIAR, and this report appears to be the first that has attempted to quantify its importance. As will be shown in Chapter 6, researchers estimate that they spend an average of 12% of their total time on this, which is about the same as on formal training activities (13%). To gain some insight into what informal learning opportunities have arisen in the course of a collaborative research project, an example is shown in the Ecuador Case Study 1, which describes Center staff leadership and advisory roles, as well as visits to and from the Center for purposes other than formal training. Taken together, the activities described suggest an extremely important

¹⁹ Data on length were very limited from CIMMYT and ICARDA that have the highest individual trainee numbers. The volume of breeding, crop production and protection, and NRM, that have been frequent themes with those two Centers, may therefore have been even higher than shown here.

learning contribution through leadership, advice and mentoring. It is significant that one of the most consistent features of the Country visits was the importance trainees and partners attached to the informal learning which takes place through, for example “learning from colleagues on the job” or the long-term working relationships which have frequently developed between Center staff and trainees. Testimony to this effect is provided in the case studies (e.g. Bolivia, Cases 2, 4). Given the importance of this activity in terms of staff time, and its perceived value to the trainees, it is inconsistent that there are apparently no processes in place in the Centers to plan, document, monitor or evaluate it.

3.7 Conclusions on data and data collection

Conclusions on data systems

Data bases have not been kept systematically by all Centers. Some were discontinued during the 1990's, presumably in association with the reduction of core funds to training, and although others have been introduced recently, there is still no minimum essential data set recorded routinely across the CGIAR Centers, or even within most individual Centers. Consequently, basic information required for decision making on training within the CGIAR system is lacking. One of the most significant gaps is meaningful information on who has been trained, and their functions in the overall system. For example, it would be useful to have a breakdown between policy makers, researchers, extension workers and farmers. The records available at present have been collected for a particular purpose, such as annual or project reports, and records contributing to the analysis in this study were for some Centers obtained from many different sources. Commonly, fields in a database have not been filled. Spelling mistakes and entries in variable formats (e.g. dates) can make sorting and querying impossible. Lack of information on the costs of training also reflect a disconnection between financial planning and reporting and program planning and reporting.

Overall these shortcomings seem to indicate a lack of appreciation of the benefits of systematic record keeping, lack of communication between database managers and those organising the training events, or entry of data after an event when details are no longer available. There is a clear need to define a minimum data set for use across the Centers, with simple but useful classifications of key items (such as trainee type) which will permit easy sorting and meaningful interpretation of the results in future. These should be agreed upon by stakeholders so that improvised requests for information in different formats are avoided. Implementation of such classifications will need to be backed up by systems capable of delivering information with consistency and accuracy.

The current state of data-gathering and monitoring systems with regard to training and learning in Centers also seems to reflect a lack of incentives to do this well and a perception that this is not an activity valued by the CGIAR as a whole.

Conclusions on available data

Among the notable trends in the results, there seem to be increases in the numbers of group training events and numbers of participants in about half of the Centers, some of which have showed a massive expansion in group trainee numbers, due partly to training farmers and extension workers. A more stable pattern over the years is shown for individual training. The information on nationalities shows a high proportion of host country trainees at most

Centers, and a less than clear relationship between intensity of training and poverty levels. However, the latter may reflect a relatively lower number of suitable candidates from the poorer countries, rather than a lack of intention to support them on the part of the Centers. But the fact is that some individual countries, including some of the poorest (e.g. in LAC, see Country Studies) have experienced a sharp reduction in training of all kinds. The relatively high proportion of developed country trainees (12%) is notable. It may be partly due to donor preferences and availability of suitable scholarships to support the trainee, as opposed to Center policy, but appears to have reached levels which merit revision in some Centers. With respect to training themes, one of the most controversial aspects refers to those which are often considered outside the Centers' comparative advantage. The present results suggest that these in fact correspond to a small proportion of total trainee days, especially in the case of individuals.

With respect to training themes, the results show distinct trends over time in their relative importance for group and individual training, although the traditionally predominant themes in both cases remained fairly stable. Thus, the rise in relative importance of themes such as Social Science (group) or Biotechnology (individual) was not at the expense of drastic declines in the older subject areas such as Crop Production (group) or Crop Protection (individual). One of the most controversial aspects refers to the subject areas which are often considered outside the Centers' comparative advantage. The present results suggest that these in fact constitute a small proportion of total trainee days, especially in the case of individuals.

4 RELEVANCE OF TRAINING AND LEARNING

This chapter assesses the relevance of training and learning to strengthening NARS capacity. It begins by discussing how relevance and capacity are understood in the CGIAR and more widely; reviews the evidence collected in the course of this study as to the commitment of Centers to capacity strengthening; the perception of relevance by the NARS; considers some of the factors that appear to be shaping NARS prioritizing and which constrain what Centers are able to achieve; and finally draws overall conclusions and suggests measures that the CGIAR Centers might adopt to further improve the relevance of their training and learning activities to NARS strengthening.

4.1 Defining the relevance of training and learning

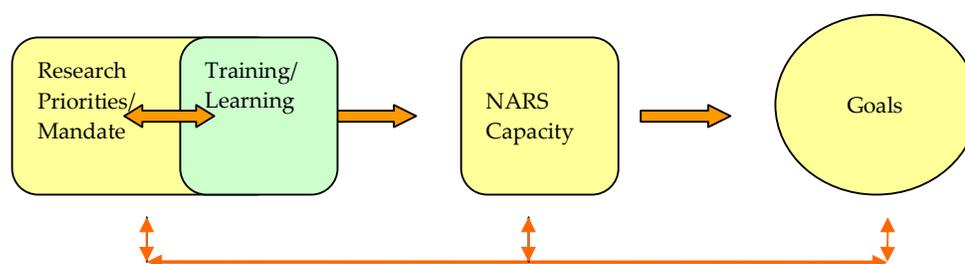
The Panel defined the relevance of training in terms of 'its applicability to strengthening NARS capacity to undertake collaborative scientific research to realize the goals of poverty alleviation, food security and sustainable production'. Consonant with the global mission of the CGIAR, training activities should also meet the 'international public goods criterion' (Inception Report, 2004).

Implicit in this definition are assumptions regarding:

- The role and contribution of training and learning in capacity strengthening;
- The nature of 'capacity' itself; and
- The goals being pursued and to which ends capacity is deployed.

Thus capacity is viewed in terms of its contribution to NARS being able to undertake agricultural research; and links are made to the broader goals which NARS indubitably share with the CGIAR in relation to hunger, poverty and environmental sustainability. In the CGIAR where training and learning is nowadays mainly decentralised to researchers and closely integrated with Centers own research strategies and mandates many interconnections need to be taken into account. A simple model would then link the four elements of training/learning, research strategy, capacity and goals as shown in Figure 4.1.

Figure 4.1 Model of training relevance



In this representation training and learning related activities, in the context of Center research priorities is directed at strengthening NARS capacity, which then allows the NARS to pursue the shared goals. Relevance is a process of delivery (large arrows) and alignment, as indicated by the smaller, feedback arrows. Alignment refers to a matching process that requires information, gathering, prioritisation and mutual adjustment. Whether or not the contribution of Center training and learning outputs is relevant to capacity strengthening of the NARS, depends partly on judgements about what is delivered but also on the robustness of the mechanisms in place to decide on priorities. The next section of this chapter therefore considers what Centers see themselves as delivering by way of capacity strengthening and then assesses processes of alignment – the decisions made intended to ensure that training is consistent with the needs of NARS.

What is delivered through the means of training and learning to strengthen NARS capacity depends on how capacity is conceived. In the wider literature on institutional capacity strengthening (see for example: Capacity Development, UNDP Technical Advisory Paper 2 1997, Horton, Douglas et al Evaluating Capacity Development ISNAR, IDRC, CTA 2003), it is common to conceive of capacity at three different levels:

- individual capacity and skills;
- organisational capacity, including management arrangements; and,
- inter-institutional capacity, including networking.

All of the above are embedded in an ‘enabling environment’. The panel has considered all three levels of capacity – the individual, organisational and inter-organisational in questions asked in questionnaires and the checklists for NARS fieldwork and case studies. The wider ‘enabling environment’ has also been taken into account in national overviews and in comparing training and learning results at a regional level in Africa, Latin America and Asia.

For CGIAR Centers, training activities nowadays derive from and are usually integrated with Center mandates and research priorities. Decentralisation to researchers and research programs is the norm. However there are also the goals of other parties to consider. In the first place NARS have goals - which may be better or less well articulated - and which may or may not overlap in their entirety with Center mandates and priorities. Furthermore there are the main goals of the CGIAR – sustainable agriculture, poverty reduction and food security – the salience of which will differ across different Centers and different parts of their research and training portfolios. Thus whilst in both figures below there is a high level of coherence between Center mandates and training and learning inputs, there is a greater consistency between NARS priorities and needs and Center training and learning inputs in Figure B than in Figure A. It is also assumed in Figures A and B that CGIAR goals are always broader than those of any one Center.

The implications of the different configurations represented in Figures A and B are discussed below.

Figure A



Figure B



4.2 NARS capacity strengthening as a Center priority

Questionnaire surveys and case studies of NARS and Centers all confirm that NARS strengthening – including through training and learning - is a priority in the CGIAR. This is reflected in policy and strategic plans and backed up by the views of researchers. When asked to rate the importance of ‘training and structured learning activities aimed at NARS strengthening’ for their Center over 85% of researchers responding to questionnaires rated this as ‘important’ or ‘very important’. When asked to assess the importance of capacity strengthening for their own research, 68% rated it as ‘important’ or ‘very important’. Outcomes of training and learning were also reported by researchers responding to questionnaires to include all the different aspects of capacity strengthening from ‘trainees’ career opportunities are improved’ to ‘new capacities and skills embedded in NARS’ and ‘new networks created’.

Similarly, according to Training Officers (or focal points) institutional strengthening is judged overwhelmingly (by 96%, 29 out of 30 respondents) the ‘most important output of

Center training'; and the two most important criteria in deciding the kinds of training that takes place are 'Center's mandate' and 'Demand from NARS'. This is reinforced by the trainee survey data: most trainees were employed by NARS when beginning their training and most of them were encouraged to participate in training and learning by their employers.

Perhaps the main inconsistency between the Centers' declared commitment to training and what happens in practice, is evidenced by the generalised reduction of unrestricted funds to training during the 1990's, which affected the training units, services and support. Given the budget reductions, Centers chose to channel funds out of training to sustain other activities. Some of these, such as gene bank maintenance which was also severely underfunded, are far less resilient than training to budget fluctuations, and in this sense the decisions were justified. But the experience suggests that the Centers' commitment to training has in fact been strong up to the limit where the continuation of training related activities puts at risk other vital long-term functions which are even more essential to the research mandates. A second inconsistency is that a majority of researchers (55%) report that there are few positive incentives in Centers to become involved in training and learning activities. This was explained and elaborated in open-ended comments:

Performance evaluation is stacked grossly in favour of research, very little to gain by doing training - No clear institutional messages that training is important - No or very little funds - Institutional culture views capacity building as soft and not important

Upper management never mentions training. General feeling is that training is no longer considered a priority. That functions as a potent disincentive.

We, at (Center X), consider training a very important function. Past decisions to stop training and close the training unit have been detrimental to (our) linkages with NARS and have hindered important gains in our capacity development role.

The importance given to the production of refereed Journal papers is too high in comparison to the importance given to the impact produced by contributing directly to partners through training.

However, against this, there is also the evidence that researchers have spent increasing time on training in recent years (see Chapter 6.2) and that a high proportion of them consider training an essential component of executing and refining their research. So the lack of incentives described above may well have dissuaded researchers differentially. (See below section 4.3 for more detailed analysis.)

The above paints a fairly consistent picture of the Centers' formal commitment to capacity strengthening often expressed through training and learning activities which are, in turn, perceived as relevant to the needs of the NARS. However as we have seen in practice Center policies are not always consistent with the formal commitments expressed.

Capacity strengthening cannot only be addressed through training and learning. Capacity also involves resources, equipment, management arrangements, policy support etc. Centers endeavour to enhance the relevance of the training through various strategies to cover the other capacity strengthening requirements e.g. by including them in collaborative project planning. Evidence on this is given, for instance, by the increasing amounts of ‘flow through’ funds managed by some Centers (e.g. up to 80% of a given project’s funds goes to NARS at ILRI). At the same time 72% of researchers regarded ‘inadequate resources in NARS/NARI’ as constraining the take-up and impact of their research. Furthermore in the course of field-work in SSA the Panel encountered many instances where those trained were unable to use what they had learned because of lack of operational resources – a reality affirmed by questionnaire results, and discussed further below in relation to outcomes and impacts (see Chap. 7).

A major concern expressed in the Center interviews concerns the relevance of present-day training through project funding to longer term institutional capacity needs. In the short term, project funding may help ensure that inputs such as equipment and operational resources are provided to complement the training provided. But over the longer term, the strength of the institutions may suffer because it has become more difficult to form a ‘critical mass’ of researchers in a given area, or to form multidisciplinary teams who would sustain research and be a force to influence institutional and political change. The importance of these contributions is illustrated in some of the cases studies which had major impact at institutional and field level (e.g. Bolivia, Case studies 1, 2). At the same time, projects are frequently too short to accommodate higher degree training, which may be in the best interest of the trainee and their institution.

4.3 Criteria for judging relevance

Relevance is generally judged by Centers in the context of their collaborative research programs with NARS. Both CIP and IRRI for example regard training as relevant to those areas of NARS research which are shared with the Center. Relevance here is both in relation to implementing research (i.e. ensuring that data can be collected and field-trials organised) and encouraging the adoption of new techniques and knowledge. This view is supported by many researchers:

Training & capacity building are essential complementary to research and are essential for enhancing food production and facing starvation in most of the developing nations. Quality research cannot be implemented without qualified staff members and therefore more funding and other resources need to be allocated to these important activities. (Open ended comment in Researcher Questionnaire)

A deeper analysis of questionnaire data as to the rationales of researchers for undertaking training and learning activities, throws further light on their perceptions of relevance. Researcher responses suggest that:

- Those who regard formal training as important for NARS capacity strengthening are highly likely to regard skill shortages in NARS as a constraint on the take-up and impact

of their research ($p < .000$). On the other hand those who regard skill shortages as a constraint may still spend less time than average on formal training.

- Those who consider the lack of skills in NARS as an important constraint for research, also consider informal training and learning as important ($p < .002$). However as with formal training this does not mean that the researcher concerned spends a high proportion of his or her time on informal training/learning activities.

These results tend to confirm that for researchers the justification for training and learning activities with NARS is complementary to their research.

However, a much wider interpretation is assumed by some of the NARS. This is reflected in the report of the recent internal review of ILRI's Capacity Strengthening Unit, which quotes criticism from NARS representatives that the training is too project-driven, rather than needs-based (Youdeowei *et al.*, 2005):

'The majority of the training programs were not directly related to the needs of the NARS programs. Rather, most of the training programs are based entirely on ILRI's approved research projects. The effect of this bias for ILRI's research program focus in training, has tended to limit the impact of ILRI's CaSt activities on livestock development in the region.'

If relevance is assessed in terms of the extent of overlap of Center research goals and associated training with NARS needs – and the career needs of NARS researchers - then most CGIAR training can be judged as relevant.

However, when the needs of the NARS extend beyond Centers' research priorities, as they often do, different conclusions can be drawn, as suggested by the ILRI case cited above. Nevertheless, given Center mandates and funding, it would be unrealistic to expect a response to the broader NARS' needs in such instances. Training outside the bounds of the research agenda would, by definition, be outside the Centers' distinctive competences. But in SSA, in particular, this poses strategic questions for the CGIAR as to whether more can be done to reconcile poverty reduction (including the toll of HIV/AIDS) and the Centers' mandates narrowly defined. The Panel heard different priorities voiced by NARS' representatives as to criteria against which the relevance of CGIAR training should be judged. Some clearly wanted Centers to respond to NARS needs even if they fell outside of Center research mandates, often regarding Centers as among the few agencies with a capability to respond to their needs.

Other problems of 'relevance' arise when the NARS re-orientate their priorities to match the priorities of the CGIAR Centers. The concern here is: what does the NARS give up in order to pursue priorities such as 'building capacity in molecular biology' in Africa? Is it to the detriment of national institutions? Does it divert their efforts from what they ought to be concentrating on? This can be regarded as a NARS problem of inadequate priority setting. However when resources are very limited, quite modest funding can be sorely tempting for NARS. Similar dilemmas face the weaker NARS in Latin America.

4.4 Priority setting in Centers and the NARS

NARS have different capacities, strengths and deficits, which also implies different capacity strengthening needs. Furthermore capacity needs change over time as priorities shift and countries and their NARS develop – or experience setbacks. The ability of Centers to differentiate between the needs of different NARS and to shape and adjust their inputs as needs change, is therefore an important indicator of relevance.

The alignment of training and learning with NARS needs and priorities can be assessed in a number of ways, including:

- The existence in Centers of training plans that are regularly updated and that specify priorities at a sectoral and national/regional level;
- Regular consultation with NARIs and other partners as to priorities which may be both formal and institutional or occur among scientists working together in networks or collaborative research;
- Integrating training needs analysis into project planning.

Surveys of those responsible for training in Centers indicate that:

- Of the 12 Centers identified, 7 report that they have a training strategy or plan – others report that this is incorporated into broader Center strategies and plans;
- Most report that their strategies have been updated within the last 2 years;
- Regular consultation with NARS is rated as an important influence on these strategies.

However, those responsible for training (training Officers/focal points) are less confident that consultation with NARS occurs in practice even if it is regarded as important: 17 out of 29 respondents said that ‘regular needs analysis and priority setting with partners’ did *not* usually take place in their Center.

Since the demise of most Center training units and programs and the insertion of training into projects, the processes in place to ensure the relevance of training have changed. Some Centers that the Panel visited, such as IRRI and CIP, retain center-wide procedures for assessing training needs and rationalising activities across subject areas and across regions. Even in these cases, some difficulty has been experienced in applying these procedures routinely, because of the decentralization of training. More commonly, needs assessment is carried out at the project level and the effectiveness with which this is done is, consequently, variable between projects within a given Center as well as between Centers.

Case studies at CGIAR Centers confirm these general findings. For example:

- There are well developed consultation procedures – at least on paper -with NARS in most Centers visited by the panel. Annual bilateral consultations; questionnaires to NARIs; consultative groups or committees are said to be used to identify priorities.
- There is evidence that Centers shift the focus of their activities, between topics and between NARS as needs change and as they respond to feedback. Thus IRRI has reduced activities in Thailand and Vietnam but increased efforts in Cambodia and Laos.

The panel also noted in the course of field visits that well-documented procedures for consultation and prioritisation in Centers are not always consistently followed, e.g. a supposedly annual process might not be implemented for several years.

4.5 Factors shaping NARS priority-setting

Where Centers work with NARS to set priorities for capacity strengthening and training and learning, they are dependent on the NARS' ability to undertake a national needs analysis and set its own priorities. This does not happen effectively in all NARS. Thus in Bolivia, a country that has experienced considerable political turmoil in recent years, the national agricultural research institution (IBTA) was dissolved in 1998. Despite the creation of decentralised, market-driven successor bodies, it was the view of country based informants that there was now no 'voice' or coherent expression of demand across the country. International research trends and project funding were seen as the main determinants of training 'needs'. The lack of firmly articulated priorities also explains, at least partly, the few cases encountered by the Panel where there was a perception on the part of the NARS that Centers impose their priorities, or even make use of the NARS for carrying out their own agenda (e.g. Ecuador Country Study). This kind of institutional weakness observed in certain cases in SSA and LAC contrasts with the situation in the Greater Mekong Basin. In the latter case, relatively strong NARS claim to have been able to articulate national priorities more effectively. As one government official observed: 'Whatever training the CGIAR does in this country is consistent with national priorities and has been agreed with (the NARI).'

It is difficult to generalise about the extent to which training priorities integrated with research priorities become distorted by the availability of donor funding for projects. Survey results for TOs and focal points, suggest that whilst donor priorities are not very important (an aggregate score of 3.5 on a scale of 1-5) availability of funds is seen as more important (4.3 on the scale). Case studies of Centers suggest that the non-availability of funds is the most likely explanation of what occurs on the ground. From country based partners there was more awareness of this actually or potentially occurring, and some evidence that it was skewing the priorities of Centers. Certainly the highly erratic peaks in certain kinds of training activity shown in Chapter 3 suggest a response to funding opportunities rather than the result of systematic planning.

NARS ability to undertake needs analyses and put forward a coherent plan also interacts with the security as well as the scale of funding. Strong NARS with secure own funding and support at policy levels are better able to plan and prioritise than those without secure funding or political support. Similarly those with longer term project funding from a donor that 'is in it for the long-term' are better placed than those dependent on short-term funding. Donors such as Rockefeller Foundation in Sub-Saharan Africa and the Swiss Development Corporation in S.E. Asia and LAC were among those identified as supporting NARS over the long-term and thus allowing NARS to develop reasonable planning horizons.

4.6 NARS' perception of relevance

Given the obstacles faced by both NARS and Centers in defining appropriate training plans, the Panel collected evidence from various sources on the NARS' perception of the relevance of the training actually carried out.

In the first place, as mentioned above, most of the NARS' trainees who responded to the survey, undertook their training with encouragement from their employers, which suggests confidence on the part of their institutions that the training would meet their needs. The trainees themselves reported reasonably high rates of positive outcomes at the personal, institutional and broader levels as shown in Chapter 7. However, as pointed out initially, some positive bias must be included in these results, and the proportions of negative perceptions varied from about 30% to about 60%, depending on the criterion and the region. These cases could be considered attributable to lack of relevance, but they were often associated with a lack of opportunity to put trainees' newly acquired knowledge and skills to use afterwards (7.2). So it is arguable that inadequate post-training provision and inappropriate candidate selection were as much to blame as irrelevance of the training. A similar interpretation seems valid for the different levels of trainee 'wastage' described in the country reports. Thus, high levels of wastage in Ecuador or Malawi (DARS) contrast with excellent retention rates of trainees in Bolivia (PROINPA) or Thailand for reasons more likely to be related to institutional health than to different degrees of relevance of the training. This is consistent with the 'model' outlined at the beginning of this chapter which suggest the difficulty of isolating training and learning from the way provision is aligned with 'needs' and ultimately the ability to use what has been learned. (This latter topic is further elaborated in Chapter 7.)

Additional evidence was obtained in the Country Case Studies. Significantly, two cases where the training was initially considered not relevant to local needs at all, were eventually recognised to have highly successful institutional and field outcomes (Bolivia, Case 1; Ecuador, Case 3). In others, there was some perception that the training satisfied the needs of the Centers' research agenda more closely than the needs of the NARS (Ecuador Country Report; Bolivia, Case 4). This contrasts with the very high degree of relevance evident in the Kenya dairy case study (which became a model in tropical livestock production. While this evidence is anecdotal, it raises again the issue of the precision with which NARS define their needs, against which the relevance of the CGIAR training can be judged, but cases where there is perceived to be a clear contradiction have, in the Panel's experience, been rare.

4.7 Conclusions

In general the Panel concluded that CGIAR Center training is broadly relevant to the capacity needs of NARS. Centers are formally committed to capacity strengthening; and many researchers within Centers as well as those with some responsibility for training and learning (Training Officers and 'focal points') are evidently dedicated to helping NARS strengthen their research base. It has also been argued by some researchers that relevance has been reinforced in recent years by the decentralisation of training to Center researchers

who are now more closely involved in specifying training to match the needs of collaborative research projects.

This broadly positive assessment needs to be qualified however, in three ways:

- First, what happens in practice does not always match formal commitments. There are few incentives to become involved in training and learning according to a majority of Center researchers. The close-down of training units and programs in many Centers has reduced the ability of Centers to plan, coordinate and monitor relevance. Long established processes of joint planning and consultation between NARS and Centers are in some Centers now less used than they once were.
- Second, funding arrangements and in particular the growing dependence on project funds can affect relevance. In some Centers project funding has been said to increase relevance as researchers are now more committed to training and learning activities that are integrated into collaborative research. However the short term nature of some project funding can undermine NARS' capacity by reducing the time horizons for planning and investing and by subsidising operational investments that are not sustained once the project ends. Where NARS are weak and under-resourced it is also possible for Center led project priorities to distort NARS own priorities – pushing them in the direction where funds are available.
- Third, judgments as to relevance depend on the criteria used. Judgments are most positive if one stays within the parameters of Centers' research mandates. However where the needs of NARS do not closely overlap with Centers judgments will be less positive. This may be the case if NARS's priorities are broader than those of any one, or all, the Centers, even though coinciding with broader CGIAR goals such as poverty reduction or alleviating hunger.

The Panel takes the view that it is justifiable to assess the relevance of training within the parameters of the Centers' research programs. This does not imply ignoring broader NARS' capacity needs, but these must be addressed in collaboration with other agencies with a different, complementary or more development-orientated mandate. The challenge is greatest in SSA and a commitment to capacity strengthening in this region may require innovative approaches to the delivery of training that goes beyond the strict requirements of Center mandates. The most immediate way to improve relevance is put in place standardised needs-assessment protocols across the full range of the Centers' collaborative research projects. At the same time, there is an evident need to assist some NARS in the establishment and articulation of valid priorities, which the CGIAR can then seek to complement and support.

5 QUALITY OF TRAINING AND LEARNING

This chapter assesses the quality of teaching and learning in the CGIAR. It begins by reviewing how quality is defined in the field of vocational education and training (VET) considering both outcome and quality assurance (QA) approaches. This sets a framework for the evaluation approach adopted in this study by the Panel. The chapter then considers the QA methods that are used in Centers including how they are applied and to what types of training and learning. Feedback from ex-trainees is discussed in terms of their satisfactions with training quality and the utilisation of what is learned. Finally in the concluding section recommendations are outlined as to how training quality might be improved.

5.1 Defining quality

Quality in education and vocational training is difficult to define, describe and measure for a number of reasons. There are fundamental differences in approach between those who favour an output model²⁰ that looks for quality criteria against standards and a process model that seeks to establish that procedures are in place to assure quality. Output models confront questions about what standards and criteria to use – knowledge acquired, student/trainee satisfaction, competencies, usefulness in post-training settings; and whose judgements count most: trainers, trainees, employers and at what point in time these judgements are best made. (For example there are many evaluations in training institutions including IARCs that depend on end of course responses rather than longer term follow-up.) Process models follow training through from needs analysis to trainee selection, course design – including pedagogic aspects, delivery, feedback etc. These approaches also have their difficulties – although they have become the preferred approach to evaluate education and training²¹. In particular linking processes with outcomes has in practice proved to be difficult: how do we know whether a pedagogically ‘good’ course leads to better outcomes.

As was noted in the Inception Report for this study the diversity of training – which includes PhDs, Masters Degrees, training of trainers, group courses, experiential/informal and work-based learning – poses additional difficulties in assessing training/education quality in the CGIAR. It was seen as unlikely that identical judgements could be reached for all the different categories of CGIAR training and learning – as has proved to be the case.

The ‘model’ adopted in this study is a pragmatic compromise among the alternative and sometimes contested approaches referred to above. This consists of:

- *An assessment of the ways in which Centers implement training and learning.* This relies mainly on an examination of the systems in place to assure quality from trainee selection through to curriculum development, delivery and follow-up. This assessment draws mostly on case-studies of CGIAR Centers, questionnaires to Training Officers/focal points and where available EPMRs and ‘impact assessments’.

²⁰ The most well known example of an ‘output’ model is probably that associated with Kirkpatrick (1967) although competency models that focus on the capability of trainees (Marrelli, 1998) have now become more accepted.

²¹ See for example the EU’s ‘Copenhagen’ Process. (Copenhagen Process: First report of Technical Working Group European Commission, Brussels, October 2003.)

- *Feedback from trainees and partners.* This includes feedback on their satisfactions and assessments of quality as well as the reports on ‘outcomes’, e.g. usefulness of what was learned for their subsequent work and careers. This relies mainly on questionnaires to ex-trainees and partners and some contact with trainees in the course of fieldwork in Centers and Countries.

5.2 Methods of quality assurance in Centers

The survey of Training Officers (or ‘focal points’ where no such role existed) were asked how the quality of training was assured in their Center.

Table 5.1 Training officer survey: question 18

By what means does your Center assure the quality of the training it provides? (N=36)	
Feedback from individual learners	27
Feedback from partner organisations	19
Peer review of training materials	18
Feedback from University partners for PhD & MSc students	14
Updating trainers’ methodological skills	11
Indicators as part of an evaluation system	9
Independent evaluations	7
Applying an explicit, written QA system	6
No explicit quality assurance	3

Obtaining feedback from learners, feedback from partners and peer review of training materials were reported as the most common approaches to Quality Assurance (QA). However there was much less priority given to obtaining feedback obtained from PhD and MSc students than from course attendees.

In the course of visits to Centers the Panel was able to confirm that these means of QA did in fact occur. However field visits to Centers and Countries also highlighted difficulties in practice. For example:

- There was less feedback obtained from individuals and very little from those involved in practical experience-based learning e.g. in field-stations or labs.
- There was virtually no feedback from in-country activities, which given decentralisation and their importance in CGIAR training and learning, constitutes a major gap in coverage.
- Nearly all QA processes referred to, applied to course attendees – there was little or no QA for other forms of training, education or learning.

With the decentralization of training to researchers, the results of whatever feedback is obtained remain in the scientists’ domain and are not necessarily incorporated into institutional measures to improve training quality.

The table above also suggests that independent evaluations play a minor role in quality assurance. This was corroborated by the Panel. In their view, EPMR’s have generally paid very little attention to training quality or to processes in place at the Centers for monitoring

it. At the same time, Centers have made relatively little use of internally commissioned reviews to cover this area, and those carried out have, in many cases, had two defects: first, a lack of independence and second, the reliance on survey data without due recognition of the positive bias in the results which this is likely to produce (see Annex III for a summary).

Those responsible for training and learning in Centers were also asked in questionnaires to rate what they regarded 'as important to support training quality' and to contrast this with what happened in practice. There were some notable discrepancies, particularly so for the following items:

- 'Regular needs analysis/priority setting with partners';
- 'Training/learning expertise to advise on training methods';
- 'Training facilitated by specialists in adult learning';
- 'Screening of applicants to get the right trainees'.

All of these were seen as important for quality but not occurring in practice by a majority of respondents. The absence of pedagogic expertise - in training methods and adult education is especially striking.

Deficits in quality were often attributed to the demise of training units and training officers in many Centers. Strengthening training units is also seen as a priority by researchers responding to the Researchers' Questionnaire Survey – although from discussions with researchers the kind of training units foreseen are different from those that previously existed. Results for researchers who responded to questionnaire items on quality are shown in the table below with their rating of factors seen as most important to raise quality ranked from the highest to the lowest.

There is only limited agreement between researchers and those responsible for training as to many of the ways that would ensure quality. Furthermore aggregate results for researchers are less emphatically positive, probably because of differential levels of involvement in training activities. Researchers are most keen on measures that involve them and less enthusiastic for those that might imply an enhanced role for a training unit.

When visiting Centers the panel encountered many specific examples of good practice in quality assurance. These were most evident in Centers that had retained some kind of central Training Unit or function. Examples of good practice include:

- Involving a training unit/department in the design stage of research projects to clarify learning objectives;
- Manuals and toolkits for trainers – often geared to the needs and experience of researchers who will be responsible for course delivery and made available also to regional programs by HQ staff;
- Systematic feedback gathered from trainees at the end of courses and the maintenance of accurate trainee records allowing for the periodic or occasional follow-up of alumni;
- Providing a resource person who is a pedagogic expert to facilitate researchers – work alongside them – in preparing and delivering their courses;
- Setting up an electronic resource of courses and training materials, which can be consulted, downloaded and re-used.

Table 5.2 Researcher survey: question 13.

Which of the following do you see important to ensure training quality?*			
	Important	Neutral	Not Important
Opportunities for researchers to update scientific content	48.9	24.9	26.2
Researchers involved in course planning	46.9	27.9	25.2
Screening of applicants to get the right trainees	46.5	23.5	29.9
Standardized record keeping of training and trainee related data	38.9	29.6	21.5
Systematic collection of feedback from trainees	36.6	25	38.4
Regular training needs analysis/priority setting with partners	33.8	31.9	34.3
Effective backstopping from training office/unit	29.9	24.8	45.3
Training/learning expertise to advise on methods and delivery	28.8	26.4	44.7
Development of best practice guides for systematic use	27.5	24.6	46.9
Training facilitated by specialists in adult learning	26.0	23.0	50.0
External evaluations of training (additional to EPMRs)	22.5	24.4	53.1

* N=204-220 depending on item; values show % total replies for each line item

Examples of Center Good Practice

1. CIP. The Center's strategy for improving quality and outcomes includes incorporating the Training Department from the start of project development, so that the necessary steps from training analysis and needs assessment to evaluation are systematised. All training activities using unrestricted funding are now written in log-frame format with specific goals, outputs and indicators of achievements. The Training Department is in the process of adapting Kirkpatrick's four levels of evaluation for CIP's training activities and implementing the ISO 9001:2000 guidelines for quality management in education. To cover informal training, there is a proposal for learning objectives to be written routinely into collaborative research projects, and for these to be monitored and evaluated as are the research results.

2. IRRI. The Training Center aims to 'facilitate' researchers in various ways. Materials are available to support course design these cover, for example, preparing a class room; designing training events; how to engage (motivate); and presentation skills. The TC does not use professional trainers – although TC staff may deliver some 'generic' courses, nor does the TC use 'training of trainer' approaches. More recently a new member of the TC with pedagogic skills has been recruited to work alongside researchers to help them improve the quality of what they do.

3. ICRAF. Course demand comes from the regional programs and the central Training Unit backstops training activities carried out in the regions. This includes both short courses and thesis research of degree students. The focus is very much on building capacity in the region to carry out training activities through training of trainers. The Training Unit has developed a toolkit for trainers running from theories on adult education through, stakeholder analysis, teaching methods, to evaluation and assessment. Content is provided by ICRAF and national scientists working together around skill needs identified in the region. There is a large participatory element within course development and use of national expertise. New courses are developed in curriculum workshops, where specialists in the subject both contribute to the content and become trainers themselves.

As noted above, these examples rely heavily on some kind of central training unit, department or resource which nowadays only exist in seven of the Centers. In addition the Panel identified major problems with the quality systems that are in place:

- Researchers are not required to follow guidance or advice and in some cases do not;
- Obtaining periodic feedback from subsets of trainees after course completion – when trainees return to work - is not common, even though this is recognised as ‘good practice’ and often more telling than feedback obtained on course completion;
- There appears to be little or no quality assurance systems in place for those involved with degrees, on-the-job or informal learning – even though these are major elements in the CGIAR training and learning offer;
- There is a particular problem with ‘quality on entry’ of trainees due to deficient basic training of applicants from many countries where the CGIAR is engaged (e.g. see Country reports: Cameroon, Bolivia), as well as to lax selection procedures;
- Generally poor record systems for in-country trainees, with one or two notable exceptions and very little follow-up at country level.

Many of these problems echo the findings of previous internal reviews carried out by CGIAR Centers. (See Annex III, for Summary of Internal Reviews.) With regard to the quality of training these reviews concluded:

Quality ratings were (also) consistently good to highly favourable. However, specific recommendations were made about systematic quality monitoring, and the need to determine whether learning objectives had been met. One study pointed up differences in quality between in-country and headquarters courses, and that the perception of quality varied according to the trainees’ previous level or preparation. It also traced trends in quality of courses over time and found no indication of improvement. A common recommendation was the need for greater post-training follow up and direct support to trainees.

The issue of how to implement QA (and quality control) for informal learning and training is more challenging than for traditional training courses. However this is an undoubted priority in the CGIAR and there are a variety of methods that could be adopted. Surveys of partners and trainees used in this study are one method dependent of course on the maintenance of contacts detail records. There are also instances of good practice already

emerging such as CIP's intention to incorporate learning objectives routinely into collaborative research projects.

Comprehensive QA systems systematically applied are not the sole determinants of quality. There are within the Centers visited enthusiastic researchers with their own innovative ideas about learning who appear to inspire learners and adopt effective pedagogic methods. However without effective systems it is difficult to consistently guarantee quality.

5.3 Feedback from ex-trainees, partners and NARS

Questionnaire surveys of ex-trainees and research partner were used by the Panel to obtain feedback on the training and learning that has taken place. The positive bias which is likely to occur is survey information is fully recognised, since the less satisfied would tend not to reply. To counteract this, the Panel conducted interviews widely with alumni, partners and their superiors in the countries which they visited, which gave a more representative sample, albeit on a smaller scale.

A series of questions were asked in the surveys about trainee satisfaction both for those who attended courses and for individual trainees. The overwhelming majority of trainees were satisfied and many were strongly positive. However there are differences in levels of satisfaction for different items. Course attendees for example were most satisfied with course content, quality of teaching, organisation of course and quality of equipment, but least satisfied with the balance of country specific and international content and the balance of theoretical and practical knowledge imparted. The latter items raise particular quality concerns.

Table 5.3 Trainee survey: question 5

Satisfaction with Aspects of Course (Course participants*)		
Areas of satisfaction	Completely satisfied (%)	Satisfied (%)
Course content	55	91
Organisation of course	51	91
Quality of teaching	47	90
New training skills acquired	30	80
Opportunities to interact with trainers	36	75
Opportunities to interact with others on course	41	79
Balance of theoretical /practical knowledge	29	75
Quality of course material	44	87
Balance of international/country specifics	21	63
Quality of equipment	50	85

* N is between 194/284 depending on item

Individual trainees also rated their training/educational experience positively – even if slightly less so than course participants.

Table 5.4 Trainee survey: question 6

Areas of satisfaction (Individuals*)	Completely satisfied (%)	Satisfied (%)
Research opportunities at center	58	83
Support from supervisor or mentor	56	84
Cooperation with host university	37	63
Interaction with researchers at Center	38	69
Availability of equipment, facilities, resources	55	70
Learning/working with experienced researchers	37	69
Balance of international/country specifics	27	67
Availability/access to information/publications	56	82

**N approximately 170, depending on item*

Fieldwork at Centers confirmed these aggregate results. For example in one focus group of 11 learners taking MSc or PhD courses, overall satisfaction was consistently high and interaction with supervisors was especially praised. In another case, the trainees pointed out that the content of their training was uniquely appropriate, because the IARC's are now probably the only institutions worldwide where molecular genetics and traditional plant breeding are dealt with in an integrated fashion. It is also significant that training quality was very seldom brought up as an issue in the Country study interviews, leading to the conclusion that it was generally considered to be satisfactory.

At the same time for individuals as for there are items which raise questions about aspects of training quality. In particular there appear to be reservations about cooperation with host universities, the balance of international and country specific content and the opportunities to work with experienced researchers – including researchers at Centers. The matter of balance between international and country specific content, which featured for both individuals and course participants, highlights the tension between the global role of the CGIAR and trainee demand for 'local' or regional content. Ex-trainees in Vietnam and Thailand touched on similar topics in the context of country-based training and the likelihood that this would be more relevant to their needs than that delivered in Center HQs.

An analysis was conducted of the minority of trainees who were consistently negative (or more precisely 'not positive') in their ratings of the training they had received.

Table 5.5 Trainee survey: analysis of negative replies

Difficulties using knowledge/skills x Positives/Negatives (Trainees)			
<i>Positives /Negatives</i>	<i>Means</i>	<i>N</i>	<i>Standard Deviation</i>
Negatives	3.69	68	.868
Positives	4.39	252	.730
Totals	4.24	320	.812

P < .000

This analysis showed that the single most powerful predictor of negative ratings by ex-trainees was their *difficulties in using knowledge and skills*.²² These differences were statistically significant across all outcome and quality filters. In brief:

- Dissatisfaction with training is greatest among those who report they have had too few opportunities to use what they have learned.
- Negative ratings of training quality were also strongly correlated with few opportunities to use what they had learned.

There is also a clear thematic or disciplinary divide in levels of satisfaction expressed by trainees. As the table below indicates, the most positive ratings are made by those with a background in Livestock, Fisheries, Crop Protection, Genetic Resources etc; and the least positive among Social Sciences, Policy, Economics. Research Management etc.

The table shows a trend towards higher degrees of satisfaction in the biological than in the social sciences. The differences were not always statistically significant, depending on the numbers of observations, but in the larger classes of Crop Protection, Genetic Resources and Crop Breeding, where the proportions of positives were 80% or more, these exceeded the values for Economics, Policy or Social Science (67-71%) at levels of probability between 0.05 and 0.01. No differences were found involving NRM, another of the larger classes, or the other classes with lower total numbers of responses.

Table 5.6 Responses by training theme

Proportions (%) of positive responses, by training theme ²³					
Theme	n	Positives (%)	Theme	n	Positives (%)
Livestock	30	87	NRM	104	77
Fisheries	9	86	Agroforestry	63	76
Crop Protection	125	85*	Research Man.	61	75
Genetic Resources	144	85*	Economics	49	71*
Forestry	28	82	Policy	35	69*
Crop Breeding	156	80*	Social Sciences	43	67*

n = total number of responses

* Themes where proportions of positive responses are significantly different ($P = 0.05-0.01$)

These finding is open to several interpretations:

- Course content and training opportunities are better developed for the themes on the left of the above table (e.g. livestock, crop protection, genetic resources etc.) than those in the column on the left (e.g. social scientists, policy specialists, economists etc);
- The judgments of social scientist, policy analysts and economists are also influenced by their need to become familiar with biological topics;
- Those who are negative come from disciplines more likely to be critical about courses;

²² Negatives were collated from different parts of the trainee questionnaire and respondents were scaled according to the consistency of their dissatisfaction. This was then correlated with new multi-item variables for 'outcome' and 'quality'.

²³ Note: Respondents were able to identify themselves with more than one theme

- There is also less of a correlation with opportunities to use what has been learned and opportunities for using what they know among social scientists when compared with those involved in crop-breeding. This may also have to do with the state of social sciences in some NARS which offer limited research opportunities.

The partner questionnaire survey did not explicitly ask for satisfaction ratings or about the details of training and learning quality, even though many were ex-trainees. However in the course of country fieldwork which always involved interviews with NARI and NARS more generally, consistently positive views were expressed by partners' representatives. Issues of quality were not raised, but quality was assumed to be positive. This would be consistent with trainee findings insofar as partners, by definition do have opportunities to apply what they learn – whether through courses, individually or informally.

A recurring theme in the Country studies was the value to local researchers of the informal learning which occurred in the course of collaborative work, or due to the long-term contacts established between local researchers and Center staff after formal training. Many perceived this informal learning to be more important to them than the formal activities. Testimony of this is given in many of the Case studies annexed to this report. (Annexes IX-XX; see Bolivia Case Studies 2 and 4).

5.4 Conclusions

Ex-trainees were highly satisfied with different aspects of training quality, including course content, quality of teaching, opportunities to interact with others etc. The minority of trainees who were not satisfied appeared to be influenced by what happened after they completed their training; not being able to apply what had been learned was a powerful predictor of dissatisfaction. Given the highly subjective quality of these judgments the Panel would view training quality to be generally but not uniformly good. More positive conclusions would require confidence in a CGIAR-wide quality assurance system. Most of the views refer to past training, i.e. before decentralization. Now researchers are more or less solely responsible, and it is difficult to extrapolate from the past degree of satisfaction to the present prevailing conditions.

QA systems for training even though they exist, are partial in their coverage and unevenly applied across CGIAR Centers. Systems that are in place are not always implemented and not all Centers have them. QA systems have been weakened by the reduction in specialist training units or functions and the lack of pedagogic or adult education expertise among Center staff. QA systems that do exist are applied mainly to courses. Informal training and learning and individual training, both degree and non-degree, is not within their scope. Country based training and in-country project based learning, more common because of decentralisation and the integration of training into collaborative research, are not covered by the QA systems that do exist. Although there are examples of good practice in Centers, it is difficult to be confident that quality issues are being monitored and that systems are being 'steered' as a result. The Panel has concluded that at the very time that decentralised modes of training delivery are challenging researchers to expand their pedagogic understandings, there are fewer and fewer back-up resources available.

Explanations of these developments are often linked to lack of core funding. However they can also be linked to a lack of prioritisation by Center management and by the CGIAR more generally. More consistent and positive messages would have to be circulated within the CGIAR for Centers to make training quality a priority area, in which they would be willing to invest limited core funds and seek out additional project funds that could be used for supporting training quality. Whatever the intention, Centers (and in particular those in Centers with a strong commitment to training and learning and capacity strengthening) have picked up messages from the days of the TAC onwards that what they do is not valued and is seen as competitive with research priorities rather than complementary. (Even though TAC's main argument was that training/learning was not the main bottleneck in NARS capacity strengthening, which raised questions about the worthwhileness of expenditures.) The belief that Center 'management' does not support and in recent years has reduced support for training and learning is widespread. Such perceptions were reinforced following ISNAR's closure and further reinforced in the course of recent discussions about proposals from the Science Council on 'System Priorities'.

On the basis of examples of good practice identified and what happens routinely in some Centers and for some target groups, it is possible to specify protocols for a QA system that would conform to international good practice standards. Such a protocol would include standards and norms for:

- Explicit training policies that set targets and link training and learning objectives to research priorities;
- Procedures and criteria for the recruitment and selection of trainees agreed with NARS
- Course design including pedagogic guidelines;
- Pedagogic support and skills training for researchers in teaching and learning methods;
- Reinforcing the support/training of researchers by feedback from trainees at course end routinely and for a sample at least at follow-up periods;
- The specification and monitoring of learning quality and effectiveness in informal learning situations;
- The feedback of QA system results to Centers so that planning and prioritisation of training and learning is improved.

All of the above ways of assuring quality would require the existence of training support resources and expertise in Centers. This might not be equivalent to resuscitating an earlier generation of 'Training Units'. Such resources would, for example, have to work in tandem with researchers and in-country collaborative projects and be attuned more closely to the priorities and needs of NARS actors. However given the continued high volume of training and learning activity within the CGIAR it will be difficult without such a system to be confident that this investment is being spent to good effect for enough of the time, in all Centers and for all types of learning and training.

6 EFFICIENCY OF TRAINING AND LEARNING

This chapter begins by discussing different understandings of efficiency, their applicability in the case of CGIAR training and learning and how issues of efficiency have been approached by the Panel. The chapter then considers resources allocated for training purposes; coordination within and among Centers; evidence of economies of scale and of specialisation. It concludes with an overall judgement as to current levels of efficiency and what more can be done.

6.1 Understandings of efficiency

Definitions of efficiency at their most simple are about how money is used: the ratio of inputs to outputs. More complex definitions elaborate more on the input or the output end of the equation, without losing touch with this basic formula. Thus the World Bank Independent Evaluation Group refers to the 'extent to which objectives have been (or are expected to be) achieved without using more resources than necessary'; and the Development Aid Committee of the OECD defines efficiency in its evaluation glossary as: 'A measure of how economically resources/inputs (funds, expertise, time etc.) are converted to results'.

There are a number of problems applying these definitions to training and learning in the CGIAR:

- First, there is little data available on 'inputs' in terms of budget, expertise, manpower, courseware or classrooms. There is certainly no data that allows for a systematic comparison of inputs over time and across Centers.
- Second, what constitutes training as has already been demonstrated is diverse and even where data exists in aggregate terms for some periods of time in some Centers they do not allow for the requisite degree of differentiation.
- Third, now that researchers rather than specialist trainers lead on most training and collaborative research projects contain most of what constitutes informal learning, it has become difficult to break down their time. Training and research activities are so closely bound together as to be indistinguishable in terms of inputs – and arguably purpose also.
- Fourth, what training and learning is attempting to achieve is similarly diverse and is both difficult to isolate from particular settings (e.g. eco-regional locations; crops and commodities; and techniques and know-how) and difficult to attribute in isolation from the actions and inputs of many others.
- Fifth, the benefits to the Centers themselves of carrying out training are seldom fully considered in discussions of efficiency.

This latter point is especially important. Efficiency cannot simply be assessed on the basis of what Centers achieve to the benefit of the NARS. From the outset, the Panel believes it is important that any discussion of efficiency should fully recognise the benefits of training to the Centers themselves (as was touched on briefly in Chapter 2). In the course of their Center visits, Panel members found convincing accounts of why scientists considered training to be an essential activity for them, quite apart from the benefits to the trainees. It extended their capacity to carry out research, improved the effectiveness of partnerships and thereby increased research impact, kept them abreast of modern scientific developments and

in touch with reality at field level, and in certain cases, even facilitated access to donor funding.

To partially overcome the difficulties identified, new data was gathered - through questionnaires and case studies, and existing data - available statistics and reviews - were further analysed. However none of this allowed the Panel to undertake a classic input/output efficiency study at a CGIAR 'system' level. It would have been possible to focus resources on one or two specific cases but even this would in our judgement have had limited yield given the integration of training and research and the many possible and actual outcomes of training and learning.

Given the circumstances, the Panel therefore fell back, as elsewhere in this study, on a relatively pragmatic approach to gauge efficiency. It concentrated on what Panel members considered on the basis of wider experience were likely to be the correlates of efficiency, including:

- The way resources are deployed;
- Coordination and economies of scale;
- Concentrating on areas of specialisation or 'comparative advantage'.

It also sought the views of CGIAR stakeholders – researchers, trainees and partners to clarify how they understood efficiency.

6.2 Deployment and targeting of resources

As CGIAR Centers have undergone reductions in core funds and in particular in unrestricted funds, they have reallocated their resources in response. There is a perception that training has been a major target of cuts which has been associated with closure of some training units or departments, closure of training programs, the integration of training into research and in some cases the devolution of group training to national partners. Figures on funding of training were difficult to obtain, but at the System level such data are available on research "undertakings" up till 2002 (Annex V). These figures show a slightly increasing trend, but there are known instances where they do not correspond with the information available at the Centers and there appears to be no standard practice as to how staff time or indirect costs are accounted for. In addition, it can be difficult to disentangle training costs undertaken as part of research from the overall research budget. As pointed out in Chapter 2, restricted/unrestricted funding data for training are not available from all Centers, so there is no reliable basis at present for estimating either the System's overall financial investment in this activity, or the real trends in 'core' funds.

Cutbacks in dedicated training units have been reflected in reductions in the numbers of persons with specialised training and adult education skills working in Centers. From the responses of Training Officers to the questionnaire survey – and to which the response rate was very high – it appears that such expertise is confined to only seven Centers. In CIAT, for example, there were 22 professionals in the Scientific Training and Conferences Program in the late 1980's, funded mainly from unrestricted core funds; 6 in the early 1990's and none today with a specialised adult education background.

Despite the reduction in specialist pedagogic skills there has not been an overall reduction in training activity (as was evident from the figures cited in Chapter 3). However the inputs in training provision and in support for informal learning are now more likely to involve researcher than specialist trainer time.

One piece of evidence on this score is that the proportion of researcher time devoted to training has not apparently fallen over the last 5 years despite the various cutbacks reported.

Table 6.1 Researcher survey: question 4

Proportion of Researchers Time Spent on Training		
Proportion of time spent on training	In the last 1-2 years (N = 275)	5 years ago (N = 175)
Less than 5%	16.7%	19.4%
5-15%	37.5%	43.4%
15-30%	31.3%	26.9%
30-50%	8.7%	5.7%
More than 50%	5.8%	4.6%

Researchers were asked to estimate the percentage of their time spent on different categories of activity - formal and informal training, research and 'other'.

Table 6.2 Researcher survey: question 7

Percentage Time of Researchers		
Activity	Mean % time	Standard Deviation
Formal training	13.2	13.7
Informal training	11.8	9.9
Research	44.9	24.0
Other	26.2	22.3

The 'mean' responses among researchers revealed a high proportion of time under both formal and informal categories, some 25% of time compared with 45% for research. It is because of responses like this – both in interviews and questionnaires - that it is reasonable to assume that most estimates of resources expended on training based on formal training are underestimates. These figures also suggest that reports at system level of the CGIAR's investments in training are understated. The likely reason for this is the consistent under-reporting of informal learning and training activities, which are increasingly important in CGIAR.

Researcher questionnaire responses also clarify the perceived connections between formal and informal training and learning.

- Those who consider formal training as important also spend above average time on formal training (significant at the .048 level).
- Those who consider formal training important are highly likely to consider informal learning as important – and the converse is also true. (This is highly significant, $p < .000$).
- Those who judge the outcomes of training and learning as positive for capacity strengthening see this as a combined effect of formal and informal means: it is only those

who consider both as important who regard training and learning as having a positive outcomes for NARS ($p < .01$).

As pointed out above, detailed analysis of the deployment of resources to training is partly difficult because of the way management accounts are kept. It is however possible to obtain useful cost data in Centers – something that we would recommend for future efforts to monitor training efficiencies at a system level. Thus in one Center that has retained a central training function we were able to establish that between 2000-2004:

- Training costs were split approximately 50/50 between research program and the central training function;
- Over the same period core funds accounted for only 5% of the research program total;
- The central training budget was made up of a number of elements of which coordination (including course administration and support) was only 10% - the other elements being a separately funded PhD program, generic short courses and ICT systems.

A number of efficiency question are raised by this example.

- How far are restricted or project funds able to be spent for purposes consistent with research and training priorities?
- How far are core funds deployed to ensure that training activities are well-focussed?
- What are the costs and benefits of coordination?

In the particular example cited above it was consistently asserted by researchers and Center management that donor priorities did not skew research priorities in approximately 80% of cases and that donors were especially keen on training and skill enhancement. In another Center however it was reported that there had been a change in the mix of training as a result of funding reductions and re-structuring. There was now less disciplinary research and training – this being previously supported by core funds, and more of a move towards commodity research and associated training.

Targeting and re-allocating resources is one indicator of efficiency. There are many examples of this:

- Reductions in long courses and in courses in Headquarters;
- Increases in the number of short courses – many in-region;
- Growth in informal learning integrated into research;
- Switching resources between countries depending on NARS needs;
- The growth of networks as vehicles for training and learning.

There are two reasons that resources might be re-allocated in these ways. First, Centers might be responding to financial pressures. This would imply the primacy of the input side of efficiency rather than outputs or results. A second rationale for re-allocating resources is that NARS needs and contexts and the potentials for partnership have changed. In order to achieve results different forms of training become salient. Examples of this would include:

- Increases in in-country training because of the identification of capacity needs in the extension system and as a way of gaining access to more trainees at a lower cost per trainee;
- Shifts of resources between countries, following reassessments of their needs and capabilities and consultation with NARS and partners.

Although the Panel was able to find many examples of this occurring the weaknesses already identified in systematic joint needs analyses with NARS partners does not give confidence that this always occurs.

On the other hand, the expected increase in efficiency due to some of these measures may not be fully realised. For instance, while in-country training may increase coverage at lower cost, there was ample evidence in the Case Studies of the distinctive value which trainees attached to headquarters training, which extended well beyond the particular subject area in question; thus, the values of headquarters and in-country training were not perceived to be simply interchangeable. Second, field evidence certainly supported the growth of networks, and they may have a specially critical role in combating the problem of high staff turnover rates, as for example, due to disease in Africa. But at the same time, they can only prosper to the extent that their individual members are strong and the Panel found evidence that the weaker members may be at a special disadvantage (e.g. Ecuador Country Study).

Types of training and learning

For active researchers and leaders in technology transfer, there seems to be consensus that a combination of training types fitted to their specific requirements will continue to be necessary. These are likely to concentrate on specialized short courses, specialized non-degree individual training and higher degrees. At the same time, evidence from Ecuador underlines the importance of informal training and learning experiences, and of long term contacts with the centers. The advantages of the networks should continue to be exploited fully, but their success depends on the stability of the members and the extent to which they meet the needs of individual partners, particularly the weaker ones, merits revision. A variety of training delivery modes will continue to be needed, with increasing use of on-line materials and e-learning, but this must not be at the expense of deterioration in quality in areas where practical experience is essential.

The proper selection of training and learning modes and methods of delivery is one important determinant of efficiency. The Panel has not taken the view that short or long courses are of their nature more efficient or that individual degree courses are better than non-degrees or periods of work experience. Rather it has been assumed that different training modes are suited for different purposes in different contexts. This is well summarised in the Ecuador country report.

The key issue is whether systems are in place to choose between modes and to match trainees to these modes. The evidence we have is that these systems do exist and examples can be found that appear to work well. For example:

- One Center, that still provides training courses, has a clear anticipation of demand for more short specialised courses and individual non-degree and degree training, but a reduction in longer more general courses;
- Centers operating in SE Asia have adapted their 'offerings' to move from training to collaborative networks;
- The selective use of e-learning and downloadable websites to support researchers improve and systematise their training and support self-directed learning.

Again however the Panel is not confident that this can be said to be universal – mainly because as previously noted the skills available in pedagogics and adult learning are so thinly spread across the CGIAR.

A closely related issue concerns the type of trainee to whom efforts should be directed. Here, again, the Panel would guard against generalizations. Deficient laboratory technicians may be a more important limiting factor than a shortage of well trained researchers, depending on the circumstances. However, their field experience did lead the Panel to three tentative conclusions. First, that interventions at the highest policy level are often an essential prerequisite to overall capacity strengthening and while these may not fall into the category of formal training, the payoff could be extremely high. The CGIAR commands the status and recognition necessary in many countries to perform such a role. Second, deficiencies in university education have major implications for capacity development at all levels, not least at the policy level and the level of candidate trainees. Major multiplier effects are foreseen not only by supporting the universities' own training activities directly but also, very importantly, by bringing them more actively into the research field (e.g. through collaborative research projects). Thirdly, the Panel understands that farmer training may be necessary in the course of developing methodologies, and also that, in the absence of effective extension systems, Centers are drawn into this area as the only means of ensuring that technologies reach the field. At present, given the state of Center data bases and the potential perverse effects of indicator systems, there is a need to be cautious in interpreting the apparent major increase in farmer training reported in Chapter 3. However a permanent shift of resources in this direction would be a cause for concern, even if financed from non-fungible additional resources, as it would not be unsustainable but may actually discourage local institutions from assuming their responsibilities in the longer term.

6.3 Coordination and economies of scale

Coordination, both within Centers and between Centers is one predictor of efficiency. In Centers without a central training function there is usually no coordination of training as an activity and often no training strategy. In such cases it is difficult to speak of training priorities or the benefits of coordination. Researchers often spoke of the reintroduction or strengthening of training units as a means of increasing efficiency of training. However those who responded to the Questionnaire Survey were ambiguous in their views about TUs. Where TUs existed the majority of researchers (60%) wished them to be reinforced. However where TUs did not exist only 39% favoured their reintroduction. Discussions with researchers as part of Center fieldwork, suggest that they would be most supportive of particular types of training units or functions, better adapted to a research-led training offer, rather than some of the units now closed. It can be argued that Training Units have come to be regarded as the symbol of a commitment to training activity by a Center. If that is a reasonable interpretation then the main issue is the policy commitment of Centers to training and learning and appropriate organisational arrangements to realise that commitment. This implies the need to manage and coordinate rather than the re-introduction of 'training units' per se. Such coordination will need to cover not only training activities within the Centers, but also between other areas of capacity strengthening expertise (e.g. IT and communications) available in particular Centers.

The Panel encountered many ways in which costs were spread over a higher volume of activity in the course of field-visits to centers. For example:

- The collation in electronic form of training modules and materials to permit their re-use²⁴ (e.g. IRRI Knowledge Base)
- Translation of resource material – both electronic and hard copy – into other languages (e.g. CIAT Farmers handbooks)
- Disseminating methods, outputs and curricula developed in one region to other regions – which is additionally efficient where it involves cost sharing with partners (e.g. CIP’s dissemination of disease diagnostics material from Bolivia to East Africa.)

These approaches to scaling-up, globalising and circulating knowledge and techniques as widely as possible seem to be among the most consistently applied in the Centers visited as part of this study.

Efficient resource deployment seems to depend to a great extent on the networking and negotiation capacities of Centers to align donor and Center priorities; the coordination efforts of those responsible for training; and the strategic use of core funds. At present this appears to only occur in a minority of Centers in the CGIAR. Lack of coordination between Centers is reported as a problem in the delivery of training by both by researchers and those responsible for training (focal points and training officers). Coordination among Centers can be seen as one way in which Centers might become more efficient and achieve greater economies of scale and synergies. Researchers who answered questions on this topic reported little evidence of coordination at many different levels including: disciplinary, general and specific training themes or use of technologies to deliver training. Those responsible for training also agreed that Centers could cooperate more in training materials, training content and training delivery.

National and regional fieldwork undertaken by the Panel suggests considerable variation in the extent to which coordination occurs. Thus in Malawi the lack of coordination was specifically noted – as it was in other parts of Africa.

Malawi: Integration needed for scaling-up

The move of each of the IARC’s into working through dissemination and scaling up methodologies for each of their crops and building the capacities to do so raises the problem that extension methodologies are not being developed within a farming systems context. Crop specific extension and scaling up methodologies make little sense once the work moves beyond the pilot stage. There would be value at this stage of the work in Malawi for the IARC’s to begin to integrate their work and the capacity building and training initiatives that flow from it

(Malawi Country Study)

²⁴ This was an efficiency measure previously identified by ISNAR in: Anderson, J.R., et al Impact of ISNAR 1997-2001.

On the other hand in Ecuador there appears to be more of a tradition of coordination.

Inter-center synergies in Ecuador

No evidence was found to suggest lack of coordination between centers in their training activities. In fact, several examples were cited of how their efforts had been complementary. CIMMYT's on-farm economic research, and associated training, in the 1980/90's, laid the foundation of what is now considered to be the on-farm research culture in the country. This was later developed and strengthened through CIAT's training and sustained collaboration in participative research, which is now a recognised feature of INIAP's overall agenda (Case study 3) and has been further built up and supported by CIP's collaborative work and training (e.g. in the FORTIPAPA project). A second example concerns product processing and producer-consumer chains, pioneered through CIAT's cassava processing research and associated training on the coast (Case study 2). It was strengthened through workshops run by ISNAR, and further developed through the CIP-led market chain potato network, PAPA ANDINA which has strong training/learning components. The producer-market-consumer chain concept is now well incorporated into INIAP's research policy for all crops. A third example relates to the collection, description, conservation and exploitation of native plant and forest species within INIAP, which has been supported through training and collaborative projects by IPGRI, CIP and CIAT. One feature of all these examples is that the Centers' policies and approaches to research and development are perceived to have been consistent and mutually supportive.

(Ecuador Country Study)

6.4 Specialisation and comparative advantage

One suggested measure of efficiency is the extent to which Centers confine their training activities to those topics where they enjoy a comparative advantage.

In national fieldwork there was a consistent understanding of what CGIAR Centers had to offer:

- Integrated approach to solving problems of world importance (hunger, poverty, resource conservation), integrated across biological and sociological disciplines, and across 'upstream' and 'downstream' levels of science;
- Long-term experience in the production and utilization of the mandate crops in the social and physical environments where they are grown;
- Unique collections of germplasm and related institutional knowledge;
- Worldwide network of collaborators;
- Capacity to act as apolitical 'honest brokers' and facilitators internationally and inter-institutionally;
- Excellent research infrastructure, documentation and information facilities.

Those responding to the training officer/focal point questionnaire were also clear about their Center's comparative advantage. Thus the 'link to strategic research' and 'scientific and practical experience in mandated area' was highlighted. However it was acknowledged that in some instances training outside a Center's area of comparative advantage does take place.

For example:

- Occasional seminars on how to develop project proposals, given to network members as a way to strengthen the networks;
- Students/scholars from IT area get trained by IT experts, while working on topics 'core' for the Center;
- English course so that researchers can participate in the international scientific community;
- Experimental design, data collection, management, analysis;
- Scientific writing and Presentation skills.

Various explanations for these activities have been put forward:

- The absence of alternative suppliers – say in a particular region or country;
- Such training is integrated with other training as a relatively small element and it would be disruptive and expensive to insert another supplier for a particular module;
- It opens up useful networks for wider Center activities (e.g. research, dissemination, etc.);
- Difficulty obtaining English tutors who are familiar with the language of agricultural science, making it desirable that Centers at least 'source' language tutors even if they do not deploy their own scientists.

There appears to be an awareness of this issue and the related 'international public goods' criteria among those interviewed in this study. Some see greater cooperation among Centers as a way forward:

'Training activities on agricultural policies and marketing though relevant is hard to approach from agroforestry standpoint. A coordinated CGIAR approach is better.'

On the other hand some informants wished to emphasise the positive aspects of these non-core types of training:

- An unavoidable aspect of training where remedial elements often have to be added to core curricula to even out gaps in trainee knowledge.
- The importance – and benefit to CGIAR Centers - of improved partner ability to raise funds in a specialist funding market (hence fundraising).
- The equal importance of English as a language of scientific communication in an international scientific community.

One of the trainings I have received was on scientific writing, including proposals. This Course gave me the opportunity to be more realistic in research. I can now exploit different aspects of my work to enhance my institution's image through publications, for instance. Furthermore, I can now prepare scientific proposals even if I have yet to learn in that field to be more efficient.

Trainee Questionnaire, open ended responses

It would in any case appear from the data in Chapter 3 that the volume of such training activity is a very small part of the overall portfolio of training and learning that is on offer from CGIAR Centers. Thus, the whole Methods category accounted for 10.7% of group trainee days, and about one third of this was devoted to statistics and experimental design,

areas in which experts in the subject matter (e.g. crop or animal scientists) are recognised to be more effective teachers than experts in statistics. (Table 3.5 and Annex VII). Also, most of the English teaching has been carried out by a single Center (Annex VIII). The corresponding figure for individual trainees was far lower (3.2% total trainee days devoted to Methods, Table 3.6), indicating that they were exposed to a very minor degree to possibly 'non-core' subjects. A very similar picture is given at a country level, taking Ecuador as an example, where it was estimated that at the most 4% of all training offered by CIMMYT and CIAT was in areas not covered directly by their mandates and that might be considered better delivered by other providers (see Country report, Table 2).

On the other hand there appears to be an extent to which Centers are driven to compensate for inadequate trainee preparation by remedial inputs outside the scope of their mandate. Field work in several of the countries visited drew specific attention to the deficiencies of basic and university education, and to the effect which this had on the initial levels of preparation of training applicants. Accordingly, for 67% of respondents to the Researchers Questionnaire 'Selecting trainees more carefully' is seen as an important way to improve efficiency and effectiveness of a Center's training and learning.

This is elaborated by researchers in open ended questions:

The level of the trainees is too low, they need to get a higher degree or go to a better school first. It is not (Center X) job to provide general training on statistics, data entry

There is a lack of control over selection (quality) of persons trained [which] can create to a large supervision burden with little return.

In some training activities there is a tendency to incorporate students that do not fit within course requirements. Some are there for political or institutional reasons.

These problems were encountered in both Latin America and Sub Saharan Africa. The Panel would also draw attention here to another aspect of candidate selection, which affects efficiency. Evidence in Chapter 5 showed that NARS' satisfaction with training is strongly related to how far it has been put to use afterwards and, as shown in Chapter 7, lack of post-training resources has been a widespread limitation. The problem is recognised by the Centers, but some of those visited were not comfortable with the prospect of assuming a stronger role in imposing criteria for candidate acceptance. The situation has improved somewhat with the insertion of training into research projects and since NARS have more commonly had to pay for the training received. Nevertheless, the Panel believes that this issue should be discussed frankly between Centers and NARS, and that the latter would welcome norms designed to safeguard their own investment in training by ensuring adequate post-training opportunities for their candidates. Such discussions might also form part of more general discussions with other donors who might be encouraged thereby to align their funding initiatives for capacity strengthening to NARI and NARS with CGIAR training and research plans. This would enhance the efficiency of the overall training process from the Centers' point of view, and perhaps also help reduce the levels of trainee 'wastage' described in this report.

Problems of trainee quality highlight broader problems of NARS capacity. These include the state of Universities, government's policy commitment to agriculture, the funding available to NARIs for operational costs - and the limited ability of Centers or indeed the CGIAR as a whole to address this scale of problems. Although many of these problems will have to be addressed by others e.g. donors, governments and universities, this also highlights the limits to what individual Centers can achieve on their own. This harks back to questions of inter-Center coordination, discussed earlier.

Discussions of where the Centers' comparative advantage for training lies, raises issues about whether other institutions are deemed to have comparable or superior capacity in what have hitherto been regarded as Centers' own 'core' areas. Clearly, the Centers' advantage changes as their research evolves, and other suppliers acquire new strengths. In this context, the 'devolution' of training activities to other suppliers, including the stronger NARS, is frequently called for. The Panel did not come across examples where this seems to have worked successfully. Rather, they were impressed by the case at Egerton College, Kenya, where despite extraordinary preparations by CIMMYT, collaborating donors and the College itself, the numbers of candidates for the production course have dwindled badly in recent years, not for lack of demand but for lack of funding. The causes are probably complex, as is the general issue of how far the stronger developing country institutions can successfully take on the support of weaker neighbours, or would be welcomed for doing so. In any case, the main onus would seem to be on the NARS themselves to ensure that their trainees are sent to the institutions most suited to their needs. Previous distortions which arose when training costs were covered completely by the Centers should now be largely removed. The most promising future strategy for efficient sharing of responsibilities would seem to be through the multipartite training partnerships, already in operation, where northern and southern institutions are linked with the Centers, and the work load shared efficiently according to the distinctive competence of each one.

6.5 Conclusions

The pre-requisites for the efficient management and delivery of training and learning are not in place in most Centers. It is therefore difficult to assess overall efficiency. There are many examples of 'good practice' but these are unevenly distributed. The most important deficits are inadequate pedagogic and coordination resources within most Centers and the absence of systematic financial and monitoring data. However it should be emphasised that the true efficiency of training and learning is its contribution to the effectiveness and take-up of research – rather than considering training in isolation.

Investment by the CGIAR in training and learning through formal and informal means continues to be high. Most training of whatever type is delivered by researchers many of whom although enthusiastic teachers, have limited pedagogic experience, whilst skills in teaching and learning, curriculum development and trainee follow-up have become scarce in most CGIAR Centers. Given the close integration of training and research it is inevitable that training and learning will continue to be an important and resource intensive activity in the CGIAR. In the past TUs have also contributed to planning and coordinating Center wide training activities, as well as to the retrieval and adaptation for widespread dissemination of

training materials. At present this does not happen consistently or widely enough in most Centers. The Panel takes the view that given the scale of resources deployed there is a need for more consistent coordination, backstopping, advice and support in all Centers.

The lack of coordination between Centers is also a problem especially in Africa. Synergies could be achieved if there was more inter-Center cooperation – but this would also depend on policies and resources within Centers (or in decentralized country programs) to be able to manage this effectively.

As previously noted (see Chapter 5 conclusions) the Panel does not favour the reintroduction of traditional TUs, it does take the view that both coordination and pedagogic support are needed in all Centers. This could be organised in various ways and will need to reflect the specific mandates of Centers and their decentralised in-country activities.

In some areas Centers have evidently adopted efficient practices. This would apply to the way training ‘products’ are usually turned into generalizable, ‘global’ goods thus achieving economies of scale in their production and use. There is also evidence that in response to changing funding levels and NARS needs and priorities, Centers have re-allocated resources between types of training, countries and themes. However given the unevenness in joint planning and needs analysis with NARS the Panel is not confident that these reallocations are always planned in the most strategic fashion. There is also room for clear exchanges with the NARS on the issue of candidate selection and likely subsequent deployment, to ensure that they not only come with suitable pre-training preparation was also with adequate possibilities of putting their training to use afterwards.

In general the Panel is confident that the overwhelming part of training and learning is covered by Center mandates – ‘they do what they do best’. Exceptions can usually be justified in terms of particular circumstances. However there is a proportion of non-research related training activity, for which this is not so, for example where Centers try to cover resource shortages in NARS out of project funds that cannot be sustained or where trainees without adequate preparation are selected. These instances point to more generic capacity issues than Centers and their training programs can address single handed and raise questions not only of coordination among Centers but also of coordination with other stakeholders, especially governments, donors and universities.

7 EFFECTIVENESS: OUTCOMES AND IMPACTS OF TRAINING AND LEARNING

This chapter begins by clarifying the way the Panel defined effectiveness and linked notions of outcome and impact. It then discusses aggregate responses from questionnaire data and important regional differences in context or 'scenario'. Country studies are then discussed allowing for a more detailed consideration of key issues - including: CGIAR investment in capacity strengthening in NARI; continuity in CGIAR interventions within the 'project' mode of funding; the apparent preconditions for success; and the sustainability of outcomes and impacts. This is followed by overall conclusions.

7.1 Understanding 'effectiveness', outcomes and impacts

As in other parts of this study, the Panel faced choices of definition with regards to effectiveness and the related concepts of outputs, outcomes and impacts. In general the Panel has followed conventional definitions. Effectiveness is usually defined in terms of the achievement of objectives; and outputs, outcomes and impacts are intended to capture the shorter, medium and longer term aspects of results. However the nature of this domain still leaves open scope for different or specific interpretations. In particular the Panel considered:

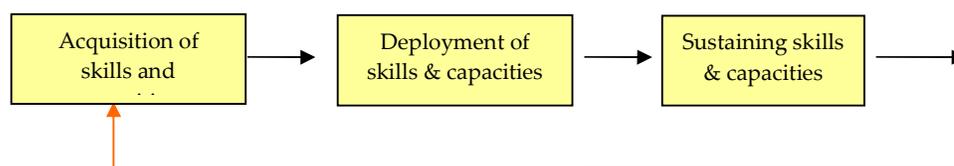
- The parameters of 'effectiveness' in capacity strengthening;
- Criteria for judging outcomes and impacts;
- What sustainability means; and,
- Effects of the wider context.

The parameters of 'effectiveness' in capacity strengthening

Capacity resulting from training and learning is frequently understood within CGIAR as individual skilling or education, largely within a human capital framework. The Panel starting from a capacity strengthening standpoint has adopted a broader view. Thus it has examined how far acquired skills and capacities are actually used as well as acquired. It has also looked beyond individual advancement, focusing where possible on organisational benefits and the benefits of networks and inter-organisational linkage – and how far these have been sustained.

Effectiveness in terms of capacity strengthening has been regarded as a 3 stage process:

Figure 7.1 Effectiveness of capacity strengthening



The feedback loop in the above figure is important because it highlights the consequences of not sustaining skills and capacities once acquired. Instead of building on previous training investments, a Center can find itself simply replacing and gap filling the basic skill set of a new generation of scientists. This is explored in this chapter in terms of different regional contexts or 'scenarios'. It is only possible to judge the effectiveness of Center training by

recognising that contexts differ and shape what is possible to expect from apparently similar inputs.

Criteria for judging outcomes and impacts: synergies and trade-offs

Capacity is intended for a purpose. Both Centers and NARS expect that enhanced capacity will encourage research that improves agricultural performance and raises the income of farmers, whilst usually increasing national income and competitiveness and often reducing risks of environmental depredation. Outcomes and ‘impacts’ have therefore been assessed at several levels: individual, institutional and in terms of wider agricultural and socio-economic goals. The Panel has similarly tried to keep in mind two sets of (presumably) linked criteria: the benefits to NARS, farmers and Countries and the benefits for Center research, its take-up and further development. Even if not all training and learning will fully and equally exemplify both sets of criteria, the synergies and trade-offs of each have been kept in mind.

Defining ‘sustainability’

Outcomes and impacts highlight the dimension of sustainability or duration. Especially in a project funded setting ‘success’ can easily be treated as a snapshot at the end of a project cycle, irrespective of what happens subsequently. As has already been noted one of the possible downsides of funding training and other capacity strengthening actions out of project funds is that outcomes and results are not sustainable. However the meaning of sustainability is not always straightforward. It can be interpreted as continuity of what has been achieved, but it can also be interpreted as a more diverse set of outcomes left behind by a particular project in which training or learning measures were an important part. The Panel has chosen to take this more diversified interpretation of sustainability – including follow-on and spin-off outcomes as well as end of project results. The findings of case-studies in particular support this stance.

Effects of the wider ‘context’

Fieldwork and data-gathering in the NARES emphasises the reality that the CGIAR is always operating within a wider context. For example a Center is only one actor among many in developing countries. Objectives, purposes and intentions related to NARES capacity are shared among many stakeholders and little can be achieved without stakeholders working together. Outcomes and impacts are therefore not the result of what Centers do alone. Although the Panel has selected cases and countries where the CGIAR has invested heavily in training and learning or where training and learning appeared to be critical inputs, fieldwork has demonstrated that it is often wiser to speak of the ‘contribution’ that Centers have made rather than to seek to attribute results to Centers alone. This is especially so in much NRM/systems research, where there are many collaborators and the issue is not so much outcome/impact at the personal or institutional level, as what they have achieved between all of those involved. Second the wider context focuses attention on a wider set of contextual factors that make ‘success’ more likely. These include not only stakeholders but also previous investments, government policies, donor priorities, local leadership, university quality, international competition and public sector reform – to name just a few.

7.2 Regional 'scenarios' and aggregate responses

In general the three regions within which the Panel has concentrated its NARS-specific efforts appear to exemplify quite different contexts or 'scenarios'. These might be characterised as:

- *Unstable*: Some countries in Latin America and SSA have been subject to considerable political, and institutional, instability which has affected the deployment and sustainability of CGIAR investments in training as well as the possibility of establishing and sustaining partnerships. Even when individual skills exist, NARS capacity is unevenly distributed and fragile.
- *Under-resourced*: Sub Saharan Africa has been affected by poverty, structural-adjustment policies, limiting public investment, limited private sector resources and the consequences of Malaria and HIV/AIDS. There is some similarity here with conditions in parts of LAC – represented by Bolivia in this study. CGIAR Centers have often found themselves replacing previous training investments and existing skills have often been under-utilised. In some countries NARES are often too under-resourced to define their own priorities or support partnerships.
- *Rapidly developing*: In Asia and in this study notably in the Greater Mekong Basin sub-region there has been – and continues to be – rapid development in the agricultural sector and in the application of agricultural research. NARS capacity has strengthened and national institutes, universities and the private sector have taken over many research and training functions previously the province of the CGIAR. Partnerships with CGIAR Centers are strong and research agendas are self determined.

These scenarios are not completely self-contained. Structural adjustment policies have affected Latin America as well as Africa – and there is considerable overlap between the conditions in poorer LAC and SSA countries. Nonetheless it is also true that in LAC there were within living memory stronger NARS than now exist, whereas in parts of SSA this has not been so. The consequences of these 'scenarios' are easily masked by aggregate survey results, but become clearer in more detailed case-studies. However there are a number of aggregate indicators of these different scenarios. These include:

- *Institutional stability*: in Bolivia there is no national agricultural research institute since IBTA was abolished in 1998. In Ecuador the Ministry of Agriculture and Livestock's extension service was closed some 15 years ago and INIAP has faced funding and institutional problems (see Ecuador and Bolivia Country Overviews). Malawi with acute resource constraints has also faced great institutional difficulties.
- *Agricultural GDP R&D levels* are often low: Ecuador 0.26%; Malawi 0.75%; Thailand 1.40%.
- *Labour turnover*, the potential 'wastage' of skills varies across NARS and NARI, as the following suggest: Kasasart University - moderate²⁵; Thai Department of Agriculture –

²⁵ Figures, available in case study reports, are based on different sub-sets of staff, different periods of time and different ways of measuring turnover. These are therefore estimates backed up by reasonably sound indicative data.

low; Bolivia PROINPA – low; Ecuador INIAP – high; Cuu Long Rice Research (Vietnam) – low.

At an aggregate level respondents to the ex-trainee Questionnaire Survey are overwhelmingly positive about the benefits that have followed from CGIAR training. Many positive outcomes at a personal level and institutional level, though not all, were rated as ‘important’ or ‘very important’ results of training received. The same was true of questions pertaining to wider CGIAR Goals, which were all rated as important or very important in enabling respondents to contribute to broader CGIAR objectives.

Table 7.1 Trainee survey: questions 8, 9 and 10

Results in terms of personal, institutional and broader goals	
	<i>Important/Very Important (%)</i>
<i>Which of the following resulted from your training at personal level?</i>	
Taking on new tasks with higher responsibility	64
Increased ability in research priority setting and problem orientation	73
More research output (innovations, publications) from your work	58
Increased participation in collaborative research activities	63
Encouraged to undertake further training and education	43
Increased skills in project planning & fund raising	49
<i>How important was your training in enabling you to contribute to changes at the level of your institution?</i>	
Incorporation into research networks	45
Improved priority setting	56
New inter institutional linkages	49
Better access to information	55
Funding new projects	41
Better access to information	56
<i>How important was your CGIAR learning experience to enable you to contribute to the following broader objectives</i>	
New scientific knowledge	75
New attitudes and technologies	78
Farmers/consumers benefited	62

It is noteworthy, however, that trainees did *not* see as an important result of training ‘finding a new job outside of your country’ although such trainees may well not have responded to this survey. It can be argued that respondents to questionnaires were likely to be positively disposed towards the training and learning they had experienced, however other sources of information (e.g. NARS interviews) confirm these responses as representative of those CGIAR alumni who have remained within their national agricultural research system. For many ex-trainees the outcomes of training are seen as positive, key events in their professional lives and a door opening to an international research career.

Nonetheless there are important regional differences which further illustrate the different scenarios encountered. Trainee respondents were divided into those who were consistently (over many items) positive in their responses when rating outcomes and those who were either negative or at least not positive. This was done for assessments of personal outcomes,

institutional outcomes and in terms of outcomes about contributing to broader CGIAR goals (new scientific knowledge, farmers benefited etc). The results are summarised below.

Table 7.2 Trainee perceptions of training outcomes

	Personal Benefit (%)*		Institutional Capacity (%)		Wider Goals (%)	
	Negatives	Positives	Negatives	Positives	Negatives	Positives
APO (N = 78)	37	63	32	68	35	65
LAC (N = 159)	39	61	48	52	31	69
SSA (N = 108)	60	39	56	44	49	51
Other (N =10)	30	70	30	70	40	60
Significance Chi Square	.002 level		.007 level		.023	

*All percentages are of regional responses

The results show a hierarchy of judged effectiveness with APO coming ahead of LAC which is in turn ahead of SSA in both personal and institutional benefits, even in terms of contribution to wider goals SSA lags behind the other two regions. These results are statistically significant.

‘Tracking-studies’ were undertaken at institutional level and country levels as part of NARS fieldwork. One stream of activity was directed at NARI in order to establish what input CGIAR trainees had made both at leadership levels and more generally. In terms of leadership:

- In Ecuador INIAP, the national institution responsible for agricultural research and extension has had approximately 400 training ‘inputs’ from CGIAR Centers. INIAP’s Director General, 6 of the institute’s 10 Directors, 17 of 28 Heads of Program, and 13 Heads of Department/Units are CGIAR trainees.
- In Bolivia PROINPA²⁶, the General Manager and 7 of the 9 Heads of Units/Regions/Scientific Programs are CGIAR alumni.
- In Vietnam, VASI (Vietnam Agricultural Science Institute) 48 out of the complement of approximately 480 scientists have been trained by CGIAR. Of these 18 are in senior positions including the Deputy Director General, the Vice Directors for Plant Genetic Resources, Root Crops and Hybrid Rice, Acting Director Legume R&D and the Head of Biotechnology.
- In Thailand, Department of Agriculture, (Ministry of Agriculture) 48 staff were trained by the CGIAR. Of those with degrees or postgraduate degrees (33 individuals) 24 remain with the department, many as Heads of Departments or Deputy Directors of research areas.

²⁶ PROINPA Foundation is a Bolivian non-profit organization oriented to promote technology innovation and the conservation, use, management, and development of genetic resources

Similar findings as to the leadership roles of Center trainees have been cited in other studies of training outcomes²⁷.

National context is extremely important for sustainability however, as was suggested earlier. In Thailand a relatively stable and rapidly developing country with a well developed NARS, 249 out of 541 names from a list of CGIAR ex-trainees (1995-2000) were tracked. Of these:

- 148 were found to be still working in the same field in the same organisation;
- 40 were found to have retired or died whilst in the same organisation.

Thus 75% of those tracked had remained in employment in the organisation where they were based when trained.

The picture is not uniformly positive however:

- In Bolivia which has undergone political and institutional instability over the last decade, many of those trained by Centers are no longer working in agricultural research – for example 12 of the 18 scientists trained by CIAT in one research station are no longer in post and over a third of those trained in participatory research in Bolivia are reported to be no longer utilising their skills.
- In many SSA countries (exemplified most obviously in this study's NARS by Malawi) the combined effects of poverty and structural adjustment policies have constrained the ability of governments to invest in agricultural research. Together with the effects of HIV/AIDS this has undermined both the deployment of acquired skills and capacities and their sustainability.

The aggregate results are somewhere between these positive and negative examples. Among ex-trainees responding to the Questionnaire Survey, 55.7% reported that they continued to work in the same organisation as before. This result would obviously be biased upwards because fewer of those who had left would have been contacted.

It was previously noted that dissatisfaction with training is greatest among those ex-trainees who report they have had too few opportunities to use the knowledge and skills what they have acquired. This was probed further in the Trainees Questionnaire Survey. The most prominent explanations for the non use of skills were resource related. Of those responding:

- 19.5% referred to lack of operational resources;
- 21.9% referred to lack of resources to support networking with relevant scientific community;
- 19.6% referred to lack of facilities and equipment (e.g., computers, lab facilities).

Further analysis indicates a regional effect here also: resource problems are most likely in SSA and (to a lesser extent) LAC than in Asia. Statistically there are significant differences between regions in terms of using what has been learned with 'no problems'. This is more likely to be the case in Asia and Latin America than in SSA.

²⁷ See for example Richmond et al.1998, In depth review of IPGRI's Documentation and Information on Training Activities; and Raab et al.1999, The Impact of IRRI's Training Program: A different perspective.

7.3 Partners, training and 'results'

A particular and important result of training is the ongoing professional links that are established between NARS scientists and CGIAR centers. Ex-trainees were asked about the kind of contacts maintained with Centers where they had obtained training and education.

Table 7.3 Type of contacts with CGIAR centers and scientists

Ongoing contacts maintained with Center (N=251)		
Maintained ongoing professional links with one or more Center scientist	209	(52.1%)
Undertaken collaborative research with the Center	131	(32.7%)
Undertaken a further course with this or another international Center	61	(15.2%)

The overlap between 'trainees' and 'partners' is evident when talking to CGIAR Center-based researchers and senior managers. For some indeed the purpose of training and education is to recruit partners whilst for many researchers trainees are recruited from the ranks of those who are already partners. This is borne out by responses to the Partners Survey, which confirms the high proportion of partners who undertake training or obtain degrees in the course of collaboration with the CGIAR. An equally striking feature of the partners' responses is the importance they attribute to informal training within a partnership.

It is reasonable to assume that the growth in informal training and learning within Centers is associated with the growth in partnerships and networks often themselves involving upscaling, 'adaptive' research and multiplier effects that engage with extension and education systems as well as with policy actors. The importance attributed to informal training is also consistent with other evaluations undertaken for centers. For example an impact study of ILRI's graduate fellows program (previously cited) reported that 'working with others' was considered by far the most important source of scientific knowledge for trainees.

Partners capable of participating in collaborative research are one of the most important 'legacies' of CGIAR training and learning activities. The goodwill towards Centers that result from this relationship is striking in countries visited. Ex-trainees – especially because of the senior positions they often occupy are willing to open up research opportunities, insert Center priorities into their own professional circles and perform a host of collegiate roles – from meeting visiting scientists at airports to being positively disposed to joint funding applications. A note of caution, however, is in order. The reduction in degree training in some countries (e.g. Vietnam and Thailand) and associated funding opportunities since 1995 means that in some countries CGIAR alumni are ageing and often approaching retirement. It was widely recognised that the CGIAR no longer offers 'free' training nor subsidies or grants to the NARS to anything like the extent it once did. One partner even anticipated having to pay for germplasm in the future. As a result the CGIAR may no longer be looked upon as frequently as the obvious partners for collaborative research, and some evidence was found in the field studies that in some instances Centers are now perceived more as competitors for funding than as partners. This may have consequences for the future resources available to the CGIAR for networking and collaborative research, and ultimately

for its capacity to leverage large scale research, from what is often a relatively modest research budget.

Partner organisations include universities, NARI, regional and sub-regional bodies, NGOs/CSOs, agricultural extension and farmers’ organisations. Capacity strengthening can therefore take many different forms. Partner respondents were asked to identify the main changes that resulted in their organisation from training and education.

Table 7.4 Partner survey: question 14

Main changes for partners’ organisations (N=148) percentage (%) responses			
	no change	some change	great change
New organisational skills and competencies have been acquired	10.4	54.5	35.1
New priorities have been formulated	20.6	48.1	31.3
Organization’s resources are now allocated differently	42.9	48.7	8.4
Enhanced role in networks	11.7	52.3	35.9
Enhanced inter-institutional linkages	6.1	52.3	41.7

It is noteworthy that although changes at an intermediate level (‘some change’) are reported in all categories, the strongest changes appear to be in relation to networks – enhanced inter-institutional linkages – and the weakest in the extent to which there have been changes in how partner organisations’ resources are allocated.

Partners were also asked to identify ‘the main changes for the take-up and outcomes of research’. Here also changes were reported under all the main categories offered:

- New research networks have been established;
- Knowledge and techniques are now more widely available;
- Knowledge that was not previously applied is now being applied;
- Knowledge has been adapted to specific settings, farm systems and eco-regions;
- Farmers and farmer organisations now understand more about uses of research;
- New research priorities have been identified by scientists/ researchers that take into account a multi-stakeholder perspective;
- Scientists/ researchers now better understand the problems of application/ implementation;
- New courses and/or curricula have been established;
- New research-friendly policies, regulations and standards have been established;
- Existing networks are more effective.

Again caution is needed in accepting such consistently positive data without qualifications but at the same time these results are in agreement with other sources such as case study material and interviews in NARI.

The difficulty in interpreting these responses stems from the difficulties distinguishing training and research inputs in terms of their relative effects. An explicit question was therefore asked to attempt to disentangle reported effects, i.e.: ‘How important is training for

sustaining the outcomes from this project and enhancing outcomes from subsequent projects?’

Table 7.5 Partner survey: question 21

Relative importance of training (N=140)	
Most outcomes are not possible without associated training activities	62 (36.5%)
Most outcomes can be attributed to collaborative research	69 (40.6%)
Difficult to disentangle training/learning from research outcomes	39 (22.9%)

This table suggests that at the very least in the view of a sample of partners, training makes a significant contribution to the positive outcomes that partner organisations experience. Again the conclusion that training makes a contribution to Center outcomes and impacts has been addressed in other studies. However this appears to be the only study that has asked partners to make this judgement for themselves.

7.4 Country overviews and case studies

Country overviews in seven countries together with specific studies allow for a more complex and multidimensional representation of the outcomes and impacts of CGIAR training and learning. Cases incorporate different elements of the NARS including:

- **NARI:** E.g. Cuu Long Delta Rice Institute Vietnam; INIAP and FORTIPAPA Ecuador; IRAD Cameroon; PROINPA Bolivia; Department of Agricultural Extension Thailand.
- **Universities:** E.g. Egerton University Kenya; Universidad Autonoma Gabriel Rene Moreno Bolivia; University of Dschang Cameroon; Chiang Mai University Thailand.
- **Local authorities and other public authorities:** E.g. 9 districts within Tien Giang Province Vietnam; Royal Forest Department Thailand.
- **Networks:** E.g. CIAT’s International Tropical Pastures network; IRRI’s Irrigated Rice Research Consortium.
- **Farmers & extension organisations:** E.g. Department of Agricultural Extension Thailand; Extension Services in Mekong Delta Vietnam; Local research committees (CIALs) Ecuador; Union of producer/processor associations Ecuador.

A summary table of cases and their characteristics is annexed to this report (See Annex IX). Cases were not selected solely to demonstrate success, but rather the conditions that lead or do not lead to outcomes and impacts.

The following general messages are supported by these Country based studies:

- In many of the traditional projects where training is significant, i.e., germplasm+new variety development+participatory breeding+extension work with farmers – there are significant and measurable increases in productivity, production, income and other benefits to farmers.
- Similarly positive results can be demonstrated in IPM and NRM type initiatives where training and learning woven into the systematic use of research findings, further research, controlled experiments, farm-based trials and farmer participatory extension

work can lead to cost reductions, effective strategies for managing plant disease and improvements in living standards for poor farmers.

- The volumes of training in NARI have been large scale and effective. Many leadership roles are occupied by CGIAR alumni. Past investments by Centers in training in NARI can be shown to have led to enhanced capacity to undertake research, changing the role and relationship of the CGIAR Center to that of colleague and peer – making joint applications to funders rather than providing funding - and opening up new research opportunities for both Center and NARI.
- Many apparently 'local' or 'national' training and learning projects build on Center experience elsewhere transferring and adapting previous innovations and setting up methods and models that are themselves transferred and adapted – e.g. between LAC and Asia in Cassava production or across Asia in the case of a rice drum-seeder.
- Training investments in Universities include examples of effective and less effective capacity strengthening. Different levels of success can be understood partly in terms of factors that have little to do with the quality of Center inputs, including national education policy, university leadership and funding availability. Changes in teaching style/methods and changing methods of selecting students can be especially difficult to achieve – more so than defining new curricula. How funds and training resources are invested is also important if vulnerable (i.e. non sustainable) 'enclaves' are not to be created.
- The CGIAR evidently faces distinctive problems in Sub-Saharan Africa, where in some countries past investments in capacity have not been sustained and NARS are weak. Whilst these problems are not within the CGIAR's sole mandate, it is seen by national/regional stakeholders as having a role, together with others. There seems to be relatively little integration of efforts among the various implicated actors – and often little coordination between CGIAR Centers themselves.
- Sustaining training inputs over extended periods of time seems to be important for continuity and sustainability. Many successful interventions can be traced back 10 or 15 years, to earlier networks, programs or initiatives. Changes in funding and in national or local or institutional policies can undermine apparently successful initiatives.
- One capacity result that can be found in a number of cases is policy learning by a NARI (INIAP in Ecuador, MARD in Vietnam) - 'this is seen as the model of for achieving sustainable agriculture in Vietnam' - or government ministry (Ministry of Natural resources and Environment Thailand).
- Decisions about priorities in a country or region are made for reasons and according to criteria that relate to the mandates, resources and priorities of particular Centers with little system-wide overview that might suggest handover to or mobilisation of another Center. (For example there may no longer be a need to enhance capacity in plant breeding or NRM but policy and economic or market issues may still be considered urgent.)
- The shift to in-country training and learning has increased the importance of informal and innovative teaching and learning methods. There appear to be few resources available to support or develop or systematise innovative learning approaches.
- There is a strong commitment in many Centers to training, capacity development, working with national stakeholders and piloting innovation at a national and regional level. In the words of one senior Center manager: 'Global public goods rest on the capacities of countries to access and utilize them, otherwise they are not global public

goods.’ At the same time there are many results of CGIAR innovation that begin their life as mainly relevant to a particular national or regional setting and through dissemination and adaptation usually involving training and participatory approaches become ‘global’ at the next stage.

What country studies confirmed and challenged

Field visits to NARS generally came after much preparatory work. It therefore provided an opportunity to cross-check ideas and sometimes propositions that emerged from Center visits, early questionnaire returns, pilot investigations and reviews of documentary sources.

Many initial impressions were confirmed by these case studies. For example:

- The difficulty of disentangling training from research. Three configurations were evident: 1) training in order to prepare to undertake research (This would apply to most of the NARI strengthening examples – e.g. Bolivia case 1 Participatory research in PROINPA or VASI see Vietnam national report); 2) training in order to use available research knowledge or adapt what is known to local circumstances (See Ecuador Case 2 Cassava processing); 3) training as part of an ongoing research project (See Thailand Case 1 Participatory mapping).
- The growth of in-country training and learning. The panel encountered training activities of which there was little detail available in HQ and certainly the volume and types of training and learning were unknown. The reduction in HQ located training courses was also noted by interviewees. (See Thailand Case 2 Integrated Cassava Cropping.)
- There was a stand-alone character of some project based and associated training and learning in-country. Training and informal learning events were entirely the responsibility of dedicated researchers. There was an absence of pedagogic backup, even though in some cases there might be a ‘framework’ or ‘guidelines’ available.
- The prevalence of informal learning and mixes of different training types tailored to particular problems and projects. (See for example Bolivia Case 2 Bean production and Case 1 Participatory research.) Starting from training types conveys very little of the way a mix of different training and learning modes interact and reinforce each other in situ.
- How relatively small beginnings – often when a key individual attends a conference or training course – can lead to major changes in capacity and priorities. (See for example Bolivia Case 2 Bean Production; and Vietnam Case 3, Enhancing gender equality.)
- The weakness of NARS in some countries and the consequence of not having needs-analyses and clear priorities coming from the NARS. (See for example Ecuador Case 1 and Malawi and Cameroon national reports). In circumstances where the NARS voice is weak, the availability of external research funds backing up Center priorities start to become pre-eminent in determining research with knock-on effects for capacity strengthening, which are usually asymmetrical – more likely to involve teaching in didactic mode than peer learning.
- The very different kinds of relationships that evolve once a NARS begins to achieve a degree of capacity and resource. Under these circumstances there is an increased importance of networks, peer learning and collaboration among ‘professional equals’²⁸.

²⁸ This and other examples of what happens among weaker NARS are consistent with the framework for diversified framework for training and learning described in Chapter 2 (section 2.3).

(See for example Thailand national report re. Kasetsart University and Vietnam national report re. VASI).

On the other hand some propositions were challenged and there were many new lessons coming from cases of NARS including of NARS partners and specific projects. New understandings emerged for example with regard to:

- The scale of CGIAR investment in capacity strengthening;
- Continuity and the long term nature of many interventions;
- Preconditions for success beyond the control of Centers;
- Sustainability of outcomes.

Scale of CGIAR investments in capacity strengthening

The Panel encountered many NARI in which the scale and persistence of CGIAR investments in capacity strengthening was strong. These activities fell into three main categories:

Capacity strengthening at or near start up

- For example IRRI's commitment to Cuu Long Rice Research Institute in the Mekong Delta in the 1980s and early 1990s; and its more recent work with the emergent NARI (NAFRI) in Laos would be examples where a Center has made a critical difference and influenced research agendas, ways of working and openness to international research networks at a critical stage.

Specific capacity interventions

- For example CIAT project to develop Monitoring and Evaluation capacity in KARI Kenya (Kenya Case 1) and CIAT's investments in participatory research in LAC – see Bolivia Case 2 and Ecuador Case 2. The contribution of several Centers to the stabilisation of Bunda College in Malawi, within an otherwise very fragile NARS.

Crisis interventions

- In some cases Centers have taken a leadership role when a NARS was in crisis or close to collapse. The best documented example is PROINPA Foundation – see Bolivia case 3 – where CIP played a fundamental role in leadership, training and learning over an extended period, with cooperation from ISNAR at the early stages.

The scale of these investments and their strategic importance cannot be overstated. It is arguable that in some cases they went beyond the research mandates of the Centers concerned and focussed mainly on the capacity needs of the NARS. However in the Panel's view these interventions can be justified because they have created or preserved an infrastructure capable of undertaking future research and sustained partners in key countries with which Centers can subsequently expand their collaborative research.

Continuity and the long term nature of many interventions

From an HQ perspective it can seem that projects are short term and hence liable to undermine long term capacity building by reason of their funding. On the ground this appears *not* to have been the case in many instances. Exceptionally projects can be long term when donors have a long term perspective – this would be the case with Swiss Development

Corporation's commitment to projects in both Latin America and SSA and Rockefeller Foundation's long term commitment to CGIAR cooperation in SSA. Projects can also be 'follow-ons' from predecessor projects (the case with ICRAF projects in Thailand). In part this degree of continuity can be explained by some donor policies; in part it can be explained by the kind of project profile that appeals to any donor which includes a baseline of experience, data and personnel.

In addition the continuity that the Panel encountered can also be explained by the personal longevity in region of key individuals whose personal networks and detailed on-the-ground knowledge enables them to successfully leverage project funding. This was the case for CIAT and ICRAF in the greater Mekong Basin countries. This raises the question about how the Centers maintain and re-create these kinds of strong local and regional networks in the future.

Preconditions for success beyond the control of Centers

As was noted previously the factors for success and failure are often outside the control of a Center. Preconditions for success noted in cases include:

- Long term reform in NARI that prepared the ground for a particular intervention (e.g. KARI case in Kenya);
- National or institutional leadership responsive and able to work in partnership (e.g. PROINPA in Bolivia);
- A commitment to participatory methods that is written in to the Constitution in Thailand making it necessary to follow participatory practice – including training and learning - with farmers in all agricultural research and extension work in that country;
- Strong and committed partners whether Universities, NGOs or governments, able to support Centers, attract funds or take-over what has been initiated (See for example Universities in Thailand and various NARI in Vietnam).

Whilst these success factors are outside Centers' control they do suggest criteria for future investments in capacity strengthening and training and learning. On the other hand there are also factors that have undermined Centers' investments that are also outside their control. The most obvious example of this among this study's cases is Ecuador Case 2 (Cassava Processing) which involved a major effort by CIAT in post harvest technologies and processing and which failed after a period of apparent great success. In this case market competition (from Thailand), funding withdrawal, natural disasters all reinforced quality problems and virtually destroyed 17 processor associations and the industry they supported. On the other hand as is noted below the temporary success of this project has not entirely disappeared.

Sustainability of outcomes

Despite the continuity of many projects and the continued commitment of many donors and stakeholders it remains true that some projects end often for good reasons - they were intended to support a specific research project which was completed. It is also the case that other projects fail in terms of their initial objectives or expectations. This raises legitimate questions about the contribution that these interventions make to capacity strengthening whether at individual, institutional or broader levels.

Evidence suggests that it is too narrow a view of sustainability, to conceive it solely as continuity in the same form of a specific initiative or project. From NARS based cases it is possible to identify a variety of ways in which training and learning investments linked with research and other capacity strengthening activities have been sustained. These include:

- *Policy leverage*: where the project ends but lessons learned are taken up at a policy level and influence policy innovation. (See case of ILRI smallholders project in Kenya and Agroforestry in Thailand);
- *Institutionalisation*: where an institution becomes established and transforms itself by taking on new mandates and roles. (See PROINPA in Bolivia);
- *'Spill over'*: Where a single person who received training, mentoring and support can become the initiator of a significant institutional change process (See Gender equality in CLRRI);
- *Replication*: where training and learning and joint research enables a partner to replicate a similar project on its own (See Universities in Thailand);
- *Empowerment*: where the experience of involvement in an initiative even if its initial success is not sustained can enthuse and empower individuals – perhaps to work in the agricultural sector or to embark on longer term education and become initiators or leaders in subsequent agricultural innovations. (See Cassava processing – APPY's – in Ecuador.

On this basis the outcomes and impacts of Center efforts to undertake research and training in ways that strengthens capacity in the NARS can be shown to have a far greater impact than might at first occur.

7.5 Conclusions

The Panel has found strong and consistent evidence of the effectiveness of CGIAR investments in training and learning - often but not always linked closely with research – in strengthening capacity in the NARS. Country based studies in 7 countries and across LAC, APO and SSA have confirmed impacts for individuals and institutions. The scale of investments in NARI has been considerable as have been the results. Many of the leaders of national research in agriculture are Center graduates and the agricultural research agendas of NARI, government ministries and other NARS partners have been shaped by Center inputs. In particular CGIAR centers have contributed to the internationalisation of research – linking even fragile NARS partners to international scientific agendas.

Results of these capacity strengthening initiatives have included modernising and strengthening NARIs, generating new scientific knowledge, transfer of existing technologies, the introduction of new crop variants, more effective means of crop protection, sustainable agricultural practices, increases in farmers' income and increases in productivity and competitiveness of exports. There are positive results in outcomes and impacts.

Country studies and surveys of NARS partners have confirmed the difficulty of separating out training and learning from research and indeed germplasm distribution. However the majority of partners who responded to questionnaires and many of those interviewed face to face confirmed that training was a significant contributor to positive outcomes in collaborative research projects. These country studies have also confirmed the growing

importance of informal training and learning alongside formal courses. However as previously discussed many of these efforts are without pedagogic backup or quality assurance procedures.

Country studies have highlighted the problems that NARS are prioritising and which set the parameters for many of the interventions and projects in which current training and learning activities are embedded. These research challenges are often post production, market related, concerned with environmental problems including drought, seek to work in less favourable environments with poor farmers and confront policy and regulatory constraints. Given that many current projects focus on policy development and markets and work with extension and farmers' organisation, the prevalence of participatory learning approaches and ways of managing policy dialogues is also understandable.

Contextual factors outside the control of the CGIAR present clear limits to the effectiveness of its contributions to capacity strengthening. Regional differences were evident in terms of the likelihood of ex-trainees being able to use what they have learned, a problem often associated with lack of resource – and most strikingly so in SSA. Institutional instability was also a strong feature of the poorer countries of LAC – Bolivia and Ecuador – included in the study. However the success and contribution of CGIAR inputs have been striking even in the most adverse conditions, especially when working with innovative local partners and committed donors. The sustainability of the results of past investments in training and learning increases considerably when account is taken of a broader set of 'results' that go beyond intentions and objectives. Many projects that have apparently failed have left behind a large footprint and many investments in training and learning have had unintended but with hindsight foreseeable positive consequences for NARS.

The serious problems faced by countries where NARS are weak and where Centers in isolation can only expect to have limited impacts, highlight the need for innovative approaches to capacity strengthening. These will need to better integrate training and learning with other capacity strengthening measures and coordinate the plans of more than one Center together with those of other key stakeholders – NARS partners, donors, governments, and universities.

8 CONCLUSIONS

Commitment of the CGIAR to training

There are different views within the CGIAR as to the priority that ought to be given to training and capacity strengthening. However, in practice Centers demonstrate a strong commitment to both activities. Training and more widely learning are viewed by the Centers as essential but not sufficient components of NARS capacity strengthening. Training is regarded as an indispensable element of Centers' research, not a sideline or by-product. It helps refine and execute their research program as well as encouraging the dissemination and take-up of results. It is one of the principal means of establishing and strengthening research partnerships: an 'investment in cooperation'. There is a perception both in parts of the NARS and in some Centers that training, learning and capacity development are not always valued within the CGIAR. The Panel has concluded that when training and learning is conducted within the context of collaborative research, is consistent with the research mandate of Centers and is prioritised in consultation with NARS, it merits support, funding and encouragement.

Characteristics of CGIAR training

Training covers a wide range of activities, from formal courses to the informal learning which takes place, often during collaborative research. The differentiation of NARS – some of which have matured and developed new capacities while other have not – and the constant cycle of scientific innovation has reinforced the emergence of new pedagogic modes, settings and forms of delivery in which Centers support learning. This can be in courses or in degrees or in other recognizably educational setting. But they can also take place in a host of informal settings as in work experience, peer learning, networks or policy dialogues. There has also been an emergence of new types of informal and collaborative learning with new modes of instruction and delivery, many occurring in networks and among researchers who are peers. This has been reinforced by the proportion of current CGIAR research that focuses on markets and policy development working with extension and farmers' organisation, often using participatory learning approaches and on issues of regulation and policy development through policy dialogues.

An approximate typology of training and learning can be constructed which takes into account: training and learning strategies, learning modes and settings, learning objectives and who learns for what purpose. A typology based on course type, subject or whether directed at individuals or groups is not sufficient. One conclusion the Panel has reached is that appropriate strategies vary according to a number of contingencies including subject areas, institutions involved, pre-existing NARS capacity and broader policy and resource settings. It is not a case of 'one size fits all'.

Factors affecting training

The three main sets of factors shaping the content and delivery of training in the CGIAR are: developments in the NARS; global concerns that have influenced policy and donor priorities; and funding arrangements in the CGIAR.

There has been an increasing differentiation between the NARS. New kinds of institutions, such as NGO's, farmers' organizations and the private sector, have joined them - some with little research experience. (Throughout this study the Panel has adopted a broad definition of the NARS to include NGOs, farmers' organisations, the private sector, universities, as well as NARI.) Some NARS have grown stronger and nowadays interact with the Centers as peers, while others have grown weaker and sometimes become less stable. This has widened the variety of subject areas and levels at which training has had to be provided, and created the need to retain some of the basic and remedial areas.

The Panel also concluded that a wide variety of additional factors have affected training in the last decade, from emerging issues of international concern such as the environment, sustainability and poverty reduction to developments in technology – all of which affect the content of training and learning as well as delivery modes.

However, the Panel concluded that the increase in project funding and the reduction in unrestricted funds available for training is probably the most important single factor which has affected the evolution of training in the CGIAR over the past decade. On balance, the Panel judged that the results of these cutbacks have been to lower the yield on the CGIAR's large investments in training and learning. The disadvantages of training within projects relate mainly to the effects on institutional strengthening: the difficulty of building a critical mass of scientists and multidisciplinary teams. Also, financing higher degree studies is more difficult when projects are of 2-3 year duration. Some of the weakest NARS, most in need of support, may be at a double disadvantage since they neither have the capacity to formulate fundable projects, nor to pay for training. The reduction in unrestricted funding has reduced pedagogic support to Center research staff. This has occurred precisely at a time when technological change opens up new possibilities for dissemination, but requires expert guidance in both the computational and educational aspects. At the same time, there has been a severe reduction in Centers' capacity to collect, adapt, translate and disseminate existing training materials in order to put them more widely at users' disposal, or to use training records for research and decision making. This is obscured by the fact that the fruits of such capacities in the past are still to be found at present.

The decentralization of training to researchers, which has resulted partly from the above trends, has increased the variability in all aspects of the activities, from needs assessment to data recording and quality monitoring/evaluation. The many cases of good practice encountered by the Panel are therefore not systematically applied. These trends have probably had a negative effect on the Centers' capacity for coordination, both across the System on matters related to training, as well as with other groups devoted to capacity building (e.g. information), or donors. Training in the regions has increased over the last 5 years at about half the Centers, and they estimate that over half of their training activities now take place outside headquarters. This has been of mixed benefit. It increases coverage at a lower cost and enriches trainers' knowledge of local conditions. But, on the other hand, trainees do not equate the special advantages of headquarters training with training outside, and most Centers have not yet extended to the regions new administrative systems to manage, monitor and quality assure what is being delivered.

Training records

Records are incomplete and inconsistent in many Centers, and incompatible across the System. Particularly deficient are data from the regions (in-country training) and information on informal training is especially scarce. Records which do exist are generally not used for planning or evaluation purposes. Financial records are handled differently across the Centers, are not readily available for training and major discrepancies are encountered in the figures cited from different sources – e.g. Centers and at System level. The Panel concluded that the recording system (including financial systems) must be overhauled so that it facilitates decision making, both at Center and System levels. Its present state seems incompatible with the size of the System's investment in training activities, and the importance attributed to training by the Centers themselves.

Trends in training types and themes

Within the limitations of the records available, the main trends appear to include:

- a marked increase in group training carried out since 1990, due particularly to the activities of particular Centers and often involving large numbers of farmers and extension workers;
- stable numbers of individual trainees each year but, among these, a considerably increased proportion of higher degree students;
- an increase in shorter training periods for both group and individual trainees;
- somewhat higher numbers of trainees from SSA than from LAC and APO, and considerably more than from CWANA;
- high concentrations of trainees from host countries and about 12% from developed countries.

There have been drastic reductions in training in some of poorest countries (e.g. Malawi and Bolivia). The Panel concluded that there was no clear relation, on a country basis, between training intensity and poverty: certain countries, including some of the poorest have experienced a sharp reduction in training of all kinds.

Training 'themes' show changing patterns over time, though with differences between groups and individuals. While some areas (e.g. Social Sciences for group trainees, Biotechnology for individuals) have increased in importance, the traditionally strongest areas such as Crop Production, Breeding (group) and Crop Protection (individual) have not been seriously displaced. Training in Methods, which include themes sometimes considered beyond the Centers' comparative advantage, has steadily accounted for about 10% of group trainees' time, but for a very low proportion of time spent by individuals (3%). The data do not show very clear evidence of a discontinuation of training in specific areas, which could be suggestive of their 'devolution' to other suppliers over time, although this may explain the downward trends in Crop Protection (group) and Crop Production (individual).

Relevance

The Panel found some differences in NARS' (and other stakeholders') criteria about and perceptions of the relevance of training to their needs. Training in most Centers is closely defined by their research programs. In so far as the research agendas are set in consultation

with the NARS, training is relevant to that part of the NARS' agenda which they share with the Centers. The Panel considers this a legitimate definition of the Centers' role, and that the Centers cannot themselves be expected to address the NARS' wider training or capacity building needs. To do so would extend training activities beyond their comparative advantage. However this does not mean that they do not have a contribution to make through joint efforts with other partners, donors, universities and the private sector. In practice, the degree of consultation on the research/training agenda varies between projects within Centers, as well as between Centers. But the Panel also concluded that the process is complicated in some cases by inadequate articulation of research and training needs on the part of the NARS, often associated with under-resourcing and political instability.

The effect on relevance of decentralization of training to researchers and project funding is not yet clear. On the one hand, experienced researchers may be better placed to fit training to candidates' needs. But since this is now commonly within a project or programmatic framework, it may have relatively short-term horizons and not necessarily lead to greater relevance to the institutional or wider needs of the trainees. On the other hand, since needs assessment procedures are not systematically applied, it cannot be assumed that satisfactory levels of relevance will be attained under this organizational mode in future.

From results obtained from questionnaire surveys, the Panel concluded that the relevance of training has been quite high. This is based, first, on the researchers' commitment and sense of importance they attach to the outcomes for NARS. Second, trainees themselves rate quite highly the benefits for them personally, their institutions and the wider goals of the CGIAR. Although the survey results will have been biased positively, this opinion was confirmed fairly consistently in the course of the country visits. There are some concerns about whether the training has been designed more to suit the Centers' research plans than the needs of the NARS, and whether the needs of the weaker partners are covered through training associated with networks. But these were not encountered frequently, and strengthening the NARS' capacity to articulate their own needs may be best way to deal with the relevance problem in future. However, the concern which does remain is whether relevance will be maintained unless the Centers adopt systematic needs assessment protocols.

Quality

Quality monitoring and evaluation is uneven across the Centers, and is particularly deficient for in-country activities, individual training and for all kinds of informal training and learning. The importance of the investment in informal training points up the need to introduce monitoring and evaluation procedures, equivalent to those in place for formal training. Existing evidence indicates that formal training quality has been high, as judged by a range of indicators for groups and individuals. The possibly biased (positively) results of the trainee survey were backed up very consistently by interviews in the field. The single most important determinant of trainee satisfaction was the extent to which their new knowledge and skills were put to use. This emphasises the need to ensure that candidates are not sent, or accepted, for training unless suitable post-training provisions are made or are likely. Improved candidate selection procedures were considered by Center staff as one of the most important ways to improve quality. There was some evidence of differences between subject areas in regard to trainee satisfaction (e.g. crop breeding versus social sciences). The Panel concluded that there are many examples of good practice which could

be applied widely across the System. To maintain standards now that training is generally decentralized, it is important that QA protocols for planning, managing and evaluating formal and informal training quality should be specified and followed routinely, and that the results should be used for decision making, including researchers' performance assessment. The Panel concluded that these measures are essential to ensure that the System's investment in training is used to good effect, and that they require the existence of training support expertise and resources in the Center.

Efficiency

Investment in training. The investment of CGIAR resources in training and learning has not been estimated accurately in the past, and current accounting systems at some Centers still make this difficult. The direct costs of these activities have amounted to approximately US\$30m per annum by the beginning of the 21st Century, a growth over the last decade despite a small reduction in the early 1990s. However, indirect costs are generally not estimable as distinct from research costs. To these must be added scientific staff costs which are substantial, although they may be overestimated by the survey results since less interested researchers may not have replied. Results from this study estimate that scientists are spending about 13% (formal) and 12% (informal) of their total time on training, and that this has increased over the last five years. However, there has been a notable decline in specialised expertise in training/adult education across the System.

In spite of imprecisions, the investment in training and learning is evidently very high. However the Panel concluded that the size of the investment and the declared commitment of the Centers to this activity did not match with several aspects of current practice. These latter include:

- reduced specialised pedagogic skills and support to training/learning activities;
- inadequate training data bases for use in decision making;
- unsystematic needs assessment and quality evaluation procedures;
- insufficient resources to collect, adapt and disseminate existing training materials;
- lax trainee selection criteria;
- absence of procedures for planning or evaluation of informal training/learning despite its importance in terms of staff time;
- limited value attached to training performance in staff evaluation procedures.

All these reduce the returns to the very substantial investment made by the CGIAR in this area.

The distinctive competence of the CGIAR. One area of efficiency examined by the Panel is the particular niche of the CGIAR as a supplier of training. All Centers see themselves as partners in the training enterprise, increasingly with southern as well as northern universities. Within this framework, the Panel found very consistent opinions expressed in the field as to the Centers' distinctive competence, and concluded that it derives from their:

- integrated approach to solving problems of world importance (hunger, poverty, resource conservation), integrated across biological and sociological disciplines, and across 'upstream' and 'downstream' levels of science;

- long-term experience in the production and utilization of the mandate crops in the social and physical environments where they are grown;
- unique collections of germplasm and institutional knowledge about them;
- their worldwide network of collaborators;
- their capacity to act as apolitical 'honest brokers' and facilitators in inter-institutional arrangements, and their appropriate research and information facilities.

The Panel also concluded that the amount of training which has taken place in areas arguably outside the CGIAR's comparative advantage is small, especially in the case of individual trainees. Some subjects (e.g. Statistics) which are treated as discipline-based, in fact have a high proportion of practical application content which bring them closer to the domain of the scientists, rather than the disciplinary specialists (e.g. Statisticians).

The Panel could not gather systematic information on the rate of 'devolution' of some of the Centers' traditional training subject areas (e.g. Crop Production) to other suppliers, nor on what had been the outcome in such cases. There were however particular cases instanced where devolution had gone badly and courses had declined or even had to be taken back by Centers. To the extent that the NARS now pay for their training, they would be expected to seek out the most effective supplier, which should reduce distortions which may have existed previously in this regard. At the same time, gains in efficiency should result from the increase in training partnerships (e.g. with Centers and universities) where specific aspects are taken on by the different partners, according to the particular competence of each.

Training as international public goods. Recent training activities have met the 'international public goods' (IPG) criterion for CGIAR activities much better than in the past. Regional and international events predominate over national events in most centers, with plentiful examples of inter-regional and inter-continental applications. Some of the most specific and according to this criterion more questionable training efforts, were justified in the Panel's view by the important potential role of the institution in contributing as a partner to the Center's international research mandate. Judgements can also be clouded by the stage in the research/application cycle that particular training and learning activities occur. Many international goods were at some point in time local or regional rather than international. Networking continues to play an extremely important role in internationalisation of training and the dissemination and adaptation of research. It may also be the best strategy for combating staffing instability (e.g. the loss of individual scientists due to disease in Africa). However, networks and regional programs can only be as strong as their individual members, and there is some evidence that the needs of the weakest members are not adequately covered.

Efficiency of different training types and delivery modes. The Panel concluded that no specific kinds of training can be considered a priori more efficient or effective than others, although they foresee a continued decline in long courses. They concluded that Centers will need to continue to provide a variety of training types, themes and delivery modes to suit the heterogeneous needs of the NARS. Greater efficiency will be achieved by fitting them more precisely to NARS and candidates' needs. The advent of new partners, some with little research experience, means that a certain demand for basic themes, as well as for advanced subjects, remains. Greatest demand in future is nevertheless foreseen for specialised short

courses, individual non-degree and higher degree training (the latter in collaboration with northern/southern universities). A major contribution is expected by making more materials available on-line. In this respect the Panel's conclusions are supportive of the System's ICT-Knowledge Management Initiative's Online Learning Resources project, the objectives of which include to strengthen capacity, facilitate cooperation between Centers as well as to disseminate existing training and learning materials. However, e-courses have been shown to be very demanding on staff time without adequate back-up and only suitable to subjects with a strong practical content, as are many of those in the domain of the CGIAR, when deployed in combination with other modes of delivery. At the same time there is considerable scope for added efficiency in CGIAR training through the strategic use of various e-learning tools and methods – including on-line modules, student selection and assessment, simulation and virtual environments, collaborative learning and on-line tutorial support.

Targeting trainees and institutions. Although the choice of trainee type will obviously vary according to circumstances, the Panel see major potential benefits from engaging policy makers more widely in activities with learning objectives. Many of the needs that were evident in the NARS visited as part of this study were related to policy, regulatory and government investment strategies. The Panel has more questions about the efficiency of the training of farmers (which the data in Chapter 3 seem to indicate) on any scale beyond that needed for research purposes (e.g. to validate methodologies and implement research that requires the active participation of farmers organisations) or to build up NARS partners capacities vital for the future achievement of Center research mandates. The Panel also concluded that the selection criteria for trainees of all types have been too lax, and should address not only their pre-training preparation but also their post-training opportunities. It is in the interests of the NARS, as well as the Centers, to work together to apply rigorous standards, and that these would enhance both the quality and the efficiency of training activities.

With regard to institutions, the Panel concluded that increased support to local universities may be the most sustainable way of contributing to overall capacity building in the long term. This may best be accomplished by intensifying the ongoing trend towards training partnerships, such as those involving Centers-local universities-northern universities or advanced research institutions. There was strong evidence from the field studies that bringing local universities more actively into research directly benefited their teaching standards.

Dissemination of existing materials. The Panel concluded from the Center visits that major efforts are being made to globalise and circulate knowledge, but that there is still immense scope for collecting, adapting, re-cycling and disseminating existing materials for training purposes. This requires expertise and financial resources, but additional investment in this area would contribute greatly to making efficient use of major investments already made. (See earlier reference to the Systems ICT-KM Initiatives Online Resource Project.)

Coordination and collaboration The Panel concluded that there is scope for improvement in cooperation and collaboration at various levels. First, within Centers, there is a need to apply good practices (e.g. needs assessment, recording systems, quality assurance) systematically

across all projects/programs, at headquarters and in the field, and to ensure that training activities are well integrated with other areas related to capacity building such as information and communications. Second, while inter-Center coordination and collaboration is considered weak by researchers and those responsible for training at the Centers, the Panel observed variable situations in the field, with strong mutual support and collaboration in some LAC countries, but less so in some cases in Africa. There is, however, clear evidence of the need to improve coordination in aspects such as recording systems and data bases, the sharing of related good practices and integration with System wide initiatives in related areas such as IT. It was concluded that to achieve improvements in coordination, it would be necessary for each Center to have some kind of central training function and pedagogic expertise, although this does not necessarily imply the re-introduction of the traditional Training Units.

Effectiveness

The effectiveness of CGIAR training has been as much determined by the conditions of the NARS as by the relevance or quality of the training. The surveys showed that over half of the trainees report positive results for themselves, their institutions and contributions to the broader CGIAR goals, but with less positive results in SSA than other regions. The partners in CGIAR-NARS collaborative projects also report positive changes for their institutions, and that training made a significant contribution to their project results. They attach great importance to the informal learning which takes place in the course of joint activities.

As before, the Panel recognises the positive bias in these results. They also noted that about 20% trainees reported constraints due to lack of operational resources, facilities and equipment which prevented them from putting their training to full use, although the situation may have improved under the present trend towards training within specific projects. They noted as well the high levels of 'wastage' of CGIAR alumni reported in certain of the Case Studies, particularly under conditions of chronic under-resourcing and institutional instability.

Nevertheless, the Panel concluded that there is impressive evidence about the effectiveness of training in a large number of cases. One of the most significant outcomes of CGIAR training has been the prominence of alumni in leadership positions in the NARS. The country studies show successful examples of training and learning contributing to capacity development e.g. in universities, among policy makers and in NARI's. There are also outstanding cases where training has recognised by the trainees to have been an indispensable component of field impact, with effects on production, income, diet, export earnings, germplasm conservation and other indicators.

On balance, therefore, the Panel concluded from the survey results and their own field work that the effectiveness of training has been occasionally outstanding and at least satisfactory on the whole. It is also clear that this depends on factors beyond the control of the Centers as well as on their own contribution. They also concluded that certain factors were usually associated with the most effective examples. These include:

- long-term engagement by the Center, with formal training of various types strongly reinforced by informal learning experiences;

- the formation of either a critical mass of researchers in a given field or multidisciplinary teams (including extension experts);
- availability of long-term funding or the ability to string together a sequence of short term projects;
- outstanding local leadership;
- local institutional support; and,
- a real or latent demand for the technology.

Explicit local demand for the training (i.e. before it started) was not a constant feature. In contrast, chronic political change, institutional instability, and low levels of government support to agriculture and to research, have been associated with high levels of 'wastage'. However, the Panel recognised that there is an extent to which it is difficult to anticipate the future insofar as the present, both in agricultural systems and in the capacity of NARS, grew out of a CGIAR of 15 or 20 years ago, which had a very different profile in terms of skills and resources.

ACKNOWLEDGEMENTS

The Panel gratefully acknowledges the assistance of the many people who contributed to this study. They are too numerous to mention individually, but we would like to express particular thanks to:

- The Directors General, training specialists and research staff at the Centers visited: CIP, CIAT, ICRAF, ILRI, IITA and IRRI;
- The training focal persons at all Centers;
- Country Research Associates: Angela Machacilla (Ecuador) Carmen Calderon (Bolivia), Tran Thi Ut (Vietnam), Ora-orn Poocharoen (Thailand), Paul Jere (Malawi) Anne Muriuki (Keyna) and Dominique Endamana (Cameroon);
- All staff of national institutions who most generously gave of their time in the course of the country field studies;
- Mina Lantican and Rolando Kapmeyer (SC Secretariat consultants) for support with the questionnaire surveys, data transcription and analysis;
- Staff at the Science Council Secretariat, particularly Sirkka Immonen who served as Panel Secretary and without whose constant attention and support this entire exercise would have been impossible to complete; and Irmi Braun-Castaldi for coordination of travel logistics.

The level of cooperation that the Panel received is a tribute to the widely shared enthusiasm for training, learning and NARS capacity strengthening across the CGIAR.

However responsibility for this report and its conclusions rests entirely with the Panel – rather than any of the above-named.

Elliot Stern, Panel Chair

March 2006

ANNEXES

ANNEX I

Terms of Reference for the Panel which will carry out an Evaluation and Impact Assessment of Training Activities in the CGIAR²⁹

These terms of reference relate to the Main Phase of this study. The First Phase involved a desk study and collection of background materials and data (see Annex I).

The Main Study will be carried out by a Panel of three experts, including the Chair. The Panel will be supported by a number of resource persons from the developing regions. The Science Council would like the Panel to use at least two complementary approaches in its data gathering and analysis (see Annex II). One approach would use NARS organizations as the unit of analysis and would rely on field surveys. The second would use specific training events across Centers as the unit of analysis and would be conducted virtually through trainee interviews. The Panel should base its analysis on a sample of the CGIAR's training efforts during the past decade that is feasible to conduct while allowing reasonable generalisability for drawing conclusion on the main study items (see below) and making recommendations at a System level.

The Panel will finalise, in close interaction with the interim Science Council and subsequently the Science Council (The Chairs of SCOER and SPIA and subsequently the Standing Panels on Impact Assessment and Monitoring and Evaluation), the interim study plan and methodologies to be used. The Panel will (a) carry out the Main Phase study; (b) interpret the results, using its own analysis and the Desk Study and its data and information as input and (c) report the evaluation findings. The Panel will be supported by a Panel secretary from the iSC/SC Secretariat and a member each from relevant Standing Panels of the SC.

Specifically, the Panel is expected to:

Define and develop the study methodology on the basis of the proposed approach (Annex II). Specifically, the Panel will select the study samples, design data collection tools, including a harmonised approach to be used across the regions, and develop a data analysis plan. The Panel will draw from the data and information collected during the Desk Study. The Panel will work in close interaction with the Chairs of the relevant Standing Panels of the SC in deriving to the final design.

Carry out and manage, with support from the Secretariat, the evaluation and surveys, and data collection. It will, in consultation with Science Council focal persons, decide on the engagement of the regional resource persons and their briefing.

Analyse the results of the survey covering areas specified below.

Submit a report to the Science Council by July 2004.

The study report should provide information, analysis and recommendations at the System level, specifically covering four items listed below.

²⁹ Without annexes to the TOR

1. Assess the quality and relevance of the training activities within the CGIAR, specifically with respect to:
 - Processes used for assigning priorities to training activities and assuring quality and relevance;
 - Strategies to guide training as part of capacity strengthening;
 - Adoption of suitable new approaches to training.

2. Assess the comparative effectiveness and efficiency of CGIAR training activities, specifically with respect to:
 - Organisation of training;
 - Comparative advantage as compared with alternative suppliers;
 - Cooperation and coordination among Centers and other providers for effective supply;
 - Adopting new, promising approaches and modalities for training;
 - Achieving multiplier effects (leveraging CGIAR investments in training);
 - Responding to funding challenges; and
 - Allocating resources to training and within training vs. alternative activities.

3. Assess the intermediate outcomes and impacts of training, specifically with respect to:
 - The impact pathways planned and expected by Centers (see Annex III);
 - Sustainable increase in NARS effectiveness and efficiency in developing, generating, supporting and disseminating research results;
 - Enhancing the effectiveness of the Centers' research via e.g. closer partnerships;
 - Analysing constraints to achieving sustainable intermediate impacts and seeking ways to overcome these.

4. Assess to the extent possible the impacts of selected training activities on the ultimate goals of the CGIAR, giving particular consideration to the capacity-related constraints to achieving these goals, and developing counterfactual scenarios.

Time frame

The Desk Study report is due in June 2003. It is a working document and information and data may be added to it for the benefit of the Main Phase.

The Panel is expected to work largely in virtual mode, but it is planned to hold an initial planning meeting in third quarter of 2003, and one towards the end of the study if necessary. As an output from the planning, the Panel should:

- review and complete the evaluation design;
- produce a vision of the final product;
- decide on the order of the different parts of the evaluation (sequential or concurrent);
- agree on sampling criteria and principle data collection methods;
- develop the data collection instruments and procedures;
- agree on the regional input from resource persons and design their TOR;
- select the regional resource persons (list to be provided by iSC Secretariat).

The field surveys should be launched at the end of 2003 and completed in 2004. The Panel report should be submitted to SC in July-August 2004 and subsequently to the CGIAR Group at AGM'04.

ANNEX II

Biodata of Panel members

STERN, Elliot (UK) – Panel Chair

Position: Director, Evaluation Development and Review Unit, Tavistock Institute.

Expertise: Evaluation, education and training, regional and rural development, transfer of innovation and technology, organisational design, social policy

Education: Political Science and Conflict Analysis, University College, London Economics with Social Anthropology, University College, London.

Experience: He established and leads the Evaluation Development and Review Unit at the Tavistock Institute, which has a mission to develop and apply innovative evaluation methods. He has extensive experience in organisational design and development issues related to innovation and evaluation; Recent assignments have included program design, organisational review and evaluation system implementation. He has directed major European and UK public sector projects, and acted as consultant to OECD, UNESCO, IFAD, World Bank and the European Commission on evaluation and evaluation design in relation to local development, social policy and vocational education. Within the UK he has worked with many public agencies including the Welsh Development Agency, DfEE, the Department of Health and the UK Employment Service as well as a number of industrial companies. Recent assignments include : a review of the system level review processes of the CGIAR, (Consultative Group on International Agricultural Research); a review of the evaluation processes for international development co-operation in UNESCO; a review of the Welsh Language Board for the Welsh Assembly; an evaluation review and capacity-building exercise for the French national energy agency ADEME; and a design of national evaluation systems for a major national urban regeneration program in the UK. Memberships include: the Council of the UK Evaluation Society (founding President 1994-1996); Vice President/President Elect of the European Evaluation Society; Founding Academician UK Academy of Social Sciences; Advisory Committee of the MEANS Program (Methods for Evaluation of European Structural Fund Programs); Member of Advisory Board, Warwick Business School Research Bureau; Editor of *Evaluation, the International Journal of Theory, Research and Practice*; Editorial Board of the *British Journal of Education and Work*.

DE VACCARO, Lucia (Peru/UK)

Position: Professor Emerita and Head of Animal Breeding, Facultad de Agronomía, Universidad Central de Venezuela;

Expertise: Animal genetics and breeding, rural development;

Education: postdoctoral studies, Cornell University; Ph.D., Leeds University; M.A., B.A., University of Cambridge;

Experience: In her previous post Dr. de Vaccaro was also Head of Animal Breeding. She has spent her professional life in Latin American universities. Her research centers on the genetic improvement of milked cattle for rural development in tropical areas. She was a member of TAC 1996-2001. She served as Chair of the Board of CIAT and was a founding member of the ILRI Board. She is a member of the Council of Advisors of the World Food Prize.

LYNAM, John K. (UK)

Position: Head of Gatsby Foundations' work in east Africa

Expertise: Agricultural research for development, starchy staples, priority setting, impact assessment, institutional development, Sub-Saharan Africa, LAC.

Education: Ph.D., Food Research Institute, Stanford University (1978); M.A., Food Research Institute, Stanford University (1974); B.S., Dept. of Agricultural Economics, Ohio State University (1970).

Experience: Current position since 2004. Previously Associate Director, Food Security Division, Rockefeller Foundation, Nairobi, Kenya. Has developed a funding program for agricultural research in Eastern Africa. Principal areas of program management include developing a banana research capacity in

Uganda; Social science research at ICIPE and KARI; Development of an integrated soils research agenda in East Africa; Integrating GIS and modelling in agricultural research planning and priority setting; Management of the collaborative study of cassava in Africa directed by IITA; Development of a research capacity for crop and resource husbandry in agricultural faculties in East Africa; 1997-88: Head, Economics Section, Cassava Program, CIAT. Duties related to design and supervision of economic research on cassava: On-farm research in cassava-based systems; Marketing and demand studies in cassava food and feed markets; Integrated cassava development projects; Research planning and priority setting within commodity research programs; Role of technological change in small farmer development strategies in Latin America; 1974-75: Visiting research fellow, Institute for Development Studies, University of Nairobi, Kenya; Memberships include: Task Force, African Highlands Initiative (since 1993), Steering Committee, Cassava Biotechnology Network (1994-1999), Steering Committee, Global Change and Terrestrial Ecology (1995-1999). He has published widely on agricultural research and priority setting, sustainable development, agricultural economics and commodity issues.

ANNEX III

Internal reviews of training carried out by the CGIAR Centers: a summary

1. Since 1990, 18 internal reviews have been carried out with written reports published or made available to the Science Council Secretariat, and which were reviewed by this team. Others are known to have been done, but the reports have not circulated outside the centers. Six centers have no internal review reports, five have one each and five (including ISNAR) had 2-3 each. This limited usage of internal reviews must be assessed against the background of the poor coverage generally given to training by the CGIAR-commissioned routine external reviews (EPMR's). These latter were judged by the present team to have been generally more descriptive than analytical, and not to have provided systematic evaluations of training relevance, quality, effectiveness or impact, nor of the procedures in place to monitor and improve them.

2. The objectives of ten of the reviews were evaluative and eight aimed to assess training impact, but most contained a mixture of elements of evaluation and impact assessment. Thirteen of them generated information from questionnaires carried out among ex - trainees, and supervisors or institutional leaders (five studies). Most of them referred to training carried out in the period 1966-1990, with a gap during the late 1990's when training budgets were reduced across the system and the fall in unrestricted funding limited the centers' ability to finance reviews beyond the EPMR's. However, three new reports were published in 2005.

3. The main limitations of the reviews are considered to be:

- a) A low proportion (27%) was carried out by independent persons (vs. staff or board members).
- b) Most dealt with specific courses or types of training, rather than the Center's training activities as a whole, providing no recommendations on overall training policy and strategy, nor comparative information on different training types, delivery modes etc.
- c) Most attention was given to training outcomes, with lesser coverage of relevance, quality, efficiency, effectiveness or impact.
- d) The combined coverage of ex - trainees through the questionnaires was low in proportion to the total number trained by the system: responses were obtained from 2168 alumni, with 67% from a single center. Responses from supervisors and institution leaders totaled less than 200. This was despite major efforts on the part of many centers to secure the responses.
- e) The low response rates to the questionnaires (17% - 79%, 43% overall) probably introduced a positive bias into the results. This was disregarded in all but two of the studies.
- f) The small sample sizes/study made statistical analysis of most questionnaire results irrelevant, but even when numbers were adequate, only two studies analyzed the significance of different sources of variation in responses, so disappointingly little information generated on these.
- g) Impact assessment was limited by the difficulty of obtaining long-term follow up information, and was mostly confined to the personal and institutional levels.

4. The main findings included:

- a) Training relevance was consistently rated good or very high to the trainees and their institutions. While some NARS suggested the centers should concentrate on 'frontier knowledge and technologies', quite recent opinions of others showed that the 'old' subject areas such as agronomy and plant breeding were still relevant, but that 'new' areas should be added.
- b) Quality ratings were also consistently good to highly favorable. However, specific recommendations were made about systematic quality monitoring, and the need to determine

whether learning objectives had been met. One study pointed up differences in quality between in-country and headquarters courses, and that the perception of quality varied according to the trainees' previous level or preparation. It also traced trends in quality of courses over time and found no indication of improvement. A common recommendation was the need for greater post-training follow up and direct support to trainees.

- c) Efficiency was covered very sparingly. Greater usage should be made of training modules already developed. The two studies which dealt with alternative suppliers, both from Asia, suggested that the centers retained a strong advantage for specific courses but that more higher degree training could be assumed by local universities.
- d) Outcomes at the personal level were dealt with in considerable detail, and were good to highly positive. The indicators most commonly used were research projects funded, publications and conferences, further training undertaken, training performed, networks joined, professional contacts maintained, interactions with policy makers, responsibilities assumed, scientific leadership given, promotions and higher salaries received. However, the proportion of trainees who experienced constraints such as lack of operating funds, inadequate experimental facilities and transport, poor communications (e.g. internet), insufficient or poorly trained support staff, low salaries and inadequate support from superiors was 40-91%.
- e) Outcomes at the institutional level were less widely documented. Indicators included training by trainees, improvements in priority setting, resource use, management, project funding, procedures for monitoring and evaluation. Three studies traced CGIAR alumni in leadership positions, showing high proportions in each case. An important conclusion from one study was that training has little weight in bringing about organizational change unless there is real institutional commitment. When training was integrated into broader capacity building efforts, increases in staff qualifications and disciplinary diversity, improvements in facilities and equipment, budgetary autonomy, senior authorship of publications, production of local scientific journals and growth of research networks were reported.
- f) Impact nearer the field level was assessed in five studies. A common factor was that training was an integral part of the centers' activities and that they had been engaged for a very long time (10-20 years). Impacts were reported in terms of selected varieties sown, yields increased, genetic resources collected and distributed food security and nutrition monitoring instruments used and policy changes achieved. These were not attributed to training alone, but it was considered an indispensable component of the achievements reported.

5. It is concluded that the centers have made sparing use of internal reviews of training, despite the shortcomings of EPMR's. This emphasises the need to ensure that other procedures are in place at the centers for monitoring and evaluation. In general, the studies made little contribution to policy and strategy decisions and their results are probably biased favourably. Within their limitations, they provided interesting and often impressive information on training outcomes and, to a lesser degree, impact, as well as on the factors which commonly prevent alumni from putting their training to full use. They underline the importance of gathering objective evaluation and impact information, and also the practical difficulties of doing so.

ANNEX IV
Trends in restricted and unrestricted funding of CGIAR Centers

A. CGIAR FUNDING BY CENTER, 2004 (US\$ million)

	Unrestricted	Restricted	Member total	% of Unrestricted
Africa Rice (WARDA)	7.0	3.4	10.4	67%
CIAT	13.5	22.8	36.3	37%
CIFOR	8.0	6.8	14.8	54%
CIMMYT	18.9	22.2	41.2	46%
CIP	9.3	13.0	22.3	42%
ICARDA	10.5	14.3	24.8	42%
ICRISAT	11.0	16.7	27.7	40%
IFPRI	15.0	17.7	32.8	46%
IITA	12.6	30.2	42.8	29%
ILRI	15.7	17.1	32.9	48%
IPGRI	15.7	19.0	34.8	45%
IRRI	16.1	16.3	32.4	50%
ISNAR	4.8	0.9	5.8	84%
IWMI	10.8	12.8	23.6	46%
World Agroforestry (ICRAF)	9.6	20.1	29.7	32%
WorldFish (ICLARM)	6.7	7.6	14.3	47%
Total	185.4	241.1	426.5	43%

B. CGIAR FUNDING BY CENTER, 1999 (US\$ million)

	Unrestricted	Restricted	Member total	% of Unrestricted
Africa Rice (WARDA)	6.6	4.2	10.8	61%
CIAT	14.3	14.4	28.7	50%
CIFOR	7.4	4.1	11.5	64%
CIMMYT	15.1	18.7	33.8	45%
CIP	11.3	8.8	20.1	56%
ICARDA	8.5	11.0	19.5	44%
ICRISAT	13.4	7.8	21.2	63%
IFPRI	8.9	11.9	20.8	43%
IITA	15.9	14.8	30.7	52%
ILRI	14.8	11.7	26.5	56%
IPGRI	12.3	7.8	20.1	61%
IRRI	19.8	12.8	32.6	61%
ISNAR	5.6	2.6	8.2	68%
IWMI	5.9	2.9	8.8	67%
World Agroforestry (ICRAF)	7.8	12.9	20.7	38%
WorldFish (ICLARM)	9.3	5.0	14.3	65%
Total	176.9	151.4	328.3	54%

C. CGIAR FUNDING BY CENTER, 1993 (US\$ million)

	Unrestricted	Restricted	Member total	% of Unrestricted
Africa Rice (WARDA)	4.5	4.4	8.9	51%
CIAT	22.3	7.8	30.1	74%
CIFOR	5.1	0.0	5.1	100%
CIMMYT	20.2	9.0	29.2	69%
CIP	12.2	8.4	20.6	59%
ICARDA	12.3	4.0	16.3	75%
ICRISAT	20.6	10.9	31.5	65%
IFPRI	7.3	5.6	12.9	57%
IITA	18.8	15.3	34.1	55%
ILRI	18.5	3.6	22.1	84%
IPGRI	9.9	3.3	13.2	75%
IRRI	22.1	21.7	43.8	50%
ISNAR	6.0	4.3	10.3	58%
IWMI	3.3	5.8	9.1	36%
World Agroforestry (ICRAF)	5.5	7.8	13.3	41%
WorldFish (ICLARM)	2.7	4.1	6.8	40%
Total	191.3	116.0	307.3	62%

ANNEX V
CGIAR CENTER INVESTMENT IN TRAINING 1992-2002 (US\$ MILLION)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CIAT	1.7	1.5	0.8	1.1	2.3	2.1	1.6	1.5	1.4	1.4	1.6
CIFOR	0	0	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.3
CIMMYT	2.7	2.5	1.5	0.9	2.6	4.4	4.6	5.2	5.4	5.7	5.7
CIP	1.0	1.6	0.7	0.3	1.6	1.5	1.3	1.1	0	1.1	1
ICARDA	2.2	2	1.4	2.6	2	1.8	0.9	1.1	0.7	0.7	1.1
WorldFish (ICLARM)	0.05	0.1		0	0.1	0.1	0.8	0.9	0.6	0.7	0.5
World Agroforestry (ICRAF)	1.6	1.3	2.1	2.6	2.4	2	3.9	3.6	4.2	4.4	4.5
ICRISAT	1.5	1.3	1.4	2.6	2.9	2.1	2.1	2.2	2.3	2.3	2.2
IFPRI	0.3	0.4	1.1	1	1	2.5	2.1	3.2	3.1	3.4	3.5
IITA	2.4	1.6	1.4	3.2	2	1.8	1.7	2.4	1.6	1.8	1.6
ILRI	2.9 ^a	1.8	1.6	1.2	1.7	1.3	1.2	1.7	1.6	1.8	1.6
IPGRI	0.6 ^b	1.1	0.9	1.0	0.4	1.2	1.6	1.7	1.6	4.2	3
IRRI	2.6	2	2.3	1.5	2.2	1.5	1.5	1.6	2.6	0.6	2.5
ISNAR	1.7	1.5	1.2	2.1	2.7	1.9	2	2	2.3	2.2	2.2
IWMI Africa Rice (WARDA)	0.4	0.6	0	0.4	0	0	0	0	1.1	0	na ^c
	0.8	0.3	1	0.8	0.4	0.6	1.4	1.5	1.1	0.8	1.3
Total	22.5	19.6	17.5	21.4	24.5	25.1	26.9	29.9	29.8	31.3	32.6

Source CGIAR Finance Reports

^a ILCA+ILRAD

^b IBPGR+INIBAP

^c IWMI expenditure for strengthening NARS in 2002: 5.2

ANNEX VI

Relative change in individual training in the 10 top countries in developing regions*

Region/Country	n	90-92	93-98	99-04
Asia				
India	1100	19.6	28.9	49.9
China	371	9.3	15.6	10.3
Vietnam	239	14.6	9.8	4.4
Indonesia	198	4.8	5.2	8.6
Philippines	193	10.1	7.4	4.5
Bangladesh	162	5.6	4.6	6.3
Nepal	127	4.8	5.3	3.1
Thailand	126	5.3	5.8	2.4
Pakistan	86	2.6	3.4	2.4
Sri Lanka	73	7.7	2.6	0.8
Latin America				
Peru	1259	33.5	31.3	44.5
Colombia	847	15.4	19.9	33.0
Mexico	214	3.9	10.0	3.2
Ecuador	158	8.4	4.8	3.5
Brazil	144	7.1	5.6	2.2
Bolivia	120	4.5	4.6	2.3
Argentina	105	3.1	4.8	1.3
Venezuela	93	4.7	3.3	1.7
Costa Rica	67	2.6	1.9	1.9
Chile	65	2.1	2.7	1.1
Sub-Saharan Africa				
Kenya	549	14.2	17.8	19.7
Nigeria	400	12.1	12.9	13.5
Ethiopia	373	12.5	13.5	10.2
Uganda	173	4.0	5.6	6.5
Ghana	149	3.7	6.0	4.1
Tanzania	145	5.0	5.9	3.1
Cameroon	130	4.4	4.0	4.3
Zimbabwe	118	4.6	3.7	3.4
Sudan	117	7.8	3.9	1.3
Cote d'Ivoire	77	0.3	1.4	5.0
CWANA				
Syria	736	56.1	39.0	36.4
Iran	227	6.4	13.9	14.7
Egypt	99	5.0	7.4	3.6
Morocco	81	5.3	4.4	4.4
Yemen	81	5.0	5.5	3.1
Jordan	80	2.6	6.1	3.4
Turkey	76	4.4	4.9	3.4
Iraq	71	0.3	2.8	7.5
Lebanon	68	0.9	6.4	2.2
Algeria	65	3.8	4.5	2.5

* average trainees/year given for three periods.

ANNEX VII
Distribution of training volume among themes in group training in each Center

		agro- forestry	bio- technolog y	breeding	crop production	crop protectio n	genetic resources	livestock	method s	NRM	post- harvest	Seed	social science	not know n
CIAT	P		12.4	2.2	30.8	3.2	2.4		6.5	21.8	3.7	1.8	15.2	
	TD		29.1	4.8	30.9	3.3	3.0		1.9	5.8	5.6	1.0	14.4	
CIMMYT	P		4.2	26.8	13.0	2.8	0.7		9.4	21.4	1.4	10.8	8.3	
	TD		1.0	39.1	45.1	0.4	0.1		5.0	3.1	1.8	2.4	1.8	
CIP	P		4.8	1.6	16.5	22.8	4.7		6.7	12.0	8.7	15.2	3.3	
	TD		3.9	2.2	15.6	20.6	3.8		12.5	7.5	10.2	17.8	3.6	
ICARDA	P		4.1	7.9	6.8	6.7	3.3	2.2	21.8	19.3		21.4	5.0	
	TD		2.7	20.9	5.3	7.4	3.1	2.1	19.5	15.2		18.3	3.6	
ICRAF	P	53.6			<0.1	0.6	0.3		17.8	8.8	4.1	0.6	12.7	
	TD	52.2			<0.1	1.0			23.7	9.9	0.4		11.3	
ICRISAT	P		2.4	19.3	17.0	14.8	4.2		31.1	4.1	4.1	2.4	0.7	
	TD		0.6	15.3	38.9	4.3	1.1		28.3	6.6	3.3	1.1	0.4	
IFPRI	P								22.4	2.9			74.7	
	TD								8.9				91.1	
IITA	P	1.0	2.8	5.4	32.7	7.5	2.6	0.5	14.5	4.9	13.3	3.2	10.9	
	TD		3.5	5.8	37.2	11.5	4.3	0.3	10.0	4.0	10.7	2.1	10.4	
ILRI	P		1.6		4.8	0.8	4.4	55.8	20.0			5.8	3.6	
	TD		0.9		5.2		6.1	58.4	12.7			4.4	12.3	
IPGRI	P		5.3	1.3		2.4	76.0		6.0		6.0	0.4	2.0	
	TD		7.7	0.9		7.5	80.1		3.7					
IRRI	P		1.8	3.2	9.8	4.9			22.3	7.4		2.9	1.9	44.9
	TD													
IRRI-in- country	P	0.3	1.2	2.7	21.2	7.6	5.0		28.9	15.7	<0.1	5.1	9.7	2.6
	TD		1.1	2.5	12.6	3.8	2.2		35.0	4.3	<0.1	1.1	8.5	28.9
WARDA	P			6.0	35.8	9.7			16.5	6.2		10.4	11.7	3.6
	TD			2.4	31.2	18.2			9.8	2.5		2.6	32.2	1.0
Courses w/o data	P	19	25	16	39	19	10		39	35	4	28	33	1
	TD	55	64	36	97	71	228	24	202	120	10	54	92	8

P=participants
D=trainee days

ANNEX VIII.
Relative importance of different Methods themes

A. Group training

	1990-2004				1990-92		1993-98		1999-04	
	% td methods	% td all themes	% p methods	% p all themes	ranking (td)	ranking (p)	ranking (td)	ranking (p)	ranking (td)	ranking (p)
statistics/data management	23.0	3.2	20.5	3.3	2	1	1	1	1	1
training/education/materials	10.0	1.4	13.1	2.1	6	9	2	3	5	3
research management/process	9.5	1.3	9.8	1.6	4	3	3	4	7	5
scientific/proposal writing	9.2	1.3	13.4	2.2	9	5	5	5	3	2
information/library	8.3	1.2	5.2	0.8	7	8	4	6	8	11
station management*	8.2	1.2	2.8	0.5	1	4	8	9	12	14
experimental design	7.6	1.1	11.7	1.9	3	2	6	2	10	4
English**	7.3	1.0	3.5	0.6	13	13	15	10	2	8
computer	4.9	0.7	2.8	0.4	12	11	10	11	4	10
management/administration	3.8	0.5	4.9	0.8	5	10	9	12	9	6
machinery/equipment/facilities	3.2	0.5	1.3	0.2	11	12	13	14	6	13
surveying	2.7	0.4	2.3	0.4	8	6	7	7	16	16
presentation/documentation/publishing	1.2	0.2	3.0	0.5	14	14	11	8	11	9
database management	0.6	0.1	0.8	0.1	15	15	12	13	13	15
group dynamics	0.4	0.1	3.6	0.6	10	7	14	15	15	7
other	0.3	0.0	1.3	0.2	16	16	16	16	14	12

** ICARDA has done most of the station management training

* IRRI (both HQ and particularly IC) has done most of the English training

B. Individual training

	1990-2004				1990-92		1993-98		1999-04	
	% td methods	% td all themes	% p methods	% p all themes	ranking (td)	ranking (p)	ranking (td)	ranking (p)	ranking (td)	ranking (p)
information/library	20.8	0.7	16.8	1.4	1	2	3	3	1	1
management/administration/finance	15.6	0.5	13.2	1.1	4	8	1	2	6	3
statistics/data management	13.4	0.4	18.9	1.5	2	1	2	1	5	2
training/education/materials	11.8	0.4	8.3	0.7	5	5	4	4	4	6
machinery/facilities	11.0	0.3	7.4	0.6	3	11	8	8	2	5
computer	9.9	0.3	10.1	0.8	7	3	5	7	3	4
presentation/documentation/publishing	4.7	0.1	6.4	0.5	6	6	10	6	7	7
research management/process	3.1	0.1	2.0	0.2	11	12	7	10	10	11
lab skills	2.8	0.1	7.9	0.6	8	4	6	5	12	8
database management	2.1	0.1	1.7	0.1	12	13	11	12	8	10
station management	1.8	0.1	2.2	0.2	10	9	9	9	13	12
bioinformatics	1.5	0.0	1.3	0.1	13	14	16	16	9	9
other	1.0	0.0	1.2	0.1	14	15	15	13	11	13
experimental design	0.4	0.0	2.0	0.2	9	7	12	11	14	14
surveying	0.1	0.0	0.1	0.0	15	16	13	15	15	16
scientific writing	0.1	0.0	0.5	0.0	16	10	14	14	16	15

ANNEX IX
Summary of case studies and their characteristics

A. Summary of case studies in Kenya

Country/ Title	Kenya 1: Smallholders Dairy Project	Kenya 2: Introducing Monitoring & Evaluation into NARI
Center/ Theme	ILRI Livestock and Policy Development	CIAT Social Science & management
Training 'Target'	Partners in dairy sector, smallholders, government department	NARI as an institution – including 15 research centers
Training & learning modes	Degree training (MSc & PhD), short courses, informal learning, problem solving teams	MSc student training, collaborative Research, workshops for research centers, joint project planning, mentoring
NARS Capacity Outcomes	Development of new knowledge, developing partnerships and disseminating knowledge through partnerships	Pilot introduction of M&E systems, developing action plans, developing M&E frameworks
Wider Impacts	Not yet known – but related projects elsewhere in East Africa	Favoured by donors as part of new World Bank loan

B. Summary of case studies in Bolivia

Country/ Title	Bolivia 1: Participatory Research	Bolivia 2: Bean Production	Bolivia 3: PROINPA Foundation	Bolivia 4: Tropical Pastures network
Center/ Theme	CIAT Social Science /Participatory Research	CIAT Crop production	CIP Crop Production, Institution building	CIAT Crop science, Forage
Training 'Target'	NARI, University researchers, local trainers, producers	University research institution	NARI	NARI University researchers
Training & learning modes	Instruction/didactic, experiential, peer learning, learning by doing	Formal courses, individual programs at Center HQ, exchange visits, networks. In classrooms and field stations & networks	Advisory, transitional leadership, instruction, peer learning in courses, collaborative projects, exchange visits, joint planning	Peer learning, experiential, managed network in formal courses, network meetings, exchange visits
NARS Capacity Outcomes	PR capacity in NARI, new methods validated/improved, Community structures & producer associations created	Multi-disciplinary research skills in university, curricula modernised, improved crop rotation	Establishment of independent institute, strong finances, research skills applied	New varieties evaluated (limited adoption), seed production technologies developed , university curricula improved
Wider Impacts	Improved production technologies, superior crop varieties identified, germplasm conserved, new markets, increase in community income	Land use improved, crop production increased, new export markets, production costs reduced, poor households diet improved, incomes raised	Crop production/ protection improved, farmers income increased, germplasm conserved in situ	Seed markets opened up, seed production increased, improved forage varieties adopted, incomes raised

C. Summary of case studies in Ecuador

Country/ Title	Ecuador 1: INIAP	Ecuador 2: Cassava Processing	Ecuador 3: Participatory Research (PR)
Center/ Theme	CIAT,CIMMYT,CIP,IPGRI NARI capacity building	CIAT Post harvest technology	CIAT Social Science & Participatory Research
Training 'Target'	NARI scientists	Farmers & Processors organisations, collaborating Institutions (NARI, National Foundation, Producer Union	Researchers, trainers, small-scale farmers organisations
Training & learning modes	Instruction, mentoring, exchange visits, joint activities, advisory roles	Instruction, peer learning, farmer to farmer, exchange visits	Instruction, learning by doing through courses, workshops in country practicals, exchange visits
NARS Capacity Outcomes	Limited by factors other than training – high turnover, few resources	New technologies applied, institutional support structures (for producers) created, research undertaken	PR applied, producer associations formed, research undertaken, institutional cultures changed, producer associations formed
Wider Impacts	Not documented	Production of processed Cassava increased, incomes increased, community& individual empowerment	Improved varieties and production technologies adopted, endangered germplasm conserved

D. Summary of case studies in Thailand

Country/ Title	Thailand 1: Participatory mapping ComMod	Thailand 2: Integrated Cassava cropping	Thailand 3: Landscape Agroforestry
Center/ Theme	IRRI NRM/methods	CIAT NRM, Crop protection	ICRAF (ASB program) Agroforestry, NRM
Training 'Target'	Lecturers researchers & NARI officials	Local researchers, extension workers, whole villages & farmers groups	NARI, university researchers, NGOs; villagers & local trainers
Training & learning modes	Residential course: lectures, group exercises, ICT resources, online networks, mentoring	Trials & collaborative research, Training of Trainers, Farmers Participatory methods	Instruction/didactic, participatory – learning by doing, collaborative research
NARS Capacity Outcomes	Courses run by trainees in Thai universities, PhDs & MSc	Learning by networks of trainers, extension workers about FPR & new techniques, new FPR methods developed by CIAT	Mobilising NARS research in agroforestry, training PhDs& MSc students, raised policy awareness
Wider Impacts	Regional (Asian) networks, 7 applications of method in Thailand	Adoption by farmers of new technologies re soil conservation, higher productivity & production, increased farmer incomes	Villagers use participatory watershed management tools, extension of research by ICRAF in Thailand and regionally

E. Summary of case studies in Vietnam

Country/ Title	Vietnam 1: Sweet Potato (SP) & pig feed	Vietnam 2: 3 Reductions/3 Gains	Vietnam 3: Enhancing Gender Equality in NARI
Center/ Theme	CIP Crop breeding & livestock	IRRI, IRRC network Crop Protection/NRM/Social Science	IRRI Social Science
Training 'Target'	NARI scientists, trainers, extension workers & indirectly farmers	NARI Scientists, University researchers, national officials, state (regional officials) farmers organisations	NARI (Cuu Long Rice Research Institute), women farmers collaborating in research projects, local authorities who send farmers and extension workers to be trained
Training & learning modes	Degree training, CIP courses, Training of Trainers, who then trained farmers leaders who then trained groups of farmers	Collaborative research, mentoring, Farmer Participatory trials, media campaigns, policy dialogue	Awareness raising, mentoring, collaborative research, informal (e.g. attendance at workshops), policy discussions with unions and management in NARI
NARS Capacity Outcomes	NARI able to develop new varieties of SP & research programs, new capacities in universities	National program, new research and farming systems skills in NARI and at District level, NARI adopts project methods for 'sustainable agriculture'	Changes in human resource policies/practice in NARI: recruitment and promotion of women scientists. Insertion of gender into research projects and training offered by NARI
Wider Impacts	Widespread adoption of new varieties, increased farmers incomes, production and productivity, national policy focus	National policy change, self directed by Vietnamese authorities, increases in income, production, productivity of farmers	Increased women's' participation in training and participatory research, greater gender awareness by local authorities

ANNEX X

Cameroon country report

In Cameroon over the last decade and half the CGIAR has built a significant internal capacity focused on the sustainable development of the humid forest zone. This was led by IITA in the establishment of an ecozone station in Yaoundé and has been progressively joined by a range of other IARC's, particularly ICRAF, CIFOR, and ICLARM. At the same time deepening of national research and development capacities has been constrained, particularly during the structural adjustment and economic crisis of the 1990's. CGIAR programs are hosted by the national research institute, IRAD. The co-existence of well-resourced international programs and under-financed national programs creates, on the one hand, an immediate demand for capacity strengthening programs and, on the other hand, the desire to be equal partners in research. This report will explore training and capacity building activities of the CGIAR within this context of deepening programs of the CGIAR and often struggling national programs.

National Agricultural and Development Capacities in Cameroon

National agricultural research capacities have their roots in the colonial structures and expansion of research units with the Ministry of Agriculture. Independent national structures are relatively recent, beginning with the creation of the Institut de Recherche Agricole in 1979. This was followed by the creation of an institute working on animal diseases and veterinary medicine in 1982, where both managed a network of 69 research stations and sub-stations. The two were merged in 1996 into a semi-autonomous parastatal, the Institut de Recherche Agricole pour le Developpement (IRAD), under the Ministry of Science and Technology. This was accomplished under a World Bank loan for agricultural research, the first phase of which ran from 1988 to 1993.

Research within IRAD is organized within five scientific coordination units, namely annual crops, perennial crops, animals and fisheries, forestry and the environment, and farming systems. There is another unit which coordinates links to extension. The research is undertaken across five regional research centers, three specialized research centers, eight multi-disciplinary stations and twenty sub-stations. The research is undertaken by 235 scientific staff. The system is medium-sized by African standards, but does not have the financial resources to sustain a high degree of productivity. The government budget for agricultural research essentially only covers salaries, which during the economic crisis was even difficult to meet. The government has relied on donor aid to provide the operational, capital and training costs required to develop a productive research system. From 1988 to 1998 agricultural research was supported by a World Bank loan, support from German aid, and USAID. Since 1999, IRAD has primarily been supported by the African Development Bank. Capacity building at a NARS system level has been principally motivated and supported through these donor programs.

During the early nineties donor programs, particularly that of USAID's National Cereal Research and Extension project, supported degree training of IRAD staff. 52 scientists were trained at MSc and PhD level in US universities, all but four returning to positions in IRAD. There was an organization in the US that administered the fellows, ensuring visas, admission requirements, and language training. Sending so many staff for training at the same time delayed research program development until they returned and by that time, Cameroon was in the depth of an economic crisis. It has been difficult for IRAD to consolidate the capacity strengthening efforts over the past decade and a half.

IRAD is currently putting together its first training and human resource development plan. This is being driven by projections of a shortage of trained manpower in the near term future. IRAD staff appointments come under the civil service and hiring is determined by the Ministry of Science and

Technology. Under structural adjustment new hiring was essentially curtailed and IRAD could not hire any new staff for ten years. Last year 105 new staff only with first degrees—note that Cameroon universities currently are based on the French system, where the first degree is a five-year agronomic “engineer” degree—were hired by IRAD. This is addition to another approximately 100 staff, who do not have terminal degrees. As well, the age of mandatory retirement within the civil service has been reduced to 55. In the coming decade most of the current PhD’s will retire, creating an increasingly under capacitated national research system—this problem is not unique to Cameroon as many systems across Africa, e.g. Kenya, Uganda, and Mali’s NARI were developed under similar programs. Research management is aware of the emerging situation, realizes that large donor training programs are a thing of the past, and are looking for cost-effective means of staff development.

One necessary part of such a manpower development plan will be the national universities. As with many other African countries, there has been a significant expansion in new universities. Prior to 1993 there was only one university in Cameroon, the University of Yaoundé. In 1993 several university centers were developed into independent universities. One of these was the University of Dschang, which had been a university center or faculty of agricultural sciences. In 1981 USAID had funded a program through the University of Florida to develop Dschang into the only agricultural faculty in Central Africa, with the idea that it would provide training at a regional level—this objective was never effectively realized. There was also a staff training component and 22 faculty members received their PhD in the US. The faculty is still developing its post-graduate programs and to date offers such programs in plant protection, animal production, water management, and forest management and wood technology.

The degree system is based on the French academic system and a recent national policy has dictated that the universities in Cameroon change their system to be compatible with the BSc, MSc, and PhD system offered in Anglophone countries. As a part of this process the rector is initiating a reflection and change process in the university. The vision he wants to instil in the university is that it become a principal driver of agricultural development in Cameroon. Nevertheless, he is aware of the capacity constraints within the university to achieve that vision.

The largest constraint is financial. The university is restricted to charging about US\$100 per year for student fees, which is far from covering costs. Government funds provide the major part of the budget and yet these are far from sufficient, again covering mainly salaries and some operational costs. The research budget is virtually negligible. The university has not been able to achieve sufficient budgetary independence to accept private students—as Makerere has in Uganda. Nevertheless, the university is just finishing installing a LAN for the campus, and ICT is a particular focus of capital investment—although the faculty did not currently have access to AGORA or TEAL. Whether this will help to reverse the isolation of the university is another question. Dschang is distant from the capital, it has virtually no interaction with IRAD—even though there is an IRAD station in Dschang—and contacts between the faculty and the CGIAR Centers are limited, principally to the participation in ICRAF’s ANAFE network.

The revisioning process is only just starting but the dean expressed many of the constraints on developing the faculty as a major contributor to agricultural development. Firstly, feedback from stakeholders suggests that students do not have the skills and competencies needed by employers. Second, the very limited research that is done is highly fragmented, done as an academic exercise, and has virtually no links to farmer problems. Similarly, virtually none of the students’ thesis year is done through on-farm research. The dean wants to increase the research that is done within the faculty, improve links to other agricultural research organizations, improve the relevance of that research, and better conceptualize how to enhance farmer linkages.

Capacity development in agricultural extension was also supported by donor funding. This came during the period of the World Bank's support of training and visit extension in Africa. In Cameroon it began as a pilot project in six provinces focusing on cocoa in the humid forest zone. The US\$31 million project began its operational phase in 1991; a second phase with national coverage began in 1997. The project employed 2,394 personnel, 69% of whom were field extension workers, 11% were regional technical specialists, and 20% had supervisory roles. The project in the second phase also had an adaptive research component led by IRAD involving on-farm adaptive trials of promising technologies and monthly technical training of extension workers. Early in the second phase the World Bank began an overall reassessment of training and visit extension, and the project was terminated in 2004. The extension system is now left with virtually no operational funds, although the staff remains in place, and ministry must consider how to restructure within an alternative extension model.

Cameroon is not untypical of building capacity in agricultural research and development in Africa. This has involved periods of institutional restructuring, importation of institutional models through donor programs, periodic programs for staff degree training, and reliance on donor funding. Adequate financing remains the largest constraint to effective institutional development and productive output. However, even within this context talent and entrepreneurial ability can be successful, where they search for their own funding and institutional links. However, with the strengthening of the private sector and civil society organizations, much of this, usually younger, talent is often attracted out of the system. The CGIAR must develop its capacity building and research partnerships within this institutional context.

CGIAR Research Programs in Cameroon

With the expansion of the CGIAR system some 15 years ago, resource management within tropical forest zones became a more explicit research objective within the system. Given the political instability in the Congo Basin and the significant clearing of the forest in coastal West Africa, Cameroon became a focus of CGIAR research on this ecosystem, connecting as it did the coastal West Africa and Central Africa forest ecosystems. IITA established a research station in the country in the early 1990's as its benchmark site for the humid forest zone, joining a small program of ICRAF. Over time CIFOR and ICLARM have also developed programs there with out posted staff. The system-wide program, Alternatives to Slash and Burn (ASB), also has Cameroon as one of its benchmark sites.

It is fair to say that even with relative physical proximity, building programs across the different IARC's within a common strategic frame for both research and capacity building has taken some time to develop. A large part of this has come around organizing at least part of the research around the benchmark site that was defined and characterized by IITA. This involves a gradient of population density and market access, with varying levels of forest degradation and cropping system intensification. There are 45 villages that are monitored within the benchmark area, with six principal research pilot sites. This has allowed the building up of an increasingly sophisticated understanding of development processes, land use mosaics, and constraints on crop production within the zone. Overtime this has led to a more shared view of development challenges within the humid forest zone.

The different centers have very complementary missions within the humid forest ecosystem. IITA focuses its programs on the development of sustainable crop production systems, ICRAF on indigenous fruit and medicinal tree domestication, ICLARM on developing aquaculture systems, and CIFOR on sustainable management of tropical forests. Each of the programs has more recently integrated a marketing component into their research programs, as this is a critical part of improving farmer incomes in this zone. The ASB program has in many ways been the catalyst for better

integration of CGIAR Center activities in the benchmark site, as well as linking the site to similar benchmark areas in tropical forest zones around the tropics.

There is no common strategy for strengthening capacity in national institutions involved in research and development programs in the humid forest ecosystem. Capacity development in each of the centers is done within the research programs of the particular center. Only to a limited extent is their overlap in the institutions involved across the IARC's, and rarely is there overlap at the research program level. Moreover, IRAD itself, while having regional research stations in both the unimodal and bimodal forest zones, does not have an overall strategy for development of the humid forest zone and by extension the capacities needed to undertake such a strategy. Rather, the approach to capacity building by the IARC's is very much couched in facilitating and understanding institutional innovation at a pilot scale. Stephan Weise, coordinator of the IITA eco-station, refers to this as research on development pathways, which fits into the larger context of research for development. Capacity development, i.e. both training and institutional strengthening, in such a framework focuses on what might be referred to as more downstream capacities, that is extension, market innovations, farmer organizations, and NGO's. The work is organized and funded within the frame of projects, but the focus on capacity building through institutional innovation characterizes most of the work of the IARC's. Examples of this include Farmer Field Schools and strengthening of farmer organizations in IITA's Sustainable Tree Crop Program (STCP), strengthening of market agents and farmer negotiation ability in ICRAF and CIFOR's non timber forest products (NTFP), ICLARM's work on participatory approaches to pond and hatchery development, CIFOR's work under ASB on co-management (community and government) of indigenous forest resources, and ICRAF's projects on on-farm domestication of indigenous fruit and medicinal trees.

The capacity issue within the humid forest area comes back in a more fundamental manner when these projects move from a pilot stage to a scaling up phase. Scaling up is very much at the research frontier of NRM programs. In Cameroon these involve a platform of institutional partnerships—very much within the frame of innovation theory--, development of a functional division of labour within the platform, funds flow for national partners, building training capacity within partner institutions—for example, to produce master trainers for Farmer Field School methodology--, a coordination capacity with the attendant transactions costs, and building in an exit strategy that ensures institutional sustainability. The STCP is currently designing a project for a second phase that explicitly focuses on scaling up. This involves not training of trainers, but rather developing training capacities in national institutions. As the experience with the early devolution of training within the CGIAR suggests, this will not be sustainable unless these capacities can charge to cover their costs.

As with the pilot phase, these units must utilize a range of training methods, with an additional problem of how to ensure quality within the ongoing training activities. It is not out of the question that the IARC's could serve as something of an accreditation agency for methods such as Farmer Field Schools. In the STCP a Canadian NGO, SOCODEV, performs something of this function in the training and formation of farmer groups, where it develops skills in farmer organizations in accounting, conflict resolution, micro-credit management, and market negotiations and monitors group effectiveness. Training within such projects is done to build a range of competencies across multiple institutions, that in the end must interact in a synergistic manner to achieve a particular development goal.

Conclusions and Emerging Issues

Cameroon is not atypical of NARS capacity issues in Africa. These are still relatively young institutions that have been put under a range of structural reforms that have in turn limited more organic program and institutional consolidation. This is exacerbated by the continuing dearth of

financial resources needed to produce effective research programs. That said, IARC's have not been explicit in first whether and second how they can contribute to human and institutional development within the NARS. It is probably a fair assessment that the IARC's in Cameroon do not, and in many ways can not, address the principal capacity needs of NARS institutions. Rather IARC's lead with their research programs and it is through these that programmatic, rather than institutional, capacities can be strengthened.

Two broad guiding principles condition how the IARC's develop such programmatic capacities. The first is that they must generate at least regional, if not global, public goods. Virtually all the projects are regional in scope, and ASB provides connectivity to global networks to distribute methods and knowledge generated within the Central African humid forest zone. The second factor is that these are in conception natural resource management programs, where systems research is the framework and different centers can contribute technological components, policy studies, site characterization, research tools and methodologies, and institutional innovations. Training and capacity development done within such a framework is by its very nature multi-faceted, involves a range of institutional partners, and is organized around project goals and strategies. As innovation theory suggests, these are structured in an extra-institutional context through platforms. Training and capacity development can only be evaluated in the context of such learning fora, rather than on the basis of contributions to the needs of a NARI or a faculty of agriculture.

Scaling up is on the agenda of many of the IARC's programs. ICRAF has a scientist whose job title incorporates scaling up. Scaling up by its very nature implies an institutional context, whether that be through markets or through networks of organizations, and the capacities to take technological, institutional, and policy innovations to scale. How to develop such capacities is in itself a research area, as it involves transfers of functions and capabilities developed in the pilot phase by the IARC's, conceptualization of organizational contexts where capacities need to be built, and the mix of private, public, and civil society organizations that can best facilitate scaling up.

Such a scaling up research agenda runs is emergent in all the IARC's in Cameroon. There is a question of whether a joint training and capacity building unit would make sense in the Cameroon context. It could provide better coherence in capacity building activities across the IARC's, provide research guidance on capacity building in a scaling up framework, provide monitoring and quality control of training activities, and absorb some of the administrative burden for training that is now shouldered by the individual research scientists. How this would be financed from budgets primarily dependent on special project funding is a question, which would require in turn some coordination in how such fixed costs could be built into respective IARC overheads. In that regard, Cameroon could become an example of how different centers come together around a common agenda and finance cross-cutting research and service support activities.

ANNEX XI

Malawi country report

Background

Malawi is one of the poorest countries in Africa, and therefore in the world. Virtually two-thirds of the population live below the poverty line. Since around 85% of the population reside in rural areas, poverty is concentrated there. Such high rural poverty levels are in part due to an agrarian economy—85% of exports are agricultural and 80% of the labor force are in the rural sector—that must produce under very severe land constraints. Average farm size outside the estate sector is well less than a hectare, and plots are often fragmented, particularly in the southern part of the country. Soil nutrient depletion levels are some of the highest in Africa and farmers have difficulty in meeting subsistence needs, as average maize yields are only around a ton on the majority of smallholder farmers' fields. There are corresponding high rates of malnutrition and increasing periods of famine, such as occurred in 2003 and is predicted for next year, 2006. Malawi has had only three "good" harvests in the last 15 years for its basic staple, maize, and the country has essentially moved to a net import position to meet its basic food needs.

Malawi urgently needs to increase agricultural productivity. However, it must do this within a context of heavy demands on government budgets and resultant difficulties in financing agricultural research and maintaining sufficient capacity within the system. This situation creates something of a dilemma for IARC's working in Malawi, namely how to develop effective research partnerships with the national system, reinforced by capacity building efforts, when that capacity is both difficult to maintain and is generally weak. This often leads to the IARC's themselves substituting for capacity gaps. Nevertheless, given the CGIAR's mission statement and its focus on poverty alleviation, Malawi would have to be a focal country, given its status as a "hunger hotspot" in Africa. Moreover, strategies for poverty alleviation in Malawi must encompass the whole country, given that poverty is pervasive, unlike countries in Asia and Latin America where rural poverty tends to be spatially concentrated in lagging regions, not effectively integrated into the broader agricultural economy. In Malawi the task is how to generate an agricultural growth process under conditions of capital and land constraints, limited market infrastructure, depletion of natural capital, limited urban markets, and weak agricultural institutions.

The Agricultural Research and Extension System in Malawi

Agricultural research in Malawi is carried out principally by the Department of Agricultural Research Services (DARS), located within the ministry of agriculture. The current structure came into being in 1985, when agricultural research within the ministry was reorganized and expanded from its traditional focus on agricultural export crops, exclusively produced by estates. Research was organized into six research programs, an adaptive research unit, and a technical services unit. This restructuring was supported by a World Bank loan, the National Agricultural Research Project, running from 1986 to 1993, and augmented by a USAID program on research and extension. Much of the human capacity development occurred during this period, as 13 PhD's and 31 MSc's were trained under the World Bank and USAID programs, or about 40% of the overall scientific staff positions. This was a period of significant capacity development, and was followed by a broader sectoral development program, the Agricultural Services Program, which ran from 1994-1999. The program supported agricultural research, extension, and a competitive grants program. During the period 1986-2000, donor funds provided on average two-thirds of the DARS budget. Donor funds were particularly important in supporting capital, operational costs, and training. Government resources essentially covered salaries.

Ironically, the period of donor support was a period of declining expenditure on agricultural research in Malawi. From the early 1970's to mid-1980's, investment in agricultural research increased at a modest rate, peaking in 1987. However, with the advent of donor funding and the shift away from emphasis on estate crops, spending on agricultural research declined, dropping from around US\$22 million in the mid-1980's to US\$13 million in 2001 (IFPRI, 2004). This loss of commitment to agricultural research on the part of the government had significant consequences when donor funding stopped in the year 2000, as by that time government spending priorities had shifted, and the drop in funding was only partially made by the government.

Agricultural research essentially depends on well supported and well trained scientific staff. DARS has been particularly unable to maintain its degree staff over the past 20 years. Current vacancy rates are about 50%. Four factors have combined to that have led to such high attrition rates. First, a freeze was put on recruitment in the mid-1990's, as part of IMF conditionality. This has only been rescinded in 2004. Second, the mandatory retirement age in the civil service is 55, and most of the degree students trained in the mid-1980's are reaching or have reached retirement age. Third, alternative employment opportunities have increased substantially in the last two decades, especially the expansion in the number of NGO's working in the agricultural area. Finally, Malawi has been particularly hard hit by HIV-AIDS, affecting all social strata. Thus, of the 137 of 202 DARS staff (including technicians) trained by the IARC's that could be traced in this study in 2005, 25% died, a large majority from AIDS, 20% retired, and 10% resigned. That is, 55% of all trainees have been lost from the system, significantly reducing the returns on CGIAR investments in training in Malawi. DARS must significantly rebuild its human capacity, and with the lifting of the hiring freeze, have started to hire staff at the BSc level. Nevertheless, funds for training at higher degrees for such staff are very limited.

Virtually all of these BSc graduates come from Bunda College, which until recently only had a faculty of agriculture. Its infrastructural and staff development was greatly aided by the same USAID program that supported DARS. This ran for a decade from the early 1990's, and was particularly instrumental in developing MSc programs in many of the departments. As compared to DARS, staff retention has been much better, averaging 80%. Of the more limited number of CGIAR trainees (34), of the 27 that were traceable, 10% had died, only 1 had retired and none had resigned, resulting in a retention rate for CGIAR trainees of 90%. However, the budget over the last few years has not allowed any funds to be put into the research fund, and academic staff must pursue outside funding for both research and supporting MSc students—who must come with their own tuition, either provided personally or through project funds. The vice-principal reports that staff retention has been so high partly because of the collaborative research opportunities with the IARC's. There is virtually no collaborative research with DARS staff, partly due to the lack of funding on both sides.

The extension system was restructured and capacitated under the Bank's ASP during the 1990's. The country was divided into semi-autonomous Agricultural Development Divisions (ADDs) under the direction of a Program Manager. This was the period of the Bank's promotion of Training and Visit extension and this system was the basis of the support to extension. A college was set up to train extension staff to diploma level, which has been recently renamed as the Natural Resources College and is moving toward private students, as government training for extension staff is moribund. With the termination of the ASP program in the year 2000, extension has as well many of the capacity and financial constraints of DARS. NGO's have moved in to fill the vacuum, expanding their work in the agricultural sector. More recently there is movement to piloting a demand-driven, pluralistic extension system with German funding, but this is only in the formative stages.

Institutional development in agricultural research and extension reflects virtually the same processes as in Kenya and Cameroon. Donors led by the World Bank restructured agricultural research in the

ministry of agriculture in the mid to late 1980's. USAID at the same time supported the revitalization of faculties of agriculture at Bunda, Egerton, and Dschang. A significant amount of degree training was done in this period, usually abroad, and resulted in the formation of professional capacity in the agricultural sector. At the same time, the World Bank provided loans to roll out Training and Visit extension in all three countries. The turn to PRSP's at the turn of the millennium and much more donor focus on social services resulted in a downturn in both donor and government budgets for agriculture, especially agricultural research. This was coming exactly at a time when the investments in human capital in the mid-1980's was needing major replenishment. By the year 2005, agricultural institutions across Africa were highly under-resourced. This was most true in Malawi, where government resources were limited to begin with, but the situation was exacerbated by the AIDS epidemic in the country. However, the need in the agricultural sector is if anything even more acute, as food shortages again loom in the country.

An Overview of CGIAR Training and Capacity Strengthening Activities

The CGIAR maintains a significant capacity in Malawi. Five centers have regional staff based in the country, including CIAT, ICRISAT, ICRAF, IITA, and ICLARM. CIMMYT as well has major activities in the country, coordinated from its office in Zimbabwe. Most of the research can be characterized as being commodity-based, with a principal component focused on breeding and varietal development. Much of this work is organized in regional networks, principally under the auspices of SADC. Thus, from their offices in Malawi CIAT coordinates a network on beans, ICRISAT on groundnuts, and IITA on cassava and sweet potatoes. Much of the work of CIMMYT is done through its maize network. ICRAF, on the other hand, is organized into various interacting country programs in southern Africa. ICLARM as well has principally a country program.

The regional SADC programs in maize, groundnuts, and beans started around the mid-1980's. The IITA network was started at the same time but for East and southern Africa, but was divided between the two regions in 1994. As the ICRISAT coordinator noted, donor funding for CGIAR programs and national program development tend to track one another in overall funding cycles for support to agriculture. However, as in Malawi, rarely are support to the IARC's and capacity strengthening within the NARI's coordinated in any synergistic manner. The two were obviously reinforcing, but synergies in degree training, in priority setting, and in research program development were sacrificed. This work now represents two decades of research, primarily focusing on the development of crop populations adapted to the constraints of southern Africa. The early tendency to distribute new varieties from centralized breeding programs through multi-locational testing programs was found to be inadequate for the particular biotic and abiotic constraints of the region. This two-year span of dedicated breeding has resulted in an increasing flow of new varieties from national programs, but within a context of very limited uptake and impact.

A conjunction of an increasing amount of technology "sitting on the shelf" and a shift in donor funding toward improving rural livelihoods has significantly shifted the research that is being done by the IARC's. This has been reinforced by dependence of the IARC programs on project funding. Over the last five years, research has significantly shifted to what might be termed the development pathway, namely understanding the chain of interventions that need to be in place to have impact with the new varieties and crop management practices. Thus, there has been a major focus on seed systems, particularly after market liberalization and the privatization of the seed sector, on output market development, and on innovative extension methods, particularly for complex, management intensive technologies. The traditional breeding activities continue, but the balance of activities has shifted to research on impact pathways. This has significantly broadened the clients with which the IARC's work. Rather than just commodity programs within DARS, the IARC's now as well work with the private sector, farmer organizations, NGO's, and extension.

It is within the above context that training by the IARC's is prioritized, trainees selected and courses developed. Training across the IARC's has been decentralized to the regional programs. As well, funding for training is embedded within project budgets. In general across the IARC's, there has been a shift in training, primarily due to current project priorities, away from MSc degrees and to short courses that builds capacity in dissemination. This training is integrated into research on such scaling up, best represented by an ICRAF scientist whose research focuses on scaling up. The current balance towards developing downstream dissemination capacity as opposed to research capacity reflects both the immediate food security situation in Malawi and the need to understand the necessary and sufficient conditions required to have impact with new technologies. Building such capacities is necessary to test those conditions, and currently the balance is on the downstream capacities.

Given the very weak institutional capacities that exist in both research and extension in Malawi, how do the IARC's both link their research programs to Malawian institutions and conceptualize capacity strengthening in the country. CIMMYT has followed a more traditional approach, focusing on maize breeding but with some work on soil fertility through SoilFertNet. (Capacity in soils research has been practically decimated in both DARS and Bunda with the deaths of the principal soil scientists.) CIMMYT provides populations for evaluation together with the funds to carry out those evaluations. A recent focus has been on breeding for drought and low nitrogen tolerance, but populations are also evaluated for quality protein and soil acidity. Targeted training is a principal component of this work, as maize scientists have attended courses on breeding for quality protein maize and a course on drought and low N breeding and evaluation. There has also been significant loss of personnel in the maize program through death and resignations. Much of evaluation work is now done by a DARS scientist who has retired, but has been retained on contract. To fill this gap there are two Malawian scientists supported by CIMMYT who are out for degree training in South Africa and Zambia. Under these conditions several OPV's from the drought work have been released, with evidence to suggest good acceptance by smallholder farmers. It is apparent that the maize research program would not be functioning at all, much less releasing new varieties, were it not for the continuing support of the CIMMYT program based in Harare.

The next phase of CIMMYT's work on drought and low N will shift from breeding to seed production and dissemination, although continuing some of the breeding program. While new varieties are being released, there is limited uptake by seed companies of the OPV's—only when there is a large order through a relief program--and limited distribution to smallholders. The focus will be on improving seed production and distribution of these new varieties. In many respects, CIMMYT is following by a few years the shift in focus that has already happened with the work of ICRISAT, IITA, CIAT and ICRAF. Seed production and dissemination is a focus of CIAT (community seed systems), ICRISAT (seed revolving fund and NGO production), IITA (rapid multiplication systems), and ICRAF (farmer organization nurseries). There is a range of training courses organized around seed technologies and dissemination and involve primarily NGO's and farmer organizations. There have been attempts to involve private seed companies in the production of these self-pollinated varieties, for example ICRISAT's work with SeedCo, but with limited success.

There was a general shift to on-farm testing of new technologies across the IARC's in the mid-1990's. This should have linked to the adaptive research program in DARS, but that program was never well integrated into the program structure and it was suspended in the early 1990's, possibly because the technologies were not quite at a sufficient stage of development for on-farm adaptation. This on-farm testing then produced technologies that had potential for wider scale adoption. In the last five years, this has produced a research agenda on how to achieve broader based dissemination, combining seed systems, extension of production technologies, and output marketing. Much of the training done by the IARC's in Malawi now revolves around these issues, with the central focus on training farmers

through intermediary organizations. Such work is well supported by donors, although primarily through regional programs.

The most well developed model for this is probably that of ICRAF. Extension and adoption of agroforestry technologies face particular challenges. The improved fallows and other soil fertility replenishing technologies being promoted in Malawi are management and information intensive, require changes in the production system, and have more than two year lags in generating benefits. Such technologies require innovative methods in extension and dissemination strategies. Training and capacity development in this area requires three essential steps, namely development and testing of the extension methodologies, development of the farmer curriculum that will form the basis of the “training of farmers”, and developing the courses for the training of trainers in these methods. In the initial stages ICRAF worked directly in training farmers. It is probably fair to say that there was not a systematic comparative evaluation of alternative extension approaches and farmer training methodologies. Much of the training was demonstration followed by some learning by doing through on-farm trials in which the farmer applied the technology and was then monitored. Such methods over time then coalesced into an understanding of farmer information needs and standards of practice, which then formed the basis for the training of trainers.

The ICRAF farmer training methodology has evolved into a modular form on the basis of the phasing of the technology components that must be put in place for a fertilizer tree system. This phasing would include nursery development, germplasm selection, tree establishment and management within the crop field, product marketing—particularly for indigenous fruits—, and enterprise development. This is somewhat similar to IITA’s integrated cassava production, processing, and market development projects and the modular training done within that framework. However, the ICRAF Malawian staff estimate that a five year commitment is needed to ensure farmer understanding of all the components and to effect adoption. As Steven Carr notes, “there has been increased uptake of (agroforestry) technology associated with projects (in Malawi) but little osmotic spread.” (Rao and Kwesiga, 2004) This gets at the fundamental research question of what are the costs and benefits associated with such projects and how can these be taken to a sufficient scale so that per farmer costs can be reduced. ICRAF is only beginning to evaluate this question.

ICRAF is probably the most advanced in developing a research agenda around this scaling up question, although the question is also within IITA’s work on cocoa in West Africa. In Malawi the team operates in about 12 pilot scaling-up sites. These are organized at the level of the EPA, the smallest administrative unit in Malawi. Given the weakness of extension currently in the country, a NGO provides the organizational structure within which to carry out the work, but with involvement of local extension agents. These pilot sites provide the focus for training and capacity building. However, while methodology development (i.e. the global public goods aspects of this work) is a central part of the research, as well as the actual potential for impact on Malawian farmers—ICRAF has set a target of 100,000 adopters of agroforestry technology in the country—, the emerging questions are how sustainable are the capacities being built (and therefore the return to training investments) and what are the requirements in moving to the next level of scaling up. In Malawi this will depend on whether the growth in NGO’s will continue—there is an active agricultural working group of NGO’s—and to what extent they will fill the extension capacity void. There is discussion of moving toward a more pluralistic extension system, such has evolved in Mozambique, but even in such systems, there is a vexing question of how to build capacities in such hybrid systems. Thus, moving to either a district or even national scale does then return to question of how to overcome the current inadequacies in extension in the country. The IARC’s are poised to have input into that question, but they cannot assume a direct role in rebuilding such capacity.

The other dimension to the scaling up research agenda, and the capacity and training issues that derive from it, is the issue of integrating technologies. The move of each of the IARC's into working through dissemination and scaling up methodologies for each of their crops and building the capacities to do so raises the problem that extension methodologies are not being developed within a farming systems context. Crop specific extension and scaling up methodologies make little sense once the work moves beyond the pilot stage. There would be value at this stage of the work in Malawi for the IARC's to begin to integrate their work and the capacity building and training initiatives that flow from it. Institutional pluralism in extension must be matched by technological pluralism. There are current discussions to do exactly this in the Chinyanja triangle with USAID funding. If this does evolve, there will as well be significant potential for feeding into the African Challenge program site in Southern Africa.

The shift in IARC funding to dissemination research and the broadening of partnerships in the process has driven something of a wedge between DARS and its traditional extension linkages. The shift has necessarily left the NARI behind in developing and evolving its own dissemination partnerships. It can be validly argued that neither public sector research nor extension have the personnel and operational capacity to affect such linkages and that this problem is a reflection of such weakened capacities. This issue highlights an important point, and one that was missed in the period of institutional restructuring starting in the mid-1980's. The IARC's have been quite successful at working through innovation in dissemination methods working from the bottom up, i.e. developing methods, testing them at the scale of the EPA, and building necessary capacities. However, this process is currently bumping up against institutional constraints that can only be solved by analyzing the R&D system as a whole, i.e. as was done through the 1990's. In essence there is potential for top down now to meet innovation coming from the bottom, but what is needed is a revisit of the structural constraints at the level of DARS and the extension system.

Conclusions and Emerging Issues

Malawi raises a central question for the work of the CGIAR. Given its mission of alleviating poverty, how far does it go in addressing capacity constraints to have impact on rural poverty rates, and as a corollary, how far does its research and capacity building programs extend through the impact pathway in order to realize sufficient scale in farmer adoption? The preconditions, most of them institutional, that allowed new technology to drive the Green Revolution in Asia, do not exist in countries like Malawi. The IARC's in Malawi have adapted their research programs in relation to the declining capacity of the national system and have maintained continuity in what research is carried out in the country. This long-term continuity of the CGIAR in agricultural research is now producing a stream of promising technologies, where uptake is now limited by other factors than the technology itself. Nevertheless, the return on the past investments in training has been low. Human capacity development must be combined with a focus on retention if those capacities are to produce effective research, and retention in turn depends essentially on institutional capacities.

However, the CGIAR is bumping up against what it can effectively do in Malawi. To move further will require dedicated rebuilding of capacity, of the type donors supported in the 80's and 90's. The CGIAR's research programs in the mid-1980's were restructuring to better focus on the particular problems of African agriculture. After 20 years there is now the possibility of a productive synergy between the CGIAR and World Bank and other donor support to rebuilding research and extension capacity in Malawi. The Rockefeller program of the same period suggested the mechanism, whereby loan funds from the Bank would support broader research system change but the Rockefeller grants supported the work of the IARC's in linking with national program scientists—this program also was closed at about the same time as other donor support (Blackie, 2005).

The Director of Agricultural Services at DARS detailed his wish list of what the CGIAR could provide in support of capacity building of agricultural research in Malawi and included the following four points: (1) a long-term commitment to training and capacity building, i.e. maintaining rather than substituting for national capacity; (2) training needs to be determined jointly; (3) integration of CGIAR training with local institutions, particularly Bunda College and the Natural Resources College; and (4) a dedicated effort to preserving human capital investments from the ravages of HIV-AIDS, including anti-retrovirals. This is rather sage advice, and meeting these four points would best come from a more coordinated approach across CGIAR Centers to training in Malawi, as is currently being discussed in the Medium-Term Plan on CGIAR integration in East and southern Africa. As only partly detailed in this report, what now appears as a super ordinary challenge, could with renewed donor commitment be turned into an opportunity for meeting Malawi's future food needs.

ANNEX XII Case study from Kenya

ILRI'S SMALLHOLDER DAIRY PROJECT

Background and Capacity Innovation

Higher level constraints often limit the uptake and impacts of new technologies, especially in Africa. These can be constraints at the level of markets or at the level of policy and institutions. For an institution such as ILRI, that focuses principally on technical innovations in livestock production systems, interventions at these higher systems levels are often necessary to achieve impact from investment in their research programs, especially impacts on poorer segments of the population. This 8-year project focused on an integrated approach to productivity change in smallholder dairy systems in Kenya, where an estimated 800,000 smallholder households keep 1 to 3 dairy cows on 1 to 2 hectares. The project initially focused on improved understanding of constraints to increases in smallholder dairy productivity and a systems approach to research on dairy production systems. However, the diagnostic surveys led to a shift in priorities to market and policy constraints. This project is typical of many that tied research to fostering development outcomes, and as such expanded both the number of partners, opened the set of interventions beyond purely production technology, and resulted in a reformulation of regulations to allow poorer urban consumers access to milk.

Kenya in many ways offered the opportunity to test how to direct higher value dairy technology to poorer segments of the rural population, noting from the diagnostic work that there was a certain minimum requirement of capital and land resources needed to enter into this market and that proximity to milk collection points and milk processing plants was critical to farmer entry into the market. These findings led to a focus on access to informal markets for raw milk as an initial entry point for improving the welfare of smallholders who had limited access to roads or milk processing plants, a focus which ran against food safety regulations in the country. Change in regulations required a range of interventions, including risk assessment, study tours to other countries, and building of evidence and policy research. As the project review stated, the project relied on a multi-pronged approach to capacity building around strategic intervention points, including developing highly credible evidence, honing good partnerships, achieving a catalytic, facilitatory role, mixing strategic vision, opportunism and luck, effectively using a steering committee, and forming a focused, issue-based network. There were a combination of approaches, all involving different types of learning and mixing formal and informal approaches. Most of this work was done outside formal institutions, a trend in developing institutional innovations in linking research, development and policy reform.

Implementation and Instruments Used

Training and informal learning approaches were integral to the smallholder dairy work by ILRI in Kenya. MSc and PhD thesis research—19 students in all—formed the basis of both the diagnostic work and the policy research. This was a critical part of the work, as this evidence-based learning provided a continual flow of new knowledge into the evolution of the work. However, the central focus was on improving the capacity of partners in the dairy sector to use effectively the new information and knowledge. All of this was coordinated by a steering committee, consisting of three key institutions the ministry of agriculture, the Kenya Dairy Board, and ILRI itself. However, as the project proceeded, an initial focus on the public sector was complemented by involvement of civil society organizations and NGO's, that effectively expanded the implementation capacity. A consortium formed around the issue of informal milk markets as a counter to impressions being given by the large-scale, commercial dairy industry. In such collaborative work, equal stress was put on

valuing process together with the hard empirical evidence, and as a result fostering ownership in a policy change process.

ILRI played a key role in several respects in facilitating the development of this research and policy process. Critically in an African setting, ILRI played a neutral role in bringing the different institutions together, in organizing the funding, and in putting together the management team. This process culminated in the launching of the Dairy Forum, which brought together all key stakeholders in the dairy sector to discuss research-based information that could be applied in the industry. The particular emphasis was on expanding input and output markets to increase further participation of smallholders in the formal sector, but without undercutting the key role of the informal milk market in promoting initial investment by smallholders in higher-value dairy production. The informal market remained the larger market though which milk was distributed and particularly was important in access of poor rural consumers to dairy products.

As the project objectives moved from purely productivity research to linking research to development impacts, the training shifted from a focus on improving individual capacities to institutional capacities, and in the process the range of learning modalities expanded significantly to short courses, e.g. on risk assessment and dairy farm management, study tours such as the South-South smallholder dairy production tour, conferences, and steering committee meeting, all of which culminated in the creation of the dairy sector forum. Individual training was augmented by being part of a problem-solving research team, where individual research was directly fed into the learning and policy process and where each research component built on other research. Being part of a larger team, focusing the research on problem solving, and direct channels for uptake of the research all contributed both to developing research skills but also understanding the institutional framework within which that research would be applied. Finally, the institutions from which trainees were drawn expanded significantly. Particularly important to the evolving focus of the interventions, training and certification of small-scale milk traders was found to be a much better intervention than tightening regulation of those traders.

Outcomes and Impacts

ILRI's work in the expanding dairy sector in East Africa focused on improving access of smallholder farmers to this higher value market. There are a range of technical issues involved in integrating dairy effectively into diversified systems where farm size rarely is over one to one and half hectares, particularly achieving productivity complementarities between the crop and livestock component. However, given the limited location of milk processing plants, especially after market liberalization of the sector, and the high cost of transport, significant numbers of smallholder farmers were effectively barred from entry to this market, unless through the informal, raw milk market. This project effectively shifted the debates first from a focus on commercial farmers to integration of smallholders and poorer segments of the rural population, second from a focus on technical interventions to policy interventions, and third from a policy focus only on the formal milk market to improving food safety and quality control in the informal raw milk market.

The principal outcomes were the development of the knowledge base to inform these debates and the creation of the institutional innovations that would drive resolution of these debates. The project can be conceptualized purely in terms of formal and informal training and capacity building, especially where the research was essentially done by Kenyan MSc and PhD students. However, many of the organizational structures were built around the partnerships across the different stakeholders in the dairy sector, rather than organizational capacities within these institutions. To maximize the benefits of this work, future capacities would need to be strengthened in these organizations, particularly in livestock extension. In this case, focusing first on capacity strengthening in these organizations would

not have worked as effectively, without first creating the linkages across the sector, however, noting that this depended on external resources.

There is as yet limited information to evaluate the final impacts of this work on the incomes and welfare of smallholder dairy farmers. This will depend on the improved efficiency and capacity of informal milk traders and with improved market access, the ability of smallholders to invest in dairy livestock and adopt new production technology. Case studies support the potential of this chain of interventions to impact on smallholder dairy farmers, but a large impact evaluation has yet to be done. Nevertheless, the pre-conditions for impacts on poor dairy producers was built into project objectives, and remain in place for expanding impacts on both poor producers and consumers of dairy products.

ANNEX XIII

Bolivia country report

1. Overview of capacity needs

Background

Bolivia is by far the poorest country in South America. Of its 8.3 million people, 59% were classified as poor by the 2001 census, but for the rural population (40% total) the poverty incidence was 91%. Overall, 91% of the total population was estimated to have energy-deficient diets. The census detected a 71% level of educational insufficiency in Bolivia's rural population, an index reflecting illiteracy and proportions of children not in school.

Policy

The country is characterised by political instability and by the politicization of its institutions. This has repercussions on all those involved in agricultural research and development, and has led to serious 'wastage' of trained human resources, equipment, infrastructure and information.

The most recent change was the dissolution of the national institution for agricultural technology (IBTA) in 1998. Bolivia is now the only country in South America with no national agricultural research institution as such. A new institution (SIBTA) was set up in 2000 which operates through foundations (FDTA) in each of the four main agroecological zones which range from very high altitude lands to lowland tropics. The foundations operate through competitively funded projects, with a market-driven, producer-consumer chain orientation. Eight priority areas have been set at government level, mainly with a view to export potential, but the foundations appear to set their priorities independently. Most of the projects in progress (>200) are concerned with technology transfer, and only two of the present ones relate to research and technology development. SIBTA also has responsibility for genetic resource conservation, which it discharges through contracts with national institutions. At the same time, the Ministry of Agriculture and Rural Affairs has contracted a study of research institutions with a view to classifying those which qualify as centers of excellence, which would receive government support. There are major concerns in the research community about the new policy. First, as to whether a strongly market-oriented demand for technology is an appropriate basis for defining national research and development policies and priorities for the long term. A case in point refers to potatoes which is the national basic crop and of which Bolivia is one of centers of genetic origin. Since this was perceived not to have export potential, it was not included as a priority crop. Secondly, there are questions about whether the real demands for technology at the community level are being expressed through the new process: supplying technology to those most able to voice their needs may not reflect the long term interests of the community at large.

The present time is, thus, one of transition. All interviewees emphasised that while education and training are the cornerstone of capacity building for technology generation and transfer in the country, the lack of clear long-term research and development policies which would serve as a framework, is an overriding limiting factor. Education for policy development and to form a sufficient body of opinion to bring about some degree of stability in policies for agriculture and related fields is therefore perceived as high priority.

Research capacity

Agricultural research has been severely debilitated in recent years and only survives in a few institutions (most estimates are 3-5) which have independent funding. Expenditures on R&D for the period 1996-2000 (0.3% GDP) were close to average for the region. But the numbers of professionals estimated to work in this area (98/million people, years 1996-2000) was much lower relative to the size

of the population than all other countries except Ecuador and Colombia, and the estimated total number of researchers (157 in 1996), most of whom were in the government sector, was by far the lowest in the region. Consequently, there is a serious question of whether sufficient technology exists or can be generated in the short term to satisfy the demand detected by the foundations. This is especially critical in the areas of the country with severest natural and social limitations where comparatively little technology is available (e.g. the highlands above 3000 m, and lowland tropics). Improved capacity for technology generation is therefore essential if the new system is not to collapse. Institutional stability, political independence and funding are of fundamental importance, so the potential role of training in capacity building is variable, but in the more stable centers of research, further training is given high priority, as exemplified by PROINPA (Case study 3).

Social aspects

The particular characteristics of Bolivia's rural population pose special challenges for technology transfer which, as described above, is the main focus of the new policy. Apart from the high rate of illiteracy, the population in many highland and lowland areas communicate best in native languages, whereas many professionals speak only Spanish. There is a strong tradition of forming associations among groups of all kinds which intervene in the producer-consumer chain, but in practice these tend to operate mainly for political purposes, rather than for facilitating production or marketing processes. Identifying real demands is therefore one aspect of the problem of rural development, and facilitating the adoption of appropriate technologies on a massive scale is another. Given the size of the rural population, large numbers of agents, trained in appropriate methodologies and communication skills, are required to implement the new system successfully.

University Education

University education in agriculture and related fields was perceived to be deficient, with few notable exceptions. There are 11 Faculties of Agriculture (or related fields) in public universities and three more in private ones. They are mostly underfunded with limited resources beyond salaries, and often highly politicised, so generally play a very limited part in agricultural research and development. Most professors are part time and do no research or extension work. Students are considered to be ill-prepared to enter the fields of research or extension. Also, deficiencies in their university formation often affect researchers' ability to take full advantage of their CGIAR training later on. Interviewees saw an urgent need to modernise and improve university education in fields related to agriculture, and bring the universities more actively into research and extension which, in turn, will be reflected in the relevance and quality of their teaching.

Education at higher degree level is generally not rewarded in Bolivian institutions. Professionals with higher degrees tend not to be sought out by national institutions because they aspire to higher salaries. When professionals return to their institution after graduate level training, they usually shift to some administrative capacity. However, all interviewees agreed that a higher degree was almost indispensable for having access to external donors' funding. Given the shortage of national funds, this was all the more important. There are several Master's programs in fields related to agriculture, sometimes in association with national research institutions (e.g. PROINPA, Case 3) and/or foreign universities. Particular interest was expressed in inter-institutional arrangements which would allow the candidate to take specific course work in a given university, combined with research in his home institution or in collaboration with a CGIAR Center. Language was mentioned frequently as a factor affecting the selection of institutions for graduate studies.

Funding

There is a mixed picture about funding as a factor limiting capacity for agricultural research and development. Bolivia has received massive contributions in this area over many years, from multilateral (e.g. IDB, World Bank) and national donors (e.g. Switzerland, USA, Denmark, Holland, Germany, Japan, Italy, United Kingdom, European Union). This support may reasonably be expected to continue. First, because of the high incidence of poverty, and second because of recent increases in the production of cocaine and the growing political strength of the coca producers. However, national researchers perceive these funds as extremely difficult to access, and report an acute shortage of national funds which they consider essential to provide continuity of work in the long-term priority areas. Reliance on project funding has made it difficult for the few national institutions which do engage in research, to maintain long term research/development policies (Case study 3). Capacity building needs, including training, arise erratically in response to funding opportunities. Professionals trained to work in a given area move to a different one when the project ends and stop making use of the skills and knowledge acquired. An urgent need is therefore to equip institutions better to access funding to fit their priorities. As suggested above, higher degrees are important in this context, but there is also a need for greater expertise in all aspects of project writing, donor contacts and negotiation.

2. Overview of the role of the CGIAR

Past contributions

A considerable proportion of the trainees' institutions have suffered major transformations or have ceased to exist. Forty-one members of the national institution, IBTA's, staff were trained by the CGIAR and though some of them were absorbed by other institutions when IBTA was dissolved, many are known to be working in areas outside their scientific competence such as tourism and commerce. In the case of a more stable institution (CIAT-Santa Cruz), 42% of the 43 CGIAR-trained scientists no longer work there, and only one of the six trained through the Tropical Pastures Network (RIEPT) remain.

Faced with these institutional problems, there are several examples in Bolivia where CGIAR Centers took exceptional measures to contribute to stabilising and strengthening, by long-term systematic collaboration with strong formal and informal training elements (e.g. Case studies 2, 3 and 4). The case of PROINPA, where CIP made major contributions to planning, policy setting and management as it evolved from a potato project into an autonomous foundation, is the outstanding example (Case study 3). It is significant that there has been remarkably little turn over of staff: of 49 scientists trained by the CGIAR since 1989, 41 still serve the institution.

In the more stable institutions and programs, the Centers' contribution to institutional strengthening typically consisted of a combination of inputs, as illustrated in all the case studies. The starting point was usually a formal training component, possibly combined with provision of germplasm and sometimes equipment, followed by continuous informal contacts between Center and national staff, widening of contacts through networks, updating of methodologies through repeated formal training experiences, and joint research project design and implementation. Training in scientific areas was complemented with training and informal advice on priority setting, institutional management, research monitoring and evaluation, information management, (e.g. CIAT-Santa Cruz, PROINPA), and even accounting and library management (PROINPA). The germplasm freely provided to national institutions by the Centers was rated as a vital and unique contribution of the Centers to capacity building. The case of beans (Case study 2) illustrates the importance of this contribution quite dramatically, with over 97% of parental material having CIAT genebank ancestry. The detailed

knowledge about the characteristics and performance of the accessions which the Centers' scientists share was considered to be as valuable as the germplasm itself. The costs of much of the germplasm and of the training carried out until the mid 1990's, and in some cases beyond, were covered completely by the Centers. Improved access to funding was another major contribution: counting on an international center as a collaborator was perceived to affect positively the success of their submissions to donors. There was, nevertheless, some feeling that the Centers had been more concerned with financing their own agenda through this mechanism, than in ensuring that national needs were adequately covered. There was also some discomfort with the fact that, due to IDB rules which required international tenders for the foundations' projects under the new system, centers had competed with national institutions. This was seen to conflict with their declared mission of strengthening the capacity of the national institutions and although the rules have now been changed, the perception of the centers as competitors for funding remains.

Given that the overall contribution to capacity strengthening generally had multiple components, looking at any one type of contribution in isolation tends to distort the real picture, but some comments on the main training components are given below.

Formal training

Formal training by the Centers has been relatively important in Bolivia. The country ranks fourth in Latin America in terms of the intensity of training (SC Secretariat, 2004) despite having far fewer (10-43%) professionals engaged in agricultural research than Peru, Colombia or Ecuador which rank higher. Table 1 gives an overview of the formal training carried out by the centers, according to existing records provided by each of them. A total of 233 Bolivians are known to have benefited, often with several training experiences at the same or different centers. However, existing figures certainly underestimate the real dimension of the training effort, mainly because in-country training activities are partly or totally (e.g. CIAT) excluded. Trainees were usually researchers (mainly agronomists and biologists), but also technicians, educators, students and a few producers. They came from research institutions, NGO's and producer associations, universities and the private commercial sector in that order. This was interpreted by interviewees to reflect the degree of activity of the various types of institutions engaged in research and development in the country, rather than a strategy of targeting them differentially.

Correspondence with NARS' needs: Discussions on formal training touched first on how far NARS' demands were perceived to be taken into account by the centers. After the disappearance of IBTA, interviewees considered that there was no 'voice' or coherent expression of demands across the institutions which comprised the national system, and that this continues to be true. Centers had therefore worked with institutions individually, and most interviewees believed that international research trends and the availability of funding through the centers had been the major forces determining their training 'needs'.

Reduction over time. A topic consistently raised in discussion was the reduction in CGIAR training which has occurred in recent years. Center records are insufficiently complete to quantify this trend overall, but CIP, for example, no longer finances training in Latin America from unrestricted funds. Another example is given by time trends for different types of training of Bolivians at CIAT headquarters, for which records are accurate (Table 2). Attendance to generalised courses practically stopped after 1985. Specialised courses reached a peak in the 1980's but no Bolivians have attended these since 2002. Similarly, individual training has fallen off markedly since the mid 1990's, although two higher degree students started training after 2000. The course work has been substituted to some extent by in-country events, but these obviously do not replace individual training. Without

exception, interviewees drew attention to this reduction and strongly advocated a reversal of the trend.

Advantages of CGIAR training. Interviewees were very forthcoming about the advantages of training by CGIAR Centers. PROINPA researchers were asked by management (i.e. unconnected with this study) to note the most important training experiences of their careers. The results shown in Table 3, although from a small sample, are quite favourable to the CGIAR. In addition, interviewees in two research institutions included professionals who had not received Center training. They consistently reported to have benefited from information or skills passed on, and by widening of their professional contacts through their Center-trained colleagues.

Taking together the evidence from all the institutions visited in the course of the study, the following aspects stood out as the particular advantages of CGIAR training, compared with other institutions. They are arranged in approximate order of importance as captured from the interviews:

- unique holdings of germplasm and knowledge about the accessions;
- multidisciplinary expertise and integrated problem-solving vision in areas of particular relevance to Bolivia, ranging widely from, for example, specific crops to a whole watershed management;
- understanding of local conditions, language;
- short, highly specialised training opportunities, fitting easily into the demands of current job;
- worldwide professional contacts;
- knowledge of financing options and donor requirements;
- 'gateway' to collaborative projects and access to funding;
- specialised libraries and access to information.

A major consideration was also that up until the mid- 1990's, and sometimes thereafter, much of the centers' training was free. This drew researchers into training where the opportunities arose. At present, Bolivian scientists report an acute shortage of funds for training. So while the advantages set out above were genuinely perceived, the cost factor may have coloured their overall perception of the comparative advantage of the CGIAR

Training strategy. The Centers were not seen to have any particular strategy with respect to the formation of a given individual. Very variable backgrounds and qualifications were observed among participants to most courses and workshops. Interviewees would welcome clearer candidate selection criteria and their strict application, to ensure that the level of training was suitable in each case, and at the same time to improve training quality. A need was also perceived for guidance about the logical sequence of training themes in some areas, so that trainees' overall learning experience could be rationally structured.

In contrast, there were several examples of a clear strategy with respect to building critical mass in a specific disciplinary area (e.g. participatory research, Case 1), building multidisciplinary capacity in crop programs (e.g. Cases 2 and 4,) and, in an exceptional case, capacity building at the institutional level (PROINPA, Case 3). Their specificity raises the question of whether they fit with the 'international public goods' criterion for CGIAR activities. Strengthening members of international networks would seem valid on the grounds of benefit to other national programs (Cases 2 and 4), and in fact the contribution of the Bolivian bean program (Case 2) to the regional network (PROFIZA) was outstanding, according to annual reports. The case of PROINPA (Case 3) may seem more difficult to justify. But Bolivia is the source of origin of many potato varieties which have a real or potential role to play in CIP's global mandate for this crop, and at the same time the poorest country in South America. With the collapse of the national research system and the risk of losing unique germplasm, there would therefore seem to be convincing reasons why CIP should go to exceptional lengths to help

ensure the survival of at least one partner institution in the country. PROINPA is, arguably, the strongest and most sustainable of Bolivian research institutions today.

Training types Table 2 shows how training types have changed over time, using the example from CIAT. Long production (general) courses and, later, short production courses were replaced by short specialised ones, while individual training has continued, albeit at a lower level. Higher degree training has been maintained with two new Bolivian students since 2000. The clear recommendation was that no single type(s) are most useful, but that a combination of different training options should continue to be offered to fit varying needs and subject matters appropriately. Short, specialised workshop-type courses; specialised individual training; higher degrees in collaboration with national and foreign universities; and collaboration on joint projects were all expected to continue in strong demand. These options would ideally be complemented with informal training (see below) and contacts maintained with the centers over long periods of time. Great importance was attached to continuing to provide practical experience, as well as theoretical knowledge, in most subject areas of interest.

Subject matter. Center records as a whole are incomplete with respect to subject matter, but some details from center and local sources are given in the case studies. These show that the number of areas covered is very wide (e.g. Cases 2, 3 and 4). They include subjects such as data processing, documentation, information and communication as well as scientific areas. The trend from general to specialised themes (e.g. from breeding to molecular techniques) can be traced in some specific cases (e.g. Case 2), and is clearly shown in the records provided by CIAT (Table 2).

Although information is incomplete, a subjective appraisal of the main areas covered by the centers taken together indicates that four subject areas stand out in terms of the numbers trained and numbers of training activities provided. The first concerns germplasm. In addition to training for the genetic improvement of the traditional crops (e.g. maize, rice), Bolivia has important, and in some cases unique, collections of native plants (e.g. Andean roots, tubers, grains, trees, fruits) and camelids. There has been a major contribution from CIP, CIAT, CIMMYT and IPGRI in training to improve their collection, conservation, characterisation, genetic improvement and utilization, and to understanding the complexities of international agreements on genetic resources. Secondly, seed production where CIP (potatoes) and CIAT (beans, forages) made numerous contributions to training in propagation, diagnostics, disease control, quality control, conservation and management. Examples of the impact associated with this are given in cases 2 and 4. Thirdly, in crop protection, where CIP (potatoes), CIAT (beans, forages, rice) and CIMMYT (cereals) had many trainees and, fourthly, participatory research methodologies. Training in this area represents 11% of CIAT's efforts alone, in terms of numbers of activities provided, and this was associated with changes in institutional policies as well as impact at field level (Case 1).

Training quality, location, delivery modes. Training quality was not brought up at all as an item for discussion in the course of the interviews. This suggests that it was generally found to be satisfactory and that other topics were more important. With respect to location, the experience of visiting the Centers was valued very highly by individuals who had done so, particularly for the learning experience from co-trainees and center staff in areas outside their particular fields. Examples in Case 2 refer to work ethic and discipline, an enhanced understanding of institutional organization and management, and introduction to new methodologies from colleague trainees. Against this, visits to Bolivia by center scientists had the important advantage of giving the centers a clearer understanding of local conditions and needs, and larger number of national researchers benefited from the visit. In this context, the value of having scientists outposted in Bolivia was underlined.

With regard to delivery modes, a mixture of these continues to be appropriate. Training of trainers was a particularly valuable approach in the technology transfer/extension areas where such large numbers of people needed to be reached. Bolivians have considerable experience with distance learning (e.g. for higher degrees offered by national and foreign universities). While fully recognising the advantages, they emphasised the danger that over-reliance on e-learning could reduce the practical learning components which are indispensable in most areas of competence of the CGIAR.

Inter-center synergies No evidence was gathered to suggest that lack of coordination between the Centers in training activities had been a problem. Rather, several examples were cited of the complementary interventions of groups of Centers (e.g. CIAT, IPGRI and ISNAR in the bean program in Santa Cruz; CIP and ISNAR in PROINPA, Cases 2 and 3).

Informal training

All the case studies underline the effort devoted by the centers to informal training, through exchange visits, mentoring, center contact scientists, joint work on collaborative projects and other means. Researchers who had received formal training frequently referred to the even greater benefits which they perceived from the informal exchanges sustained between center scientists and themselves over long periods of time. Expressions such as “they taught me the best things of my life” and “it opened my eyes” were common. Comments were made most frequently about changes in attitudes, work ethic, widening horizons and vision, research discipline and rigour, understanding the importance of multidisciplinary, and expanding professional contacts.

Networks

The paradox of the networks seems to be that while researchers consistently recognise the importance of knowledge sharing and coordination of research across countries in the region, the networks’ sustainability has been low. The activities of the RIEPT (tropical pastures) were almost completely discontinued once support from CIAT ended, and PROFIZA (beans) was not sustained from national sources much after external funding stopped, although in Bolivia it was replaced with a national network, PRONALAG, with a wider mandate to include legumes besides beans, where CIAT only provided technical advice. PAPA ANDINA (potatoes) which still has Swiss funding, will provide a test case when this expires. The RIEPT provided an interesting example of how international networks may not fill the research/training needs of all partners, in this case Bolivia, because the technology was not relevant. This indicates that even the most mature of the international networks may not necessarily attend to the needs of individual members, and there is the danger that the weakest ones may be at a particular disadvantage (Case study 4).

Outcomes and impact

Most of the information on these topics is given in the case studies attached to this report. They were chosen because they represent a major training effort on the part of the centers concerned. This in itself may have caused a bias towards successful ones, but the availability of information was also a prerequisite in choosing them, and since proper documentation is a feature of successful initiatives, the bias was probably reinforced. Nevertheless, they provide detail of the dimensions of formal and informal training carried out by the centers, and information on some of the components associated with particular outcomes and impact. All of them represent long term involvement in formal and informal training by the centers. Other common features were the availability of funding, outstanding local leadership, and local institutional support. Explicit demand for the training was not always an ingredient of successful outcomes (Case 1), but a real or latent demand for the resulting technology was (Case 4). Perhaps the most important recurrent outcome at the personal level was a widened

vision and understanding of the multidisciplinary nature of research problems. There are clear cases of new scientific knowledge generated (e.g. Cases 2,3), new crop varieties released (Case 2), germplasm conserved *in situ* (Case 1), university curriculum modernization (Cases 1, 2, 3 and 4), institutional culture and policy changes (Cases 1,3), overall institutional strengthening (Cases 2, 3), and contributions to national policy (Cases 2, 3). At field level, the cases document increased production (Cases 2, 4), employment (Cases 2, 4), income (Cases 1, 2,4), export earnings (Cases 2 and 4) and consumption (Case 2) which would, in all probability, not have occurred if the training had not taken place.

Additional information was obtained from the surveys of trainees and partners, but is also biased favourably, since dissatisfied trainees and partners would not bother to reply. However, the responses from Bolivia were quite numerous with up to 85 trainees responding to some questions. In general, the greatest personal benefits from training were in improving abilities in the areas of priority setting, project planning and fund raising; in increased research output and in being able to pass acquired knowledge on to colleagues and their own trainees. At the institutional level, their training had led to a quite high degree of improvements in priority setting, and to a lesser degree in funding, inter-institutional linkages and access to information. High average ratings were given to the effect of training on scientific knowledge generated adoption of new attitudes and technologies, and benefits to farmers and consumers. However, over 60% of respondents reported lack of resources for carrying out research and networking with relevant scientific communities as the most important limiting factors.

Future directions

Given the present situation, the role of CGIAR Centers in training was perceived to fall into four categories.

First, at the policy level. It was felt that the Centers (particularly IFPRI) could make a valuable contribution to the process of setting policies which balance the long-term interests of producers and consumers, with the present strongly market-oriented shorter term goals. This kind of input was expected to follow mainly from informal exchanges and workshops, with a limited number of formal training opportunities at the individual visiting scientist or higher degree level. Great importance was attached to the formation of a sufficient critical mass of trained scientists who might eventually prevail to ensure stability in matters of agricultural development policy, and transparent, scientifically based criteria for decision making and staff appointments.

Second, there is a need for strengthening local institutions engaged in research. They need to access and utilise the scientific knowledge and technologies developed by the Centers and others, maintain their scientists at the forefront of developments in their particular fields and carry out the research required to satisfy the country's needs over the longer term. No single types of training were identified as most useful. Rather a mixture of options are needed to suit varying needs, including short courses and specialised individual training, higher degree 'sandwich' courses, promotion of research networks, joint research projects and informal exchanges sustained over time between center and national scientists. Learning experiences in project formulation and donor negotiations are essential. While collaborative projects may be the best immediate option for obtaining funding, greater care must be taken to cover local operational needs and to help national institutions conserve their long term policies. It is expected that the centers' role in training will continue to be complemented with the provision of germplasm and with helping national institutions access information relevant to their research agendas.

Third, there is a need to strengthen national teaching institutions. The role of the Centers here was perceived as making accessible materials which would contribute to modernising university curricula,

through teaching partnerships (e.g. for higher degrees). More collaborative research partnerships are also needed to bring universities more actively into the research and extension fields so that teaching would become more dynamic and relevant to existing conditions. E-learning must be fully exploited, but the need for practical experience must not be neglected at the same time.

Fourth, in the area of technology transfer, most 'available' technologies need local adaptation or validation, so continued training in new participatory methodologies is required. At the same time, Centers have an important contribution to make in developing and sharing participatory methodologies for monitoring and evaluating technology transfer initiatives. Short courses, workshops or specialised training in these methodologies, coupled with joint projects to develop and validate new ones, were perceived to be of particular relevance in this area.

Table 1. Number of training events/activities attended by Bolivian scientists, according to Center and training type

Type:	Group	Individual	MSc	PhD
Center				2
CIAT	164	80	7	-
CIFOR	17	6	-	1
CIMMYT	50	96	9	-
CIP	28	26	3	-
ICARDA	2	-	-	-
IPGRI	70	1	-	
ISNAR	7	-	-	
Total	338	209	19	3

Table 2: Time trends in training of Bolivians at CIAT, by training type (numbers of events/activities attended at headquarters)

Type of training	1970-5	1976-9	1980-5	1986-9	1990-5	1996-9	2000+
Courses for trainers	-	-	-	-	1	-	-
Short production courses	-	8	4	2	1	-	-
Long production courses	8	12	-	-	-	-	-
Specialised courses	-	9	38	8	13	11	18 ^a
Specialised course + IT ^b	-	4	17	10	3	-	-
IT (non-degree)	5	7	4	3	17	4	6 ^c
MSc	-	-	1	1	1	-	1
PhD	-	1	-	-	-	-	1

^a Not after 2002

^b Individual training

^c 5 in 2003, 1 in 2004

Table 3. Perceptions of the value of CGIAR training, relative to other institutions*

Number of scientists

Replying to survey ^a	18
With CGIAR training	10
Rating as the single most important experience	
CGIAR training	5 ^b
Northern university	1 ^b
Southern university	2 ^b
Other	2 ^b
Rating CGIAR training as one of the three most important experiences	10 ^b

^a From a survey carried out by PROINPA management; respondents remained anonymous.

^b Refer to the 10 CGIAR trainees, all of whom received specialised, individual training

Sources:

Interviews with:

- Ing. Juan. Ortubé (Leader), Ing. Carlos Rivadeneira, *Programa de Frijol, Universidad Autónoma Gabriel René Moreno, Santa Cruz*
- Ing. Jorge Rosales King (Director), Ing. Alejandro Ramírez. *Oficina Regional de Semillas, Santa Cruz*
- Ing. Luis Navia (Director), Ing. María Fernanda Otero, *PROSEMILLAS, Santa Cruz*
- Ing. José Luis Escobar, Ing. Edwin Magariños, Ing. Nelson Joaquín, Ing. Rosemary Peña and Ing. Willy Fernández (Program/Unit Leaders and researchers). *Centro de Investigación Agrícola Tropical (CIAT), Santa Cruz.*
- Ing. Erick Ferrufino, Ing. Jorge Quillaguamán, Ing. Franz Gutiérrez, Ing. Ruddy Meneses, Ing. Iván del Callejo (Professors/Researchers), *Universidad Mayor de San Simón, Cochabamba.*
- Ing. Gino Catacora (Director, SEDAG, Cochabamba), Ing. Antonio Vallejos (District Head, SENASAG), Ing. Antonieta Rivero (SEDAG), Ing. Ricardo Alem (FDTA-Valles), Ing. Mauricio Crespo (Manager, BIOSIS, SRL), Ing. Rosario Llerena (SIBTA), Ing. Waldo Torrez (Director, Oficina Regional de Semillas), Ing. Julio Gabriel (Project Leader, PROINPA), Ing. Gino Aguirre (Head, Training, PROINPA), *Cochabamba.*
- Ing. Gastón Sauma (General Manager), *SEFO-SAM, Cochabamba*
- Ing. Javier Rojas, Ing. Claudio Peñarrieta, Ing. Sara Taborga, Ing. Oswaldo Castro (Technical staff) *Oficina Regional de Semillas, Cochabamba*
- Dr. Antonio Gandarillas (General Manager), Ing. Claudio Velasco (INNOVA-PROINPA (CIP), Ing. Edson Gandarillas, Ing. Juan Almanza (FOCAM-PROINPA (CIAT), Ing. Pablo Mamani, Ing. Ximena Cadima, Ing. José Cevallos, Ing. Noel Ortuño, Ing. Rayne Calderón, Ing. Oscar Barea, Ing. Jaime Herbas, Ing. Giovanna Plata, Ing. Gladis Main, Ing. Luis Crespo, Ing. Ilich Figueroa, Ing. Rolando Oros, Ing. Magali Salazar, Ing. Juan Vallejos (Project leaders and researchers in biological and social sciences), *Fundación para Promoción e Investigación de Productos Andinos (PROINPA), Cochabamba*
- Ing. Roberto Arteaga (Director, Unidad de Tecnología y Sanidad), *Ministerio de Asuntos Campesinos y Agropecuarios, La Paz.*

ANNEX XIV
Case studies from Bolivia

1. PARTICIPATORY RESEARCH

(Partner Institution: Fundación para Promoción e Investigación de Productos Andinos PROINPA, Cochabamba; main CGIAR Center involved: CIAT)

This case was chosen because training in participatory research accounts for a substantial proportion of CGIAR training activities in Bolivia (about 10% all trainees). It traces the outcomes observed in a single research institution, PROINPA.

Background

The history of PROINPA is described as Case 3 in this study. It was originally part of the national research institution, IBTA, which had a traditional 'top-down' approach to R&D. This, together with the relative exclusion of the poorer small farmers from the benefits of research, provided fertile ground for introducing participatory methodologies in Bolivia. At the same time, participatory approaches were favoured by Bolivia's long-standing donors (e.g. the Swiss SDC) and partners (e.g. CIP, FAO). In 1993, Kellogg Foundation funding was obtained by CIAT for the validation in Bolivia of community-based research committees, known as CIAL's. The funds covered training of PROINPA staff, the cost of personnel with exclusive responsibility for setting up the CIAL's, and start-up funding as incentives for new ones. Besides having funding opportunities for work in this area, PROINPA scientists had strong leadership and a stable, supportive institutional setting for their work, circumstances which were unusual given the precarious state of most other Bolivian institutions at the time.

Implementation

Training in participatory research was provided by CIAT to professionals (mainly agronomists) working in research institutions and universities. The intention was to build capacity in this area and to validate in Bolivia methodologies developed elsewhere (e.g. Colombia). It was supply-led at the start, since there was no explicit demand on the part of the NARS. Altogether, 23 Bolivians were trained at CIAT headquarters. Table 1 shows that PROINPA was the institution which received most training. Thirteen PROINPA scientists were trained at CIAT, two of them in the specific methodology related to CIAL's (1999-2001). Eight more PROINPA staff attended a 2-day course participatory breeding course run by IPGRI (2003). The first three Bolivian trainees were invited to a course at CIAT in 1993 and there were a few trainees most years until 2001-3 when a group of twelve went to Cali (Table 1.1). By that time, too, there were two higher degree students trained at CIAT (Table 1). The 1993 group attended a 40-day course on participatory research, but the later events were shorter (5-18 day) workshop type courses. This was reinforced by additional training in Bolivia in at least two events where CIAT staff acted as instructors. From the start, formal training was complemented by practical work in Bolivia, setting up CIAL's under the collaborative project described above. This involved constant interchange between CIAT staff and trainees in the joint activity on the ground. CIAT staff visited Bolivia approximately twice yearly from 1993 onwards. The CIAL methodology developed in Colombia needed adaptation to Bolivian conditions, using modifications not dealt with in the manuals or formal courses. As a result, there was considerable discussion which enriched the learning experience of the Bolivians. The availability of funding gave trainees the opportunity to put their knowledge to use. This was also encouraged by strong institutional support and leadership, and by the interest of other partners and donors, as a result of which participatory methods were incorporated into projects in other areas.

Outcomes and impact

At the individual level, some interviewees returned from their training with serious doubts about the scientific validity of participatory methods and sceptical of their applicability to Bolivian conditions. Their decision to continue owed something to the shortage of funding for other projects, and something to an increasing realization that working more closely with end-users was required for effective technology change. After some years of experience in the CIAT validation project, they became genuinely convinced of the value of participatory methods. They made special reference to the importance of the informal training which occurred during the visits of CIAT staff and the implementation of the joint research projects. By 2005, ten of the thirteen PROINPA scientists originally trained at CIAT were still active in the institution and all of them record that they still make good use of their training. This is remarkable given the instability of most Bolivian R&D institutions. Six responded to a survey on their training experiences in general (i.e. including northern and southern universities as well as CGIAR Centers), and four of them perceived their CGIAR training to have been the most important for them personally. One of the trainees gained the IICA award for the outstanding contribution of a young professional to participatory research in Bolivia in 2003.

At the institutional level, there is strong evidence that participatory methods have permeated the culture of PROINPA. This is demonstrated consistently in their publications (e.g. Annual Reports) and is a constant feature of their research project proposals. Examples include the current projects on bacterial wilt in potatoes and on potato varietal selection. All new professional staff coming into the institution are required to have training in participatory methodologies. As related above, this has occurred at a time when the international climate was favourable to participatory research, but the staff interviewed unanimously agreed that CIAT training had made a major contribution to the establishment of this institutional culture.

At the inter-institutional level, PROINPA is recognised as the pioneer and leader in the application of participatory methodologies. This is recognised at national level by the fact that PROINPA has been given the responsibility for monitoring and evaluating the technology transfer projects executed under the new Bolivian System of Agricultural Technology, SIBTA (using participatory methods –SEP –under the FOCAM collaborative project with CIAT). This has enhanced the quality of the service and ensured better attention to users' needs. PROINPA has also provided support and training for many of the institutions which execute the projects under the new system (e.g. ASAR, ANAPO, SITSA, DAI). This has proved successful even under the most difficult conditions, as in the case of a US AID financed project (DAI) to promote alternatives to coca growing in a notoriously difficult area (Chapare), where the influence of the cocaine industry is dangerous. PROINPA trained DAI technicians in participatory methods and, as a result, farmer field schools and participatory methods of evaluating technologies have now been successfully institutionalised. In the establishment of CIAT's, PROINPA collaborates with a number of national research institutions (e.g. CIAT-Sta. Cruz) and NGO's (e.g. CARE) in four departments of Bolivia. At the same time, PROINPA staff contribute to academic activities at the Universidad Mayor de San Simón. A module on participatory methods has been included in the course on extension for undergraduates of the Facultad de Agronomía. Three undergraduate theses on participatory research were submitted in the period 1998-99. There are now two diploma-level courses with 77 students on participatory methods for agricultural innovation, and material on the same theme has been incorporated into the Master's courses on crop protection and genetic resources, respectively.

An important indirect effect of the training described, according to the Bolivian interviewees, was that it led to the refinement of CIAT's participatory research methodologies and training methods. This was the result of the mutual learning experiences which occurred particularly during collaboration in the setting up of the CIAT's, where considerable adaptation of the Colombian model had to be made.

Thus, the training of professionals in a specific country led to the improvement of the research and training methodologies for more universal application.

At the field level, CIAL's were set up initially to work on potatoes. By 2001 there were 26 established in four departments and there are now 54. They have extended coverage beyond potatoes to other Andean roots and tubers, beans and peppers. PROINPA staff concur that this would not have happened without CIAT training. Scientific information has been generated and technologies validated, notably in the areas of: frost and disease resistant potato variety selection; integrated insect pest management; protected beds for certified potato seed production; and bacterial wilt control (for which information was generated in 19 CIAL's). They have also made an important contribution to genetic resource conservation *in situ* by developing new markets for organically grown native potato varieties. The exchange of information and experiences has been a constant element of the project, both between CIAL's in different Bolivian communities as well as in Colombia, Ecuador and China.

Three CIAL's were visited in the course of this study. The interviews were conducted mainly in Quechua through translation into Spanish, which indicates part of the challenge involved in establishing them. CIAL members had a clear conviction of the importance of research and of their own ability to carry it out. They also appeared to have conveyed this message to the communities which they represent, or at least to the younger members. All of them had expanded the crops covered beyond potatoes. From small groups of 3-5 members originally, two of them had developed into producer associations with over 20 members in three years. They had identified novel products for the market (certified potato seed and organically grown native potato varieties for direct consumption). One of them had developed a well-functioning packaging plant and had sent 15000 kg attractively packed and labelled native varieties to supermarkets since 2004. The five varieties selected had been chosen from a total of 80 which they had evaluated themselves. They had also produced a beautifully illustrated catalogue of native crop species, with collaboration from CIP, IPGRI and the SDC. Another group had developed a simpler but effective processing method of producing fried beans and potatoes for local consumption (e.g. in schools). All of them participate in exchange visits to other CIAL's, field days and agricultural fairs, and monitor their activities through a participatory process. The members were mostly young, with a high proportion of women. They unanimously agreed that they had obtained economic benefits through the CIAL's which would be used primarily to improve housing and education.

Conclusions

This case describes a training initiative which was sustained for more than 10 years, with formal components strongly reinforced by visits and practical experience in Bolivia through collaboration on joint projects. It did not arise from an explicit NARS 'demand' but, despite initial scepticism, eventually led to the formation of a considerable 'critical mass' of Bolivian professionals who, through practice, became convinced champions of participatory methods. Given strong leadership and stable institutional support, this was associated with a change in PROINPA's own culture, which then widely pervaded other national institutions and influenced university curricula. It also permitted CIAT to refine their research and training methodologies as international public goods. While the general climate among donors and partner institutions was favourable to a participatory approach, there is enough evidence from the Bolivian interviewees to conclude that the training, and especially the collaborative work experience, was a vital factor in determining these outcomes. Field level impacts in terms of technology generated and adopted, genetic resources protected and incomes increased are evident. Whether the CIAL methodology will survive, due to its high cost and subsidised structure, is not an issue here and no information was available on the failure rate. But among those which had prospered, there was clear evidence of recognition of the importance of

research, a sense of empowerment and economic progress. This was the more impressive given the extreme depression and hopelessness evident in many surrounding communities in the Andes.

Table 1.1 Training in participatory research undertaken by Bolivians at CIAT headquarters, according to year and institution (*days/months duration in brackets*)

Year	Number of trainees/year ^a	
	Institution:	
	PROINPA	Other
1993	3 (40 d)	-
1994	-	-
1995	1 (13 d)	-
1996	-	1 (18 d)
1997		1 (12 d), 1(3 d)
1998	-	-
1999	1 (10 d)	1 (10 d)
2000	-	-
2001	1 (5 d)	-
2002	9 (5 d)	3 (5 d)
2003	-	1 (12 m) ^b
2004	-	1 (33 m) ^c

^a Some trainees attended two events, the total number of trainees was 23

^b MSc

^c PhD

Sources

Interviews with:

- Members of the Social Sciences and Biological Sciences Programs of PROINPA, Cochabamba; Members of the CIAL's and Producer Associations of Sora Sora, Chomoco and La Candelaria (APROTAC), Cochabamba.
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2. BEAN PRODUCTION

(Partner Institution: Instituto de Investigaciones Agrícolas de 'El Vallecito', Universidad Autónoma Gabriel René Moreno; main CGIAR Center involved: CIAT)

This case is an example where a complete research team, with replacements, was trained by the CGIAR.

Background

Bean research in the area of Santa Cruz arose in response to a need to identify a suitable crop to fill the winter gap in the rotation. A single scientist from the Universidad Autónoma Gabriel René Moreno (UAGRM) attended a general bean production course for a month at CIAT in 1978, was encouraged to experiment with beans and provided with 10 kg of seed. A small research team was set up at the university in 1980 consisting of an agronomist and a breeder. This was later expanded with two more 'generations' of scientists with a wider range of disciplines. The team has been under the same leader since 1986. The university provided them with stable tenure, and CIAT continued to provide improved germplasm at no cost. Financial support was obtained from the Swiss SDC from 1989 onwards, first through the Andean bean network PROFIZA and, after 2001, directly through a national network (PRONALAG) which was led by the program. PROFIZA was also a valuable source of information, exchange visits and learning experiences. Additional support came from CIP and FAO in establishing a diagnostic laboratory, while US AID financed the first 50 ha of beans to be sown for export. Once production expanded, the program counted on farmer associations, NGO's and entrepreneurial seed companies who contributed to the expansion of markets for consumption, certified seed production and export.

Implementation

The team who received training at CIAT, financed by the Center up to 1989, were all agronomists except for one biologist. Table 2.1 summarises the types of training and subject area. Most of the activities consisted of short courses in specialised topics followed by individual training for periods of up to about three months and, in some cases, repeat visits to CIAT over long periods of time. This provided increasing degrees of specialization in the team's skills (e.g. from breeding to molecular techniques, or from farming systems to the specific agronomy of the bean crop), and filled gaps in their collective expertise (e.g. participatory research methods, research data management). Each team member had their own contact scientists at CIAT who provided information and support, including frequent visits to the Bolivian program. In addition to the team's base staff, a socio-economist from the same university was given individual training at CIAT for three months to carry out a study of bean consumption in rural and urban households in the Department of Santa Cruz. The research team was later supported by two home economists. Training of trainers for technicians and farmers in all aspects of bean production started in 1992, with direct involvement of CIAT staff. CIAT's Seed Unit also provided support to the small producers' association which pioneered the production of certified seed. Until 1989, all training was financed by CIAT. IPGRI also provided advice to the team on studies of wild bean relatives, while strategic planning advice was given by ISNAR through the CIAT-led Andean bean network PROFIZA.

Outcomes and impact

At the individual level, the program leader underlines the value of training in several dimensions. The formal training at CIAT was 'made to measure' to the team's requirements. Besides acquiring scientific knowledge and skills, their experience helped them: form a work ethic and discipline;

develop an integrated vision of the research and development issues relevant to their program; learn how to teach and organise classes. Visits to CIAT contributed to their understanding of institutional organization and functioning. Informal contacts during their visits led to the introduction of tissue culture and participatory research into the Bolivian program. In synthesis, they 'learned the best things in their life'. In their specific scientific fields, training permitted the pathologists to identify the principal pathogens and their geographic locations, as well as develop control strategies. Once his training was finished, the breeder hybridized the traditional variety and is about to release the first one developed by Bolivian scientists. At the same time, the seeds specialist developed and applied artisanal methods of producing certified seed on the farms of small producers.

At the institutional level, a stable, well-equipped, multidisciplinary research team was formed, with third generation replacements. In the opinion of the present leader of the program, 'training was the key' to its success and without it 'progress would have been far slower'. A survey of university authorities concluded that the bean program provided outstanding, probably unique, leadership at national level, due to its highly qualified staff. It was the only program which operated on the basis of clear goals and objectives, and had brought renown and status to the university. The university curriculum was modernised, with material on bean production introduced for the first time. Eighty nine *Ingeniero Agrónomo* theses on all aspects of bean production and consumption were submitted to the university in the period 1978 to 1999. The average grade for these exceeded 70/100. An impressive aspect of the program relates to the very detailed documentation of results and impact, and that an exhaustive internal evaluation was carried out in 1999. Main research findings were related to the development and release of disease resistant varieties of bush beans; the development of an innoculum; identification and control of major pathogens; economic aspects of disease control; agronomic practices (e.g. sowing dates/region); seed production; changes in rural and urban consumption patterns. No improved bean varieties were released in Bolivia before CIAT training occurred. Afterwards, 8 new varieties were released in 1980-89, and 7 more in the period 1990-2000. These were obtained by selection and by hybridisation, relying heavily (97%) on parental materials brought into Bolivia by the research team, mainly from the CIAT genebank. By 2005, one variety of purely Bolivian origin was about to be released.

At the inter-institutional level, the program founded the Bolivian Bean Network (REDBOF) in 1997, with participation of 10 other institutions. One indirect result was that 6 members of these sister institutions went to CIAT for training in the period 1989-99. Links were also formed with seed production, distribution and export institutions. Notable among these was ASOPROF(1990) consisting of 11 farmer organizations with about 1800 members which, with technical assistance from the program, played a major role in artisanal certified seed production for export. The program also provided input into the national institution (SENASAG) responsible for setting norms for seed production and certification in general. In 1989, the program became a member of the CIAT-led Andean Bean Network, PROFIZA. The final report of this network shows the contribution of the Bolivian team to have been outstandingly productive. When PROFIZA ceased to exist, the program set up a national network, PRONALAG (2001) with coverage expanded to other grain legumes. The program has successfully developed its international relations (e.g. cooperation with the University of Wageningen for the development of innoculum; with FAO and CIP for the establishment of a diagnostic laboratory). Partnership with CIAT in a biofortification project (Fe and Zn) will continue. The program has developed the capacity to pay for germplasm and consulting services from international Centers, and expects contributions from producers and the commercial sector to ensure continuity once Swiss funding ends in 2005.

The training of professionals, farmers and housewives has been a major component of their activities. In the period 1989-99 alone, 80 demonstrative plots were set up, 52 courses/workshops held for 930 farmers and technicians, 69 field days held for 3827 technicians and farmers, 13 publications produced

on technology transfer; 228 workshops on nutrition and use of beans in family diets for 7845 housewives, 147 cooking demonstrations for 73991 families; use of beans promoted at 25 agricultural shows, as well as through radio and television programs; 13 courses held on the production and use of clean seed for 1004 farmers and technicians.

Table 2.2 summarises some of the results obtained in the field. They are obtained from different sources so information on every item was not available for each of the years shown. Together they indicate major changes in land sown to beans and the reduction in winter fallow; increased production of beans for consumption and certified seed; the growth of export earnings; cost reductions due to disease resistant varieties and to less weed infestation in the summer crops (resulting from the introduction of beans as a winter crop in the rotation); employment generation and an increase in domestic bean consumption, especially among poorer households. A 1999 survey carried out by the program showed other benefits perceived by growers to include: improved nutrition, less incentive to emigrate in search of work, better access to production inputs, better education for the children; and reduced energy costs from the acquisition of solar panels. A later study (2003) estimated the cumulative value of the incremental production of the new varieties was estimated as US\$ 2.87 million.

Conclusions

The training carried out in this case responded directly to the institution's needs. It was mainly individualised, coordinated over a whole research team and sustained over a long period of time so that the skills of individual members evolved and gaps in the team's collective skills were filled. Although other factors related to outcome (e.g. excellent, continuous leadership; institutional support, financial support, market opportunities) were favourable, it is the team leader's view that CGIAR training was an indispensable component. Because of CIAT's unique knowledge of bean production under lowland tropical conditions and of the available germplasm, it is unlikely that a similar contribution could have been made by other institutions. The results have been outstanding to date, and there is a good probability that they will be sustained in future, given the solid base established with large numbers of producers of beans for consumption and seed, as well as with seed distribution and export companies. This program became one of the most productive members of the Andean bean network, PROFIZA, so capacity building through training of this individual member contributed to strengthening the rest.

Table 2.1 :Training of scientific staff of the UAGRM's bean program at CIAT

Generation	Name	Field	Time (days)/type ^a	Date	
				Start	Finish
First	Francisco Kempf	Interdisciplinary	33 (SC)	21/08/78	22/09/78
First	Jesús Soto	Breeding	106 (SC +I)	27/08/79	10/12/79
Second	Juan Ortube	Agronomy	153 (SC + I)	03/02/86	05/07/86
		Data processing	5 (SC)	28/09/92	01/10/92
		Participatory	18 (SC)	25/04/96	12/05/96
		Research	12 (SC)	25/10/99	05/11/99
		Breeding			
Second	Carlos Rivadeneira	Pathology	83 (SC + I)	24/09/90	15/12/90
		Breeding	12 (SC)	25/10/99	05/11/99
Second	Marco Koriyama	Farming Systems	88 (SC +I)	02/2/87	30/04/87
		Agronomy	88 (I)	18/9/90	14/12/90
Third	Maria Isabel Cazón	Pathology	54 (I)	04/05/93	17/06/93
Third	Angelica Hernández	Entomology	34 (I)	31/07/94	02/09/94
			13 (I)	28/11/99	10/12/99
Third	Tito Anzoategui	Breeding	91 (I)	18/09/95	17/12/95
		Breeding	12 (SC)	25/10/99	05/11/99
		Molecular tech.	26 (SC)	21/10/02	15/11/02

^a SC= Short course, I = Individual training

Table 2.2: Changes over time in land use, bean production and consumption in the area of Santa Cruz

	1979	1991	1999	2005
Area sown (ha)	0	18,000	23,000	20,000
Area under improved varieties (%)	0	-	80	-
Winter fallow (% total area)	81	-	14	-
Disease resistant varieties released	0	-	7	25 ^a
Production (MT/year)	0	12,000	25,000	-
Certified seed produced 9MT/year)	0	665	-	-
Export (MT/year)	0	14.8	10.2	-
US\$ (million/year)	0	6.9	8.7	5-10
Employment generated (days/year)	0	-	450,000	-
Production cost reduction (%) ^a	0	-	15	0
Summer weed control cost reduction (US\$ million, 1979-99)	0	-	1.5	-
Consumption (% households , <i>kg/head/year</i>)				
Rural	0	6.0	75; 23.5	-
Urban	0	4.0	50, 6.0	-
Poor urban	-	-	84, 14.0	-

^a Through the Andean network PROFIZA

Sources:

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3. PROINPA Foundation, Cochabamba

(Partner Institution: PROINPA: Fundación para Promoción e Investigación de Productos Andinos; Main CGIAR Center involved: CIP)

This case documents an exceptional degree of involvement by the CGIAR in the evolution of a single institution through training and other institutional strengthening support.

Background

PROINPA was set up (1989) as a potato project within the national agricultural technology institute, IBTA. IBTA had considerable difficulties due to unstable leadership and reduced resources. It was closed in 1998, and national support to agricultural R&D greatly reduced, putting research and genetic resource conservation activities at serious risk. Funding for PROINPA has been continuously available from the Swiss (SDC) and, from 1992-98, through a World Bank loan to IBTA.

Implementation

Perhaps the major contribution of the CGIAR to the strengthening of PROINPA was in an advisory and leadership role which undoubtedly had an important learning component. CIP participated initially with the SDC in the proposal to establish PROINPA in 1989, with an agreement of support from both institutions for twelve years. Although part of IBTA, PROINPA had its own directorate and autonomy in terms of financial management and hiring of staff. CIP scientists were located in Bolivia and served as International Director (co-responsibility with a National Director) and as heads of most of the technical departments. CIP presence on the staff continued until 1998. There were frequent visits from other CIP staff in advisory capacities. For example, during the first year 1989-90, three members of Management, including the Director General, a virologist, an entomologist, the librarian and the accountant came periods of up to 5 days. With the collapse of IBTA imminent in 1997, CIP participated in the process of planning institutional change to ensure independence and stability, and in designing a sustainable financial strategy to compensate the reduction in funds from Swiss and national sources. PROINPA was transformed into a foundation in 1998, with CIP represented in its directorate. ISNAR played an advisory role in strategic planning in the years 1999-2000, using PROINPA as a case study in the New Paradigm initiative. IPGRI was also represented on the directorate after 2000. Once the foundation was established, national staff assumed full responsibilities for technical, administrative and financial matters, and the two remaining CIP staff were transferred to the Andean potato network (PAPA ANDINA). CGIAR presence (CIP, IPGRI) continues at the level of the Assembly (maximum decision-making body), and as collaborators (CIP, CIAT and IPGRI) in research projects.

From its beginning, PROINPA established a policy of hiring and training young professionals. Forty nine members of staff received training from one or more of the CGIAR Centers in a diversity of areas during the period 1989-2004 (Table 3.1). CIP and IPGRI participated mainly in themes related to genetics and breeding, CIP in crop protection and CIAT in participatory research. A total of 14 scientists received individual, specialised training for periods up to 30 months. In addition to the 49 trained while in- service, four more scientists who joined PROINPA had been trained previously at CIMMYT, in one case on six occasions.

Outcomes and impact

There has been a very high retention rate of the PROINPA professionals trained in-service since 1989, with 41 of them still serving the institution. This in itself is an exceptional achievement, given the instability of most Bolivian institutions. Today, the General Manager is a CGIAR trainee. Immediately beneath him there are nine leadership positions, including heads of units (e.g. planning and evaluation; investment and finances), heads of regions and heads of scientific areas. Of these nine, seven are CGIAR trainees, with only the leaders of communications and agroindustrial research as exceptions. A survey was carried out among staff to determine the importance they attached to training at different types of institution. Ten of the 18 respondents had been trained at CGIAR Centers and other institutions (e.g.: universities in the north and south). Five of these rated their CGIAR training as the single most important experience for them personally, and all ten rated it as very valuable. In interviews, they emphasised the benefits of informal learning through collaborative projects and other contacts with the Centers. Some of them recorded that contacts with the Centers had changed their work attitude from one of simply complying with a job to one of service, and considered that this had pervaded the institutional culture of PROINPA.

At the institutional level, PROINPA evolved in about 10 years from a potato project within IBTA (1989) to an autonomous foundation in 1998. The institution has 115 staff, with activities in three regions of the country (highlands, northern valleys, southern valleys and Chaco). Their mandate has expanded from potatoes alone to eight other Andean roots and tubers, three Andean grains, three cereals, three legumes, three vegetables and one fruit crop. The number of professional staff has increased somewhat but the number with graduate degrees has more than tripled. The institution has been entrusted by the state with management of the germplasm banks of Andean roots and tubers (1998) and Andean grains (1999) which were in serious danger of erosion. These included 2056 accessions of Andean roots and tubers and 3141 accessions of *Chenopodiaceae* by 2001. Although funding has not increased since the foundation was set up, the financial base has diversified considerably, with the Swiss block grant, national projects and international projects each accounting for about a third of the total. PROINPA presently executes 54 research projects, 28 of which have international funding. Donors include UK, Holland, EU, FAO, IFAD, McKnight, Belgium, Switzerland, Kellogg, Denmark, Germany, USAID, Italy and FONTAGRO. The process of change has not been easy and management's main concerns now relate to funding and to the difficulty of maintaining long term priorities and covering overhead and administrative costs when a high proportion of total funds come from short term projects.

The generation of scientific information has increased and evolved, as illustrated by Table 3.2. Output of scientific publications tripled between 1992-3 and 2002-3, and the balance of authorship changed. CIP scientists appear as the sole authors or senior authors of most publications up to 1993. Thereafter, PROINPA took over the leadership. The unusually high number of publications in 1998-2001 is due to the inclusion of written abstracts in congress proceedings. PROINPA's scientific standing was recognised nationally by the award of the National Academy of Sciences in 1997. Thereafter, PROINPA publications won first awards in national and international competitions (e.g.: Belgian

State Secretary for Development Cooperation (1998), Spanish Phytopathology Society (1998), Latin American Potato Association (2000)). The institution's activities, including publications, are documented in reports which are published about biennially.

At the inter-institutional level, PROINPA has become recognised for national leadership in many areas. These include genetic resource conservation and characterization, potato pest and disease control, and participatory research methods (see Case 1). The institution is responsible for monitoring and evaluating projects executed under the new Bolivian System of Agricultural Technology (SIBTA) and continues to contribute to policy decisions at national level (e.g. the national strategy for biodiversity conservation). It is an active member of the Andean potato network (Papa Andina) and listed 37 municipalities, 51 national institutions and 47 international institutions as collaborators in research, outreach and training in 2004.

PROINPA's own training activities include collaboration in undergraduate, diploma level and Master's level courses with local and foreign universities. For example, the Master's course on management of genetic resources and biotechnology is run in collaboration with the local Universidad Mayor de San Simón, the Peruvian Universidad Nacional Agraria and two Belgian universities. PROINPA co-edits the journal 'Revista Agricultura' which has run to over 30 numbers. PROINPA staff collaborate with CGIAR Centers in short courses for national professionals (e.g. with IPGRI on participatory evaluation of germplasm, 2003), and provide numerous short courses themselves. In addition they work directly with producers, mainly through farmer field schools and CIAL's in collaboration with the municipalities and NGO's. These activities are supported by a wide variety of publications, audiovisuals, and radio messages for farmers and technicians.

At the present time, PROINPA estimates that it reaches more than 11,000 beneficiaries directly and over 45,000 indirectly through new technology generated. This is notably in the management of various major pests and diseases of potatoes, varietal selection for late blight and nematode resistance, and management of seed potatoes. Examples of the results include the identification of varieties with 2-5 times higher yields than the commonly grown one, through participatory selection (Morochata); reduction in insect damage in potatoes from 48.9% to 8.5% by technology transfer using farmer field schools in the highlands (Ayo Ayo and Umala); reduction in the use of chemicals in pest and disease control and a predicted US\$ 1680 benefit per farmer due to training in potato blight control (Morochata). In other crops, increases of 100% in yields of peppers were reported in 40 communities (Chuquisaca) leading to a doubling of family income from this source; and increases of 25% in the price paid for quinoa in 27 communities, thanks to better quality control (Irpa Chico). Over the longer term, benefits would be expected from the conservation of native genetic resources not only *ex situ* but, by organic production and innovative marketing, *in situ* as well.

Conclusions

There was general agreement among PROINPA staff that CIP's contribution was an indispensable element in the institution's evolution into the strongest agricultural research institution in Bolivia today. The building of an institution with a high probability of remaining sustainable over time is an exceptional achievement, given the chronic politicisation and instability of Bolivian institutions over the last decades. CIP's contributions at the planning stage, especially in relation to establishing a solid financial base and international contacts, and leadership at the program level, as well as training in specific research areas, all had important learning elements which are clearly recognised by the institution... The question which arises is whether such a heavy investment in a single institution was justifiable for an international center. CIP had compelling reasons to support PROINPA, at a time when all national institutions were in crisis. They needed at least one effective partner in the country of origin of many potato varieties which were of potential significance in fulfilment of the Center's

global mandate for the crop. Otherwise there was a risk that unique germplasm would be lost. In this sense, support to a specific institution contributed to the Center's ability to continue to produce improved genetic material as international public goods. Added to this, it was desirable to be able to continue to work in the poorest country in South America where potatoes are the staple crop. That CIP should have entered into the fields of institutional planning and management, albeit with support from ISNAR, is explicable since no other institution would have had the same incentive to contribute. This case is therefore arguably one where strict adherence to the IPG and comparative advantage criteria for CGIAR Centers' activities might not have been appropriate.

Table 3.1: Formal training received by PROINPA staff, according to type, theme and Center (1990-2004)

	Center Type ^a	CIAT		CIP		IPGRI		Total	
		I	G	I	G	I	G	I	G
Theme									
Breeding		-	-	1	-	-	-	1	-
Biotechnology		-	-	4	-	-	3	4	3
Genetic Resources		-	1	1	2	1	8	2	11
Crop Protection		-	-	3	-	-	-	3	-
Information/Documentation		-	2	1	2	2	6	1	8
Participatory Research		1	14	1	1	1	8	1	22
Impact Assessment		-	-	1	-	-	-	1	-
Not recorded		-	-	1	13	-	-	1	13
Total		1	17	12	15	1	25	14	57

a I: Individual training (2 days – 29 months). G: Group training (1 – 40 days).

Table 3.2 Time trends in numbers of PROINPA scientific publications and authorship

	Number of Publications				Total
	PROINPA + CIP		Senior author:		
	Author's institution:		PROINPA	CIP	
	PROINPA	CIP	PROINPA	CIP	
1991-92	2	-	-	-	2
1993	-	5	9	5	19
1998-01	71	-	6	8	85
2002-03	29	-	27	3	59

4. TROPICAL PASTURES NETWORK AND SEED PRODUCTION

(Partner institutions: Empresa de Semillas Forrajeras (SEFO)-Universidad Mayor de San Simón (UMSS), Cochabamba; main CGIAR Center involved: CIAT)

This case was chosen as an example of outcomes associated with a CGIAR Center-led international research network, which had strong training objectives.

Background

The International Tropical Pastures Network (RIEPT: Red Internacional de Evaluación de Pastos Tropicales) was set up in 1976 by CIAT. It operated in 24 LAC countries until 1996, with the objectives of training professionals in the evaluation and production of forage species, sharing and evaluating germplasm in different localities and generating extrapolable scientific information. During its twenty-year duration, 685 professionals were trained through the network. In Bolivia, active participants came from four institutions: the UMSS with its associated seed company SEFO, the Universidad Autónoma Gabriel René Moreno (Santa Cruz), the Centro de Investigación Agrícola Tropical (CIAT- Santa Cruz) and the national research institution, IBTA. The Swiss government had financed a pasture program at the UMSS since 1969, predating the RIEPT, and concluded that the scarcity of seed was the main factor limiting the adoption of improved pasture technologies. The British technical mission at CIAT-Santa Cruz provided some support to pastures work there from 1978, but the projects with most financial support were on production systems and the conservation of criollo cattle. IBTA was disbanded in 1998 and many of its staff left the area of research completely.

Implementation

Bolivia ranks fifth in number of RIEPT trainees, with a total of 37, despite its small professional population compared with countries with higher trainee numbers (Colombia, Brazil, Peru, México). Table 4.1 summarises the type of training undertaken at CIAT headquarters. Most of the trainees were agronomists. Five of the six forage scientists at the UMSS and SEFO were CIAT trained, and the data are shown separately for them because of the particular outcomes described below. The Table shows that a wide range of themes was covered, including training of trainers. General agronomy and pasture management and the specialised areas of seed production, systems and soils predominated. A common pattern was for professionals to attend courses of up to two months, followed by specialised individual training. The latter was often of considerable duration. In 36% of the cases, it lasted 4-6 months and in 41% cases more than six months. One MSc (entomology) and one PhD (soils) student was included. In addition to formal training, the RIEPT provided learning experiences and exchanges of information at their annual meetings, and through their numerous publications which included the scientific journal 'Pastos Tropicales'. CIAT staff frequently visited the national institutions members of the RIEPT, providing additional advice and support.

Outcomes and impact

At a personal level, scientists underlined the broadened vision of pastures research which experience at CIAT had given them. Concepts of pastures within an integrated production systems context and of soil-plant-animal interrelationships as an integrated whole, were mentioned specifically. These integrated concepts were pioneered by CIAT at a time when a disciplinary treatment of the subject predominated elsewhere in research and teaching. Trainees agreed that the practical content of training at CIAT had been valuable and that visits to the center had improved their understanding of institutional management, strategic planning and information management. On the other hand, there was also a perception that part of the training was related to technologies which did not find commercial application, and was determined by the research interests of CIAT (e.g. the mixed

legume-grass pasture technology and the corresponding species evaluated). Consequently, not all their training was put to use. A clear exception was the training in seed production. This was perceived as an indispensable element of the subsequent growth of the forage seed industry, because of the skills acquired. No other institution had experience comparable to that of CIAT in the management of lowland tropical forages, or seed production there from. Apart from the skills acquired in production and quality control, particular importance was attached to CIAT's advice in setting up the seed company, and to their continuous support in the difficult process of incorporating small farmers into the production of high quality seed.

At the institutional level, outcomes were mixed. For various reasons, including institutional instability and lack of funding, strong, sustained tropical pastures research capacities did not develop in the participating institutions. There was no widescale adoption of the grass-legume mixed pasture technology which was emphasized through the network. Some selection of grasses (e.g. *Brachiaria* spp) and legumes did take place, but Bolivia is one of the few members of the RIEPT which did not officially release forage cultivars evaluated through the network because there was no official mechanism for doing so. In contrast, an effective institutional arrangement was developed for the production of forage seeds, which has been sustained since its foundation. It grew out of the UMSS's seed production research unit (set up in 1972 with Swiss funding) which evolved into a seed production company (1977) with several national institutions as partners and technical support from CIAT. It later (1986) became an independent mixed company (Empresa de Semillas Forrajeras, SEFO) with the UMSS, the Swiss SDC and small farmers who produce the seed as partners. Seed is now produced on over 1000 small farms in five departments with widely different ecologies, from the highlands to lowland tropics. Some 650 of the farmers are active members of the company and own 49% of the shares. Despite financial difficulties during times of national recession, the company is now economically self-sufficient and is able to make investments for future improvements. The present leader, himself CIAT trained, underlined the importance of CIAT training in specific aspects of seed technology and also their advice and support in the logistics of setting up the company and incorporating small farmers as primary producers. This was due in large part to the continuous interest and support of the CIAT forage seed specialist over a number of years. SEFO worked initially on corn and oats (i.e. species not covered by the RIEPT) but at present has a wide coverage of tropical species including several cultivars generated by CIAT. There is linkage between SEFO and the academic activities of the UMSS. Staff participates in the forage production courses and supervise student theses on genetic improvement and seed production at the university's research center (La Violeta), some of which are financed by SEFO. SEFO also provides continuous technical assistance, as well as certain supplies, to the seed producers to ensure yields and quality.

SEFO now produces seed of more than 40 species, used for forage, green manure, ground cover and nematode control. Quality standards exceed those required internationally. Annual production rose to 505 MT in 1996 and has remained in the range 336-568 MT each year since then. The approximately 7000 MT of seed sold in Bolivia since the start is estimated to have covered about 350,000 ha with improved forages. About 400 MT of seed from 19 mainly legume species have been exported to 17 countries in Europe, Asia, the USA, Latin America and the Caribbean. SEFO is the region's leading producer of *Arachis pintoi* which it exports to twelve countries. Employment has been generated for about 5000 people on the farms which produce the seed as much of it has to be harvested by hand. Community development projects directly involving SEFO have included improvements in housing, irrigation, sewage, roads, drinking water supply, schools and sports fields.

Conclusion

Training through this international research network was perceived by interviewees to have led to useful outcomes at the personal level, in terms of concepts, vision and principles, even though they

were not always able to put their knowledge to full use, and it did not always lead to impact at the institutional or field level. Therefore, it did not contribute fully to the aims of the network by generating new knowledge about the forage species in question. The factors associated with this include institutional instability and lack of funding but also, in the perception of the interviewees, the 'top-down' nature of part of the technology involved. This may be a danger inherent in large international networks, especially for the weaker members. The training in seed production, on the other hand, filled a need which had already been identified. The success of the seed enterprise was attributed to the combination of relevant, specialised training and continued support over a long period time from the Center; a strong commercial demand for the product; the long-term availability of funding; stable, independent institutional arrangements; and continuous excellent local leadership. At the same time, the model of export quality seed production based on partnership with a large group of small farmers merits replication elsewhere.

Table 4. 1 Training of Bolivians carried out at CIAT through the RIEPT, according to type and theme

Institution: Type ^a :	Number of training activities attended					
	UMSS/Seed Co.		Others		Total	
	I	G	I	G	I	G
Theme						
Agronomy	4	4	13	2	17	6
Seed Production	3	6	1	2	4	8
Systems	2	2	1	1	3	3
Soils	3	2	3	2	6	4
Entomology	-	-	1	1	1	1
Animal Management	-	-	-	4	-	4
Weed control	1	-	-	-	1	-
Breeding	1	-	-	-	1	-
Training of trainers	-	-	-	3	-	3
Total	14	14	19	15	33	29

^a I = Individual, G = Group training

Sources

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ANNEX XV Ecuador country report

1. Overview of capacity needs

Background

Ecuador has about 13 million inhabitants. The economy depends on oil, money sent by emigrants, and agricultural products (in that order). Poverty has increased dramatically since 1995, reaching 68% in 2000 with an insignificant decrease since then. At the same time, the distribution of income became less equitable, emigration increased and about 22% of the population presently lives abroad. About 30% of the total work in agriculture, which contributes approximately 10% of the GNP. Over 60% of all agricultural properties are less than one hectare. In general, there are low levels of productivity, low added values of agricultural products through local processing, high levels of over-exploitation of natural resources, and high levels of contamination of soils and water.

Policy

The present government is a transitional one until 2006. There have been 17 Ministers of Agriculture in the past 6 years. Unsurprisingly, all interviewees agreed that there is no agricultural research and development policy in force at present, and this has been a constant feature of agricultural R&D in the past.

In the absence of a defined policy at national level, there is debate about the balance in resources which should be devoted to the traditional food and 'new' export crops. Authorities in the Ministry of Agriculture and Livestock see as priority needs the identification and development of crops with export potential; biological control of pests and diseases to reduce levels of contamination and production costs; and the processing and commercialization of agricultural products. They see little future in continuing to devote resources to the traditional food crops (e.g. potatoes, wheat) for which Ecuador can never be competitive in international markets. There is considerable concern about the impact on national agriculture of the Free Trade Agreement presently under discussion between Andean countries and the USA. On the other hand, the national institution responsible for research (INIAP) devotes a large part of its resources to traditional crops such as potatoes, cereals and legumes, which are the bases of the production systems of the majority of farmers, especially the poorest. The new Director of INIAP expects to give priority to 'organic' production through genetic selection for disease resistance, biological means of pest and disease control and organic fertilization; to processing and commercialization aspects of the traditional crops; and to the collection, characterization and exploitation of native and endangered plant and animal species.

In this scenario, there is evidently a need for capacity strengthening, including training, in the area of policy. Beyond that, the precise role of training in the overall scheme of agricultural development will depend on how national policies are defined.

Research capacity

Ecuador is among the countries with the lowest expenditure on R&D on the continent. It invests only 0.26% of the agricultural GNP in agricultural research and development (compared with 1.12% for LAC, and 0.53% for Colombia, its main competitor). It was estimated to have 83 scientists and engineers in R&D /million people (1996-2000), the lowest figure published for Latin America except Nicaragua. The total number of researchers (387 in 1996-7) was the lowest in the Andean region, except for Bolivia.

The majority of the agricultural research capacity has traditionally been in the national institution, INIAP. Since the Ministry of Agriculture and Livestock's extension service closed about 15 years ago, INIAP has also taken on increasing technology transfer activities. However, INIAP continues to struggle with major institutional problems, which severely limit its effectiveness (Case Study 1). There are a few vigorous and effective NGO's, such as the Grupo Randi Randi, with good research capacities and ability to attract project funding, but the universities' participation is very limited (see below).

Under these circumstances, continued training of INIAP staff should be accompanied by structural reform of the organization, which the present Director is striving for. But training is recognised by the Director as a vital component in developing capacity to carry out the institution's ambitious agenda. He sees a continuous need for refresher courses and higher degree opportunities, especially for researchers in the areas of biotechnology, biological pest and disease control, processing and marketing for local and international trade. This kind of training would have to be provided by outside sources, whether CGIAR Centers or foreign universities. At the same time, there is a need to strengthen through training the NGO's which are involved in research, as they are less subject to the kinds of structural problems which beset the national institutions. INIAP and partner NGO's have considerable experience in training of trainers for farmer field schools, community based research committees and other kinds of extension work, but training in new methodologies and impact assessment will continue to be necessary.

University Education

There are 22 faculties of agriculture (or related areas) with very variable academic levels. A few private universities maintain standards of excellence, but the public ones have generally deteriorated. Theses are required for the 'ingeniero agrónomo' (undergraduate) degree, but few university departments have well defined lines research and there is little training in experimental design or scientific methodology. Limited funding has been available through a competitive funds scheme, but the response has been poor and less than half of the universities submitted projects in any area (including agriculture) in the latest round of applications. The proportion of university professors with higher degrees is generally very low, but as these are required by law, there has been a proliferation of Master's degree courses. Many of these are of doubtful value, although an accreditation process exists through the Consejo Nacional de Universidades y Politécnicas (CONESUP). CONESUP is actively pursuing options to obtain more funds for research from national (from confiscation of drug-related properties) and bilateral (e.g.: Japan) sources. CONESUP sees a major need for re-organization and consolidation of the universities, support to teaching staff through information, making materials available for curriculum modernization, providing opportunities for higher degrees, and drawing the universities effectively into research and extension, through project partnerships.

Funding

External funding in the sector is relatively limited (e.g. about 20% of that supplied to Bolivia), and is declining as donors (e.g. Holland, Germany) direct more attention to Africa. Agriculture in general and research in particular have been neglected traditionally by the national government. Some relief was provided through PROMSA, a competitive funding scheme for research financed by IBD, and for technology transfer by the World Bank, but this was discontinued in 2004. There is reasonable optimism that the present government may assign funds from oil income to science and technology and that INIAP would receive a stable income of about US\$4-5 million/annually from that source. At present INIAP's current income barely covers (very low) salaries, and only 3% comes from projects

(Case Study 1). There is no budget for training so funding opportunities through projects are the main determinant of the training carried out.

2. Overview of the role of the CGIAR

2.1 Past contributions

Ecuador ranks third in Latin America in terms of the amount of training received from a sample of ten CGIAR Centers, and highest of all except Peru and Colombia which are host countries (SC Secretariat, 2004). The records available from all centers show 692 formal training activities/events, distributed as follows: CIAT: 372, CIFOR: 1; CIMMYT: 168, CIP: 90; ICARDA: 15, IPGRI 32; IRRI: 1 and ISNAR: 13. However, this underestimates the real contribution because some data bases are incomplete, especially for in-country training.

An outstanding feature is the heavy concentration of training activities on the national research institution. Taking records available from all centers, 59% of formal training activities concentrated on INIAP. No other institution exceeded 2%, except the Ministry of Agriculture and Livestock (10%). However, as shown in Case Study 1, 43% of the INIAP trainees are no longer there.

Training has typically consisted of a formal component complemented by informal training and learning, information, networking and also, in the case of the CGIAR mandate crops, by provision of germplasm. Much of the training and germplasm was provided free of charge. More recently, charges for overheads, services and germplasm (e.g. rice varieties through CIAT-led FLAR, which requires an annual subscription, including back payments) put these out of the reach of struggling organizations like INIAP. There was a perception that the days of these invaluable contributions of the CGIAR system were past, and that the centers' need to fund their own research and demonstrate field-level impact had forced them to become competitors for funding rather than allies.

Formal training. Correspondence with NARS' needs. Given the predominance of INIAP, there is no mechanism for the NARS system as a whole to identify its training needs. Some members of NGO's and universities consulted felt they had been bypassed by the CGIAR Centers, yet this may be explained by their limited involvement in research. In general, it is fair to conclude that CGIAR training has reflected funding opportunities provided through the centers (e.g. Case Studies 2, 3), rather than stemming from clear local demand. However, successful outcomes and impact have been associated with training for which there was no explicit local demand (e.g. Case 3). Only one case was mentioned where training was perceived to have reflected the center's needs, and did not fit well with the local institution's long term interests. This refers to the policy of the bean network, PROFIZA, of training nationals in the evaluation of lines developed at CIAT, instead of training them to breed their own. The present shortage of bean breeders is attributed to this, and although it was rectified from 1997 onwards, an impression remains that the training carried out was to serve the interests of the center, rather than the trainees.

Reduction over time. All interviewees were seriously concerned about the reduction in CGIAR training. An example of the effect in Ecuador is illustrated in Table 1 from the records from CIMMYT and CIAT (which account for a major share of training and their records consistently include training dates). The data from CIAT are complete until 2005, but refer to activities at headquarters, and there be some missing records after 2000 from CIMMYT. Despite these limitations, the trends in reduced course attendance and individual training seem very clear. There has been no increase in higher degree candidates. These trends may have been somewhat set off by in-country events but information on these is too incomplete to provide an estimate.

Advantages of CGIAR training. The comparative advantage of the CGIAR in training most often mentioned was the centers' particular expertise. Examples cited were international leadership in the area of participatory research in developing countries, and unique expertise and working knowledge of accessions held in the gene banks. Second, trainees emphasised the advantage of practical experience and 'learning by doing'. This occurred under realistic conditions such as they would meet at home and was reinforced by the center scientists' first hand knowledge of local conditions and language. Third, trainees underlined the advantage of the centers' holistic vision of research and development problems, and having access to multidisciplinary problem-oriented research teams at the centers. This was difficult to match in other institutions. Fourthly, they drew attention to CGIAR training as facilitating worldwide professional contacts, donor contacts and as a gateway to funding through collaborative projects. A fifth consideration referred to the cost of training. Perhaps cultural reasons restrained interviewees from mentioning this at the outset, since, as indicated above, funding opportunities have been the overriding determinant of the training undertaken.

Training strategy. The centers' training strategies were perceived to be defined by their research projects and the center-led networks. This would be expected in the absence of a training policy on the part of the national institutions and where the availability of funding determined what kind of training was carried out. The main concentration of training at INIAP was not seen as part of an explicit institutional strengthening strategy towards them, but due to the reduced participation of other institutions in national research. This degree of concentration may be questionable given the centers' mandate to generate international public goods. However, INIAP is the main Ecuadorean member of international networks, and technologies generated as a result of the training would potentially be shared more widely.

Training types. Information on the type of training carried out by the centers together is incomplete, but the samples taken from CIAT and CIMMYT records (Table 1) show a high proportion of individual trainees. The trends away from general, towards specialized, courses, and the cessation of long courses shown in the CIAT data are typical of trends in the CGIAR system as a whole.

2.2 Discussion of the effectiveness of different training types centered on three aspects.

First, the insertion of training in collaborative research projects seems to have been the main – perhaps only- way to ensure the presence of the other inputs necessary for the training to be put to use. It is significant in this context that over 60% of the trainees (n=85) who responded to the survey carried out by this study, reported lack of operational resources as a factor limiting their ability to use their training.

The second aspect concerns continuity. Ecuador has been fortunate to have several projects of long term duration which have facilitated continuous human resource development (e.g. through training with progressive degrees of specialization in the subject matter, and continuous informal contacts with the centers). This latter is difficult to reconcile with the short term nature of most projects, and lack of continued contact and follow-up by the centers was one of the shortcomings most frequently cited in the trainee survey results. In the longer term projects (e.g. SDC-CIP-INIAP FORTIPAPA), formal training has been combined with continuous informal learning experiences maintained over time, to which the trainees interviewed attached very high value.

The third issue relates to the importance of practical training. This was perceived as an indispensable part of the learning process not only in the biological sciences (e.g. in the application of biotechnological methodologies) but also in the social sciences, and an outstanding case of the latter is described in Case study 3. This increases the time required on the part of the centers, but is essential for the trainees.

Subject matter

Records on subject matter are incomplete for most centers, but Table 2 gives a sample of activities from CIAT and CIMMYT. These refer to all CIMMYT training types with available records, and all CIAT headquarters individual training plus short courses up to 2005. Of a total of 496 entries, 411 had the subject matter defined and these were grouped arbitrarily into the classes shown in the table. Allowing for some imprecision in the classifications, the table shows that the majority of training (85%) occurred in the area of biological sciences, as might be expected. Agronomy/production/systems, genetics/breeding and crop protection predominated, especially as applied to maize and wheat, beans, rice and cassava. Perhaps less expected is that the social sciences – where only participatory methods and economics were identified as such - accounted for so little (6% of activities). Post-harvest processing accounted for 5%, but the proportion might have been higher if CIP's records had been available. There are no records on training in Ecuador by IFPRI, and activities of ISNAR were very limited, so it appears that there was little or no training in policy, despite the clear weaknesses in that area. An interesting conclusion from the table is that the centers appear not to have engaged much in training in areas which would best be covered by other institutions. Only 4% of total activities were accounted for by classes shown at the bottom of the table which, it might be argued, fall in this category (e.g.: training/communications/information, experiment station management, data processing and project writing).

Training quality, delivery modes. The only quality issue brought in discussion was related to post-training contacts and follow-up which were generally considered insufficient. This would be a particular problem where training was part of a short term project. With respect to delivery modes, the most important issue concerned the future role of on-line materials and e-learning. Much of the value of traditional training was attributed to practical learning-by-doing and to enrichment of the learning experience through the face-to face exchanges with center staff and trainee colleagues. Structured e-learning would need to provide for practical work and tutor-trainee/trainee-trainee interactions. Its overuse would be likely to lead to deterioration in the quality of training, for the reasons given. Interviewees saw on-line depositories of learning materials as extremely valuable for researchers and universities, but these were perceived as complementary resources, and that increased investment on the part of the centers in preparing them should not be at the expense of traditional training. No single delivery mode was perceived as most useful for the future, and the effectiveness of training would depend on fitting modes appropriately to the needs of the trainees.

Inter-center synergies No evidence was found to suggest lack of coordination between centers in their training activities. In fact, several examples were cited of how their efforts had been complementary. CIMMYT's on-farm economic research, and associated training, in the 1980/90's, laid the foundation of what is now considered to be the on-farm research culture in the country. This was later developed and strengthened through CIAT's training and sustained collaboration in participative research, which is now a recognised feature of INIAP's overall agenda (Case study 3) and has been further built up and supported by CIP's collaborative work and training (e.g. in the FORTIPAPA project). A second example concerns product processing and producer-consumer chains, pioneered through CIAT's cassava processing research and associated training on the coast (Case study 2). It was strengthened through workshops run by ISNAR, and further developed through the CIP-led market chain potato network, PAPA ANDINA which has strong training/learning components. The producer-market-consumer chain concept is now well incorporated into INIAP's research policy for all crops. A third example relates to the collection, description, conservation and exploitation of native plant and forest species within INIAP, which has been supported through training and collaborative projects by IPGRI, CIP and CIAT. One feature of all these examples is that the Centers' policies and approaches to research and development are perceived to have been consistent and mutually supportive.

Informal training

The case studies included in this report give some indication of the major contribution of informal training and learning. An attempt to document what this entailed in one collaborative project is shown in Case study 1 (FORTIPAPA, CIP-INIAP-SDC). Center staff were involved on the directors' committee, as project advisers, and in continuous visits to the project, while INIAP staff visited the centers and other research partners for events such as annual meetings and international conferences, all of which provided important learning experiences. In general, the trainees and collaborative research partners interviewed rated these informal learning experiences very highly. They perceived that their value increased over time because of the close professional relationships which were established, and that this was one of the particular advantages of longer-term projects.

Networks

While CGIAR-led networks have been very successful as mechanisms for spreading new approaches to research (e.g. PAPA ANDINA), exchanging information and learning from other experiences, they have also provided some important lessons. The tropical pastures network (RIEPT) trained at least 20 Ecuadorean professionals, mainly from INIAP. But the outcome was limited because most emphasis was on pastures suited to acid tropical soils, which are not widely distributed in Ecuador, and INIAP's livestock program was later closed so trainees were unable to put skills acquired to use. Similarly, CIAT's attempt to form a CIAL network in Ecuador failed because of institutional instability (Case Study 3). In the case of the bean network, PROFIZA, training was mainly directed towards evaluation rather than breeding, a shortage of bean breeders followed and Ecuador has only recently acquired the capacity to produce its own commercial hybrids. These examples suggest, first, that networks cannot be relied upon necessarily to fill the needs of individual partners and, secondly, that they cannot contribute effectively unless the partners have stable institutions and policies.

2.3 Outcomes and impact

The case studies attached to this report were chosen because they represent major investments in training by the CGIAR. Case 1 concerns INIAP which, as shown above, received most of the training in Ecuador. It shows high proportions of ex-trainees in leadership positions, even in areas outside the CGIAR's mandate (e.g. cacao). Yet training and leadership has not been sufficient in itself to influence policy of the national government, and institutional capacity has remained quite limited, as judged by three indicators: the proportion of highly qualified staff, trained staff turnover rates and the availability of operational funds for research. As a reflection of this, 43% of INIAP's scientists trained by the CGIAR had left the institution by 2005. These findings highlight the problems which some national institutions on the continent face even today and raise the question of how best the CGIAR should adapt its training strategy to respond. Some INIAP staff would welcome stronger intervention by the CGIAR at the high policy level, although this may be ineffective where political instability is the norm. Collaborative projects with funds for operations and equipment may help, but in the long term are only a palliative. So there does seem to be a need for clearer messages to the NARS that their own, and the CGIAR's, investment in staff training can only be fully exploited where there is sufficient institutional support to ensure reasonable staff stability, human resource development, and basic operational facilities.

The other two cases describe combinations of different kinds of training and types of trainee, carried out over long periods of time in the context of specific programs. They both had funding, either through the centers involved or from mixed sources. Neither of them responded to direct local 'demands' for training. Outcomes attributed to training include changes in attitudes and culture (Cases 2, 3), improvements in institutional organization (Case 2), institutional policy (Case 3) and

inter-institutional cooperation (Case 2). Training stimulated further education (Case 2) and improved the relevance of the research of the trainees' partner institutions (Cases 2, 3). Without training, the adoption of the technology (Case 2) or methodology (Case 3) would not have happened, according to those interviewed. Impacts associated with the training were documented in production and farm income (Case 2) and the opening of new markets (Cases 2, 3). Both cases provide insights into the long term benefits of training. Case 1 shows how market collapse suddenly made a new technology obsolete, but the training had social as well as technological elements, and the empowerment and institutional organization capacity was successfully applied to other areas afterwards. In Case 3, the participatory methodology, which was the subject of training and applied in a specific project, later spread to become an established part of the institutional culture.

Some additional information on outcomes and impact is given by the results of the trainee survey carried out as part of this study. With 86 responses from Ecuador, the results merit attention even though they would be biased towards trainees with positive experiences. At the personal level, respondents gave the highest rating to the effect of training on their ability in priority setting and research problem orientation (4.4 on a scale of 1-5). They perceived a quite high degree of improvement in their institution's priority setting (4.03), but lesser effect on its ability to obtain project funding (3.54), and inadequate operational resources were reported by over 60% of respondents as the main limiting factor. Even so, quite high scores were assigned to the effect of training on scientific knowledge generated (4.27), new attitudes and technologies adopted (4.33), and farmers/consumers benefited (4.0).

Some examples of outcomes which respondents attributed directly to their CGIAR training are given below. Individually they are only isolated cases, but taken together they contribute to building a fuller picture of the effectiveness of training.

*Training from CIP in the use of molecular markers led to the systematization of the characterization of INIAP's potato collection, and to adjusting the genetic resource data bases to international standards. IPGRI training led to the application of international standards in collection, characterization and conservation of materials in INIAP's genebanks.

*Training by various centers in crop genetic improvement led to the release and adoption of improved varieties of crops within the CGIAR's mandate (e.g. cassava for starch and flour production, white and yellow maize, wheat, barley, beans, disease resistant potatoes) and also of crops outside the mandate (e.g. cacao).

*Training by CIP in soil pathogens and potato virus led to the establishment of a diagnostic service for potato viruses and bacteria at the Departmental level, as well as the services necessary to ensure clean seed production from the experiment station.

* Training by CIAT in bean breeding led to a change of vision in the national program from one which depended on evaluating lines acquired outside, to breeding their own. Now, beans are bred locally through hybridization and material is no longer received from the CIAT genebank. Training in molecular markers led to their incorporation in the program, and to sharing the technology so that it was also made use of in other crop breeding programs.

*Training in participatory methods by CIAT and CIP led to community-based research on crop varieties, management practices and integrated pest and disease control, followed by adoption of superior varieties and practices, and to the participatory assessment of the impact of these innovations.

2.3 Future directions

The greatest present need is for national policy which will give adequate, stable support to agricultural research and development, define the role of INIAP and, if the institution is to continue as such, provide it with the basic resources to carry out its mandate effectively. The CGIAR may be able to contribute through policy advice at the highest political level, and through policy training. Some INIAP authorities consider that the CGIAR would be justified in exercising more pressure in this area; otherwise capacity building efforts, including training, are opportunistic and incoherent.

Meanwhile, training should be inserted as far as possible into funded projects and programs. Collaborative research projects with training components are one option, but the disadvantages of short term projects in this regard have been pointed out. Newer institutions (e.g. NGO's) with good research capacity and the ability to attract funding will be expected to participate more fully in CGIAR training activities.

There is a fundamental need to contribute to the strengthening of the universities, so that they may prepare students well enough to enter the fields of research and extension, and have the basic knowledge necessary to take full advantage of any further training (including that offered by the CGIAR). This should involve making didactic material available and helping the universities modernize their scientific information systems; collaborative research projects with training components for the professors which will, at the same time, enrich teaching; and inter-institutional arrangements for graduate training (e.g. national + foreign universities + CGIAR Center).

For active researchers and leaders in technology transfer, there seems to be consensus that a combination of training types fitted to their specific requirements will continue to be necessary. These are likely to concentrate on specialized short courses, specialized non-degree individual training and higher degrees. At the same time, evidence from Ecuador underlines the importance of informal training and learning experiences, and of long term contacts with the centers. The advantages of the networks should continue to be exploited fully, but their success depends on the stability of the members and the extent to which they meet the needs of individual partners, particularly the weaker ones, merits revision. A variety of training delivery modes will continue to be needed, with increasing use of on-line materials and e-learning, but this must not be at the expense of a deterioration in quality in areas where practical experience is essential.

Table 1: Time trends in training of Ecuadoreans by CIMMYT and CIAT, by training type (numbers of events/activities attended)

Type of training	1970-9	1980-9	1990-9	2000+
CIMMYT				
Trainees	25	33	14	-
Visiting scientists	20	33	21	4
Fellowships	8	5	3	-
CIAT				
Courses for trainers	-	-	4	0
Short production courses	8	15	5	0
Long production courses	42	-	-	-
Specialised courses	10	32	61	29 ^a
Specialised courses + IT ^b	5	28	5	-
IT (non-degree)	31	35	42	12 ^c
MSc	5	1	-	1
PhD	-	-	1	-

^a Not after 2002, ^b Individual training, ^c Not after 2003

Table 2: Distribution of training activities (CIAT*, CIMMYT), according to subject matter (number of activities)**

	General			Crop-related		
	Undefined ^a	Beans ^a	Cassava ^a	Pastures	Rice ^a	Maize/wheat ^b
Agronomy/Production systems	1 (2)	12 (10)	3 (4)	5 (4)	10 (9)	33
Genetics/Breeding	14 (8)	8 (11)	4 (6)	---	7 (6)	28
Crop Protection	1 (16)	11 (2)	5 (2)	---	10 (2)	23
Soils	1 (-)	---	---	7 (1)	---	---
Seeds	7 (57)	3 (2)	---	-- (2)	-- (1)	---
Grain quality	---	---	---	---	---	7
Processing	-- (1)	---	16 (1)	---	---	3
Participatory Research	7 (9)	---	---	---	-- (1)	---
Economics	-- (3)	---	---	4 (-)	---	---
Training/Communication/Information	4 (2)	---	---	---	---	1
Expt. Station management	---	---	---	---	---	7
Data processing	-- (2)	---	---	---	---	---
Project writing	---	---	-- (2)	---	---	---
Other/undefined	5 (1)	2 (1)	2 (-)	3 (-)	5 (1)	66

^a CIAT individual training; numbers in brackets refer to short specialized courses

^b CIMMYT all types of training

^c There may be missing records from CIMMYT in this area, dating from their early on-farm economics research in Ecuador

Sources

Interviews with:

- Dr. César Chiriboga (Vice Minister) *Ministerio de Agricultura y Ganadería, Quito*
- Dr. Julio César Delgado (Director General), Ing. Victor Hugo Cardoso (Director) Ing. Fausto Merino (Director) *INIAP, Quito*
- Dr. Leonardo Corral (Director of Research) *INIAP, Guayaquil*
- Ing. Iván Reinoso (Leader), Ing. Cecilia Monteros, Ing. Jorge Rivadeneira, Ing. José Unda, Ing. Manuel Pumisacho *Programa de Raíces y Tubérculos FORTIPAPA, EE Sta. Catalina, INIAP, Quito.*
- Ing. Eduardo Peralta (Leader), Ing. Nelson Mazón *Programa de Leguminosas y Granos Andinos, EE Sta. Catalina, INIAP, Quito.*
- Ing. César Tapia (Head) *Dirección Nacional de Recursos Fitogenéticos, EE Sta. Catalina, INIAP, Quito.*
- Ing. Fausto Merino (INIAP), Ing. Pedro Llangari (INIAP), Ing. Fausto Llumisaca (FORTIPAPA), and members of small farmer organizations and CIAL Flor Naciente, *Chimborazo*
- Ing. Francisco Andrade, Ing. Carlos Monteverde (ex Rice Program) *INIAP, EE Boliche, Guayaquil*
- Dr. Jorge Andrade Piedra (Legal Representative), Dr. Patricio Espinosa (Coordinator), Dr. Meter Cromann. *CIP Program in Ecuador, Quito.*
- Dr. Rubén Ruiz (Director of Research and Training) *Consejo Nacional de Universidades y Politécnicas (CONESUP), Quito.*
- Dr. Alberto Ortega (Professor), *Escuela Politécnica del Litoral, Guayaquil* Dr. Carlos Valarezo (Professor, member University Development Unit), *Universidad Nacional de Loja (by telephone)*, Dr. Oswaldo Paladines (Professor, ex-CIAT) *Universidad Central de Ecuador, Quito*
- Ing. Galo Sánchez (Agricultural Specialist) *Agencia Suiza para el Desarrollo (COSUDE), Quito*
- Dr. Susan Poats, *Grupo Randi Randi, Quito*

- Ing. Hernán Caballero (*Universidad Técnica de Manabí*), Ing. Carlos Eguez, (FUNDALGODON), Ing. Vicente Ruiz, Ing. Alma de Arroyave (*INIAP*) Ing. Gloria Cobena (*INIAP*); Ing. Duval Valeriano (*President, Association in Jaboncillo*) Sr. Colon Mendoza (*Administrator Mixed Association*) Sra Solanda Intriaga (*Administrator, San Vicente Association*), Sra. Leyda Vera (*Member, San Vicente Association*), Young farmers (*Jaboncillo Association*), *Porto Viejo*.

ANNEX XVI Case studies from Ecuador

CASE 1: INIAP

(Partner Institution: Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP); main CGIAR Centers: CIAT, CIMMYT, CIP, IPGRI)

INIAP has received more training from CGIAR Centers than all other Ecuadorean institutions together. This case was chosen to provide some information on the retention rate and leadership roles of the trainees, and the state of the institution at present.

Background

INIAP was set up as the national agricultural research institution under the Ministry of Agriculture in 1959. It became an independent organization in 1992. Its mission, as defined in 2005, is to “generate and provide appropriate technologies, products, services and specialized training to contribute to the sustainable development of the agricultural, forestry and agroindustrial sectors of the country”. In 2005, INIAP had 215 researchers, and 178 administrative and service personnel. There are seven experiment stations and three experimental farms located in the three major agroecological zones: coast, highlands and Amazon basin, which work on a total of 42 agricultural and tree crops, as well as livestock and pastures. Research is structured round fourteen different crop and livestock programs and seven thematic areas (sustainability of natural resources and agrosystems, plant genetic resources, plant breeding, biotechnology, plant protection, crop nutrition and soil fertility, production technology). INIAP also has responsibility for the national germplasm banks with over 25,000 accessions.

Implementation

Taking available records from all centers, INIAP staff participated in 405 formal training activities, which is 59% of the total recorded for Ecuador. No other institution exceeded 2%, except the Ministry of Agriculture (10%). Many trainees participated more than once, up to as many as six times (a CIMMYT case). Overall, 178 INIAP professionals received at least one period of training, with an average of 2.3 periods each. These data are known to underestimate the real number of activities, because in-country training records are incomplete, but in any case it is clear that INIAP received a great deal of training, and the overwhelming share of the CGIAR’s effort in Ecuador.

Most of the formal training for which information is available was provided by CIAT (209 activities) CIMMYT (145), and CIP (41). Most activities were short courses and non-degree individual trainings, but included one PhD and seven Masters’ degrees candidates at CIAT alone. A very wide range of subjects were covered in terms of disciplines and the crops to which they were applied. At CIAT, which is best documented, over 30 different subject areas are recorded with agronomy, breeding and genetics, and crop protection predominating in the disciplinary areas, while in the crop areas, beans, rice, cassava and pastures all had over 25 activities each.

In an attempt to document the dimensions of informal training and learning, the case of a specific project, FORTIPAPA, was studied in more detail. This is a Swiss funded collaborative potato research project carried out with CIP. Table 1.1 shows some indicators of informal training/learning in the period 1992-98, when the project involved 26-36 INIAP scientists. The table shows the numbers of CIP staff who served on the project directors’ committee, and as advisers. Also shown are the numbers of scientists who visited CIP and CIAT for purposes other than formal training (e.g. to attend annual

meetings and workshops), and the numbers of Center staff who visited the project for periods of up to three days for informal exchanges on various topics. Apart from the scientific areas relevant to the project, the visits were to advise on subjects such as communications, computation, accounting and scientific writing. Taken together, the data suggest an extremely important learning contribution through leadership, advice and mentoring. Obviously the degree of informal exchange which usually takes place depends partly on the funding of the project and this case may be exceptional, but it is included here to provide some quantified information in an area where concrete evidence is scarce and difficult to obtain.

Outcomes and impact

This section is designed to give information on specific aspects of the state of the institution and the trainees, rather than a more complete coverage of outcomes and impact in the conventional sense.

Trainee retention: Overall, 43% of the INIAP staff known to have been trained by the CGIAR since the 1970's, is no longer there. This is shown in Table 1.2, by year of training (using the last year in the case of trainees with multiple training activities). The apparent reduction in numbers after 2000 is partly due to incomplete records from the Centers, but also reflects a genuine tendency perceived by INIAP staff. Taking the group of 71 staff trained since 1990 who might reasonably be expected to be still active, the Table shows that 31% have left the institution.

Trainees in leadership roles: In spite of the loss described above, CGIAR trainees play a major role in leadership within the institution today. Table 1.3 refers to the 75 members of staff who have positions as directors or heads of programs, departments and units at the central level and in INIAP's seven experiment stations in 2005. Overall, 49% of these are CGIAR trainees, and the proportion is highest at the level of directors (64%) and program leaders (61%). The Table also shows that the proportions of trainees acting as heads of programs, departments and units in areas outside the CGIAR's mandate (e.g. coffee and cacao, fruit production, horticulture) is quite considerable. This suggests that trainees are valued as leaders whatever their original areas of training.

Staff qualifications, remuneration and dedication: In 2005, 3% of the 215 research staff holds doctorates, and 38% have Master's degrees. This may mean that CGIAR training did not stimulate further academic preparation of trainees very effectively, but the more likely reason is that many of the most qualified trainees work elsewhere. Salaries are very low in relation to reasonable standards of living, especially given the costs of housing and education. Table 1.4 gives a comparison between INIAP salaries and three private research organizations in the country. One consequence is that most staff have other jobs. The Director General estimates that 80% have university posts as well, and that this erodes the time actually spent on research at INIAP.

Funding: Table 1.5 shows the sources of income in 2005. The outstanding feature is how little of the overall budget comes from research projects. This is despite the fact that INIAP reported having more than 85 national and international agreements and collaborative projects in 2002. It is possible that high staff turnover rates, coupled with the low proportion of scientists with advanced academic qualifications, has limited the ability of the institution to generate fundable projects. The government's contribution is unpredictable and often arrives well after the start of the fiscal year. Taken together, the institution's income is barely enough to cover salaries, and the need to generate income from goods and services reduces time available for research.

Field results: Despite the difficulties, INIAP has solid achievements in the areas where CGIAR training was most intensive. For example, INIAP varieties are responsible for 65-85% of the area sown to rice, corn, wheat and potatoes. The internal rates of return to research on these crops were estimated by

INIAP to be in the range 29% (wheat) to 54% (corn). CGIAR training was perceived by the scientists involved to have played a major role in the achievement of these results, especially through collaborative projects such as FORTIPAPA (INIAP-CIP-SDC).

Conclusions

This case documents some of the characteristics of the institution to which the CGIAR dedicated its major training effort in Ecuador. Besides formal training, the scope of informal training and learning within specific projects was of major importance. The case illustrates the extremely difficult conditions under which some NARI's in Latin America are operating even today. CGIAR trainees play an important role in leadership within the institution, but have not been able to overcome the chronic problems of high staff turnover rates, low academic qualifications, low salaries and very limited project funding. The case raises questions about what the CGIAR can best do to contribute to institutional strengthening under these conditions, and how to target training activities in future. Perhaps the first step is to bring to the attention of authorities at the highest political level that investments in training cannot be effective without proper institutional support and a stable agricultural development policy. Until these are in place, collaborative projects with training components may be the best option, but in the longer term are only a palliative.

Table 1.1 Indicators of informal training/learning in the INIAP-CIP project FORTIPAPA, for the years 1992-8

	1992-3	1994	1995	1996	1997	1998
CIP staff on D.C.	3	3	2	2	5	3
CIP Advisers	6	5	3	3	3	3
Visits to Centers ^a	1	11	2	4	2	4
Visits from Center staff	2	6	5	1	7	4

^a Committee of Directors

^b For purposes other than formal training e.g. workshops, annual meetings

Table 1.2 Retention rate of CGIAR-trained staff of INIAP, according to last year of training undertaken

Period	Numbers trained	Active (% ^a)	Inactive (%)
1970-79	29	34	66
1981-89	40	50	50
1990-99	62	66	34
2000+	9	89	11
No date	38	58	42
Total	178	57	43

^aAs reported in 2005

Table 1.3 CGIAR trainees in positions of leadership within INIAP

Type of position	Total number	CGIAR trainees (%)
Director General	1	100
Directors ^a	3	67
Directors of Expt. Stations	7	57
Sub-total - Directors	11	64
Heads of Program ^b		
All	28	61
CGIAR mandate areas	17	71

Type of position	Total number	CGIAR trainees (%)
Non-CGIAR areas	11	45
Heads of Depts/Units ^b		
All	36	36
CGIAR mandate areas	26	35
Non-CGIAR areas	10	40
Total	75	49

^a Directorship of Research presently vacant

^b In experiment stations and at central level

Table 1.4 Salary structure for INIAP, compared with three other research institutions (US\$/month in 2003-2005)

Qualification/Position	INIAP	Others
PhD	805	2200-4800
MSc	562	1300-3200
Ingeniero	486	800-2000
Director	1103	
Researcher (Grade 6)	976	
Researcher (Grade 1)	560	

Table 1.5 Sources of INIAP's income (2005)

Source	Percentage of total
National government	60
Self-generated	37
Research projects	3

Sources

- Interviews with Dr. Julio Delgado, Director General; Dr. Leonardo Corral, Ings. Victor Hugo Cardoso, Fausto Merino, Directors; Ings. Ivan Reinoso, Eduardo Peralta, Program Leaders and other members of staff. Salary data provided by the Planning Section.
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CASE 2: CASSAVA PROCESSING IN MANABI PROVINCE

(Partner Institutions: Asociaciones de Productores y Procesadores de Yuca (APPY's) and others; CGIAR Center involved: CIAT)

This case was chosen because a) it represents a major training effort on the part of CIAT and b) because it concerns two fairly uncommon disciplinary fields: post-harvest processing and anthropology.

Background

CIAT's post harvest technology (sun drying, processing into chips or flour) had been used successfully to add value to cassava in coastal Colombia since 1980. The objective of the program in Ecuador was to determine the possibility of transferring the technology to a larger number of small farmers, but under different institutional arrangements which would reduce the cost and be more sustainable. The program started in Manabí Province in 1985, working as much as possible through existing institutions, and using farmer-to-farmer training to reduce extension costs. The national research institution (INIAP), the Ministry of Agriculture and Livestock (MAG), other government offices, the local university, voluntary organizations and private producers all participated. Most institutions provided their own staff and budget, but additional funds came from US AID and a national foundation, FUNDAGRO which, among other contributions, financed a CIAT anthropologist who was based in Manabí. From 1985 to about 1990, there was a growing demand for cassava chips and flour for the animal feed and shrimp industries. By the 90's, Thailand had dominated the international market for cassava products, wheat flour became cheaper than cassava and Ecuador's shrimp industry had collapsed. FUNDAGRO terminated its support in 1993, so the CIAT anthropologist left, and budget restrictions at CIAT reduced the support from the rest of their Cassava Program. Furthermore, INIAP shut its cassava program in 1997 and very severe damage was inflicted on the whole area by flooding in 1997-8.

Implementation

To pave the way in 1985, CIAT staff organised numerous events (courses, field days and lectures) for various types of participant with the objective of presenting the new technology and mobilizing institutional support. In the same year, CIAT and MAG staff identified two existing groups of small farmers who were experiencing problems marketing raw cassava and agreed to experiment with the new process. The farmers provided some working capital and cassava on consignment, obtained short term loans and CIAT provided the chipping equipment. The cassava was sun dried and processed into chips for animal feed. The training of the farmers' groups was carried out by an experienced Colombian producer/processor brought over by CIAT for a month, and a Colombian builder was brought to demonstrate the construction of a prototype drying floor. After the success of the initial trial, more producer/processor associations (APPY's) were formed and adopted the technology. These in turn formed a union of associations (UAPPY) to provide services, and an inter-institutional committee which included CIAT, MAG, INIAP, FUNDAGRO and the UAPPY, was set up to support the program. The more highly educated members of the UAPPY (e.g. agronomist, mechanical engineer) were assigned strategic roles to increase the effectiveness of the organization. Farmer-to-farmer training continued with exchange visits between Ecuador and Colombia. UAPPY members also received international training. One member (an agronomist) was sent to CIAT headquarters in 1990 for training in seed multiplication, and in 1991 five others received individual training for a month in new processing methods for flour and starch. These formal training activities were reinforced by frequent visits to Manabí by members of CIAT's Cassava Program (e.g. 13 visits in 1987). Their activities had formal and informal learning components e.g.: participating in courses,

workshops and seminars; designing of trials with INIAP and UAPPY; and the introduction new technologies (e.g. drying-tray) and germplasm (e.g. high dry matter varieties).

Training in the technical aspects of processing was complemented by support from CIAT in the social sciences, particularly from the anthropologist based in Manabí. Through leadership and mentoring, the inter-institutional committee, the individual APPY's and the UAPPY were set up, their roles defined and their functioning was facilitated, based on participatory, democratic principles which were not strongly imbedded in the individualistic culture of the region. Aspects covered included all stages from planning to monitoring and evaluation of the groups' activities. Particular attention was given to the incorporation of women, who formed 4 APPY's themselves specializing in starch production. The importance of carrying out research in continuous support to the programme was emphasized and participatory methods were introduced (e.g. for evaluating cassava varieties).

Outcomes and impact

For this study, members of 4 APPY's as well as technical staff from the university, INIAP, and others now employed elsewhere were interviewed.

There was agreement that the farmer-to-farmer training and exchange visits had been very successful initially. The technology was adopted increasingly, as shown by the growth of the APPY's, production rose and members' incomes exceeded those of other farmers from the start (Table 2.1). Some members were encouraged to continue their education, and five graduated from the university using the program's data for their theses. However, when the program expanded, APPY presidents were trained with the expectation that they would transmit the knowledge to their respective members, but this was not always successful because of their lack of training skills. Later, extensionists were brought in to give courses directly to the APPY members. Thus the farmer-to-farmer training experience was partly successful, and certainly the Colombian producers who came to Ecuador would have been carefully chosen.

Apart from the technical aspects, all interviewees stressed the benefit to them personally of the learning experience that resulted from working in a highly participative, democratically-based organization which depended on each individual assuming specific responsibilities. The testimony of women leaders who described how the cassava project had built their self-esteem, and empowered them to fulfil crucial roles in the development of their own communities was extremely impressive. For the first time, they had income of their own which they most appreciated to improve their houses and care for the educational and health needs of their children.

At the institutional level, the APPY's grew from two in 1985 to 17 in 1992 and production rose (Table 2.1). The area planted increased from about 5,000 ha to about 16,000 ha. The union (UAPPY, later UATAPPY) took on an increasing number of services in response to the APPY's needs. It acquired its own offices, transport and machinery department. It appointed a training coordinator (agronomist) and established a demonstration center. It advised on the formation of new APPY's, was responsible for communications between members, provided loans and accounting services to the APPY's, explored markets for new products, controlled quality of the products, and negotiated sales on behalf of the groups. In collaboration with INIAP and the university, it carried out research, mainly on seed production, marketing and processing. Between 15-20 university theses were produced using the project results. Interviewees considered that many of the most successful aspects of the groups' functioning were directly due to the principles of institutional organization and management which had been imparted by CIAT. These included the importance assigned to: inter-institutional cooperation, research combined with training, participatory democratic processes, and continuous planning monitoring and evaluation. On the other hand, some interviewees now see the democratic

organization of the groups and the union as excessive in that it a) slowed down management decisions and may have made them insufficiently agile to contend successfully with rapidly fluctuating market conditions, and b) made it more difficult to ensure strict quality standards. Some training in marketing was provided by CIAT but it came too late, and they found themselves incapable of exploring new international opportunities effectively once their normal markets collapsed.

At the inter-institutional level, CIAT's leadership was decisive in holding together the inter-institutional committee which supported the producers. The committee's role developed from one of communication and coordination, to actively planning and evaluating the groups' activities. CIAT used international training partly as a strategy to promote collaboration between the institutions. For example, the UAPPY member who attended the seed course in Cali was accompanied by a university thesis student and a member of INIAP. On their return, they collectively designed, obtained funding and implemented a seed multiplication project. The UAPPY's collaboration with INIAP was considered by interviewees to have brought INIAP's research more into line with producers' needs, particularly in the areas of agronomic practices, seed multiplication and selection of high dry-matter varieties suitable for processing. At the field level, UAPPY members collaborated in extending drying technology to Esmeraldas Province, through exchange visits between farmers. From one group in 1986, the Esmeraldas APPY's grew to 15 with 190 members in 1987.

Despite their early success, most APPY's were not strong enough to overcome the combined adversities which occurred in the early and mid-nineties (described above). The quality of the products began to fall short of initial standards. The cassava growing area fell from about 16,000 ha to about 7,000 ha today. Most of the groups were dissolved and their plants are now in ruins. Nevertheless, there is evidence ten years later of some lasting effects of the project. Four of the original associations have survived. They are among those which received most training (e.g. 4-6 members each). They have now expanded into growing and processing five other crops besides cassava, and in one case are exporting coffee to Italy. They are exploring possibilities of exporting cassava in peeled, frozen pieces. One of them has opened a bank which lends money with no guarantee and at lower interest rates than the local banks. The young members interviewed all seemed enthusiastic about staying on their farms and making them successful, which contrasts with local trends of young people tending to leave the countryside. In addition, some of the members of the disbanded associations have leading positions in agricultural industries and other organizations, while others considered that their participation had empowered them to play active roles in community services.

Conclusions

This case refers to technology transfer within an innovative social and institutional framework, where training both in technical and social aspects played complementary roles. There was consensus among interviewees that the processing technology would not have been adopted without the training facilitated by CIAT. Some indication of the added value from the technical innovation and institutional framework is given by the up to four-fold increase in income obtained by members, compared with non-members (Table 2.1). All those interviewed attached as much, or more importance, to CIAT's leadership and mentoring in the building of the institutional structure, as to their contribution in technology training. After all its success, the program as a whole was not strong enough to survive the combined effects of market slumps and the withdrawal of external financial and institutional support. Nevertheless, some legacy is evident 10 years later in the surviving organizations which have diversified and expanded, and in the testimony of people who participated.

Table 2.1 Changes with time in numbers of farmer associations (APPY's), production of processed cassava and members' incomes

	No. of APPY's	Product (MT) ^a		Members' income/head/year	
		Starch	Chips	US\$	% increase ^b
1985	2	0	142	---	--
1986	4	0	228	80	33
1987	6	0	1006	80	23
1988	10	90	2850	240	140
1989	16	30	2280	410	410
1990	16	162	5027	315	163
1991	17	--	--	240	118
1992	17	--	--	--	--

^a Fresh equivalent

^b % increase of members' income over income of other producers

Sources:

Interviews: Dr Susan Poats, ex-CIAT anthropologist; Ing. Hernan Caballero (Technical University of Manabí), Ing. Carlos Eguez,(FUNDALGODON), Ing. Vicente Ruiz, Ing. Alma de Arroyave (INIAP) Ing. Gloria Cobena (INIAP); Ing. Duval Valeriano (President, Association in Jaboncillo) Sr. Colon Mendoza (Administrator Mixed Association) Sra Solanda Intriaga (Administrator, San Vicente Association), Sra. Leyda Vera (Member, San Vicente Association), Young farmers (Jaboncillo Association)

CIAT Cassava Program reports 1985-1992

CASE 3: PARTICIPATORY RESEARCH

(Partner Institution: Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP); main CGIAR Center: CIAT)

This case was chosen because training in participatory research in the Andean countries represented a major effort on the part of CIAT. It is parallel to a case in Bolivia, so the differences and similarities in outcomes could be informative and will be discussed in the regional summary.

Background

Agricultural research in Ecuador has been dominated for over forty years by the national institution, INIAP, which up to the 90's operated with the traditional 'top-down' approach typical of Latin American NARI's of the time. There was little connection to the then existing extension service, which was later closed. Consequently, the relation between the national research agenda and farmers' needs and was weak, especially in the case of the small farmers. CIMMYT's training in farm-level diagnostics for economic studies from 1978 onwards contributed to an increasing recognition of the importance of on-farm work. This was also encouraged by the Swiss SDC which had been active in Ecuador since 1969 and favoured participatory approaches in their projects. Under these circumstances, there was a clear opportunity for improving the relevance of research to small farmers' needs, when CIAT brought its Kellogg Foundation participatory research project to Ecuador in 1992. The approach was further supported through the Swiss funded CIP-INIAP project FORTIPAPA which, with a strongly participatory approach, provided scientific backstopping in genetic selection and disease control of potatoes.

Implementation

Five INIAP agronomists were invited by CIAT to a course in participatory research in 1992. The objective was to train them in the community based research committee (CIAL) methodology developed by CIAT, and evaluate its implementation in Ecuador. The training consisted of a 15-day phase at CIAT headquarters, combined with practical work in Ecuador which involved writing and executing a project to set up three CIAL's, including the training of the technical staff responsible. This took place with three supervisory visits from CIAT scientists in the course of a year. Farmers and technical staff also visited CIAT and the Colombian CIAL's which were already operating, to exchange experiences. A workshop on CIAL methodology was held by CIAT for professionals in Quito in 1996. Thereafter, CIAT staff continued to visit, with the objectives of further consolidating the 15 CIAL's which had been formed in the meantime by INIAP in Chimborazo, and promoting a national CIAL network. An international course on CIAL methodology was organized by CIAT in Quito in 2000, where experiences with the methodology were exchanged between representatives of about 20 Ecuadorean institutions and delegates from the other Andean countries. Support from CIAT (\$5000/year) to INIAP for the implementation of CIAL's was continued up to 2004.

Outcomes and impact

One of the original INIAP trainees was interviewed for this study. He recorded being highly critical of the CIAL methodology after initial training at CIAT, and that he proceeded with the practical work out of a sense of duty rather than conviction. During the course of it, he became convinced of its value and was stimulated by the CIAT training experience to undertake graduate studies in social science. He now leads the new area for technology transfer and participatory research established this year within INIAP. Another CIAT trainee, the Director of INIAP's Santa Catalina Experiment Station,

returned from Cali convinced of the value of the methodology which he then implemented as routine procedure for all crop improvement programs of the Station.

The first three CIALs set up as part of the CIAT practical training, while perceived as successful, involved larger, more progressive farmers. Encouraged by the experience, INIAP extended the model to illiterate, small communities and a further 15 CIAL's were set up in Chimborazo in 1994. The 1996 workshop run by CIAT in Quito was considered by interviewees as a 'turning point' in the establishment of the methodology. New CIAL's were established and their agenda extended to cover grains and legumes as well as potatoes, and with emphasis on processing and marketing as well as selection and production. They were introduced into other research projects such as FORTIPAPA (INIAP-CIP-SDC) and PRONALEG-GA, working on potatoes and Andean grains and legumes, respectively, where they participated in varietal selection and in the production of clean seed. INIAP's Experiment Stations adopted the methodology to varying degrees, with less success on the coast but notable results in Santa Catalina (Quito) as mentioned above. This was attributed directly to the Director's experience in Cali. By 2002, INIAP had explicitly adopted participatory methods as basic to their research programs in all areas, as set out in their handbook. There are presently about 50 CIAL's working in 6 provinces in the country on native grains, legumes and potatoes. There was consensus among interviewees that CIAT training had been decisive in the adoption of participatory methodologies and in the change in INIAP's approach to research.

At the inter-institutional level, there were various attempts to improve cooperation and exchange experiences. CIAT's initiative to form a national network did not prosper at the time, due apparently to the lack of continuity caused by high turnover rates among the staff of the local institutions. However, most regional groups organized field days, exchange visits and meetings (e.g. in Chimborazo in 2000, and Cotopaxi in 2004). A national meeting of CIAL's was organized by INIAP in 2004, about 50 professionals from 14 institutions, as well as about 50 farmers from 24 CIAL's, attended. Presentations emphasized the principles of the methodology and organization, but were quite short on the results obtained from the research carried out.

Four farmer field schools and CIAL's were visited in the course of this study. One CIAL set up to work on quinoa had been discontinued. Another one had developed into a producers' association with the main objective of marketing clean potato seed, for which there is a strong local demand. They had carried out trials to identify early varieties which could be harvested before the frost and demonstrated that the seeding rate could be reduced 66% by using clean seed. They now included additional crops (quinoa and tarwi) in their selection trials and had set up a bank for the use of members. Their conviction about the importance of research was very clear. An interesting feature in all the visits was the predominance of women among the members. Some members have gone on from the CIAL to assuming major responsibilities in municipal affairs.

Conclusions

This case points to a close association between CGIAR training in a particular methodology and its application in the field, which occurred in the context of generous external funding for comprehensive, long-term training and for field implementation. Research results are reported, especially in varietal selection, although they are not abundant in the documentation and proceedings reports (e.g. the 2004 national meeting). Some of the applications, as in Chimborazo, have led to valuable developments for the communities. There are some doubts among INIAP authorities about whether the CIAL methodology will survive once the continuous technical assistance provided in each case, is withdrawn. However, there does appear to be consensus that training in the CIAL methodology and the experience of its application in the field was a decisive factor in changing attitudes of professionals in leadership positions in INIAP, and hence the institution's policy in favour

of participatory research methods, even though the change was favoured at the same time by the policies of donors (e.g. SDC) and other international centers (e.g. CIP).

Sources

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ANNEX XVII

Thailand country report

Introduction

Thailand's economy has been traditionally dependent on the agricultural sector. Its main agriculture exports are such as rice, maize, rubber, and cassava. Currently it holds the highest rice market share in the world. In the last ten years slightly over 50% of agriculture land has been dedicated to growing rice.

Government structures also reflect the importance of this sector to the Thai people. The main public body responsible for agriculture is the Ministry of Agriculture and Cooperatives. The ministry is further divided into 14 departmental agencies. It includes the Department of Agriculture which oversees and conducts researches in the agriculture field. Within the department there is the Rice Research Institute, a governmental organization dedicated only to research on rice. The institute links with rice experimental stations throughout the country employing over 400 researchers.

Current issues and priorities

Current concerns for the country include competition among rice exporting countries; the debate on GMO technology; bio-technology; ways to reduce usage of pesticides and chemical fertilizers; promoting sustainable agricultural practices; organic crops; food safety; growing crops for energy replacement; and encouraging small farmers in vulnerable areas to grow sustainable small scale farms for family consumption.

The strategies of the Ministry of Agriculture and Cooperatives (MOAC) for 2005 demonstrate efforts to simultaneously increase productivity and maintain sustainable agricultural practices. Its vision statement is "The MOAC is a major organization to develop the quality of life of farmers, support an adequate food production and safe consumption, and be a world leader of food export under the continual environmental and natural resources management." There is a clear consciousness to move towards sustainable agriculture and environmental - friendly agricultural products.

The strategic plans for 2005-2008 of the Department of Agriculture (DOA) also reflect these concerns. According to the plan the department is committed to three large strategies. They are 1) increase the number of relevant research projects for agricultural related plants and machinery 2) set standards for agricultural production and products to prepare for international competition 3) develop farmers' knowledge and skills on plants and machinery to increase farmers' income. The third strategy has performance indicators such as the number of farmers trained in various areas such production technology; laws and regulations on fertilizers, hazardous substances, and endangered species.

The area of extension work is of vital importance to ensure effective linkages between scientific discoveries and the needs of the real world. The role of the Department of Agriculture Extension (DOAE) has evolved along four approaches: 1) transmitting knowledge through farmers' and youth groups on large demonstration plots (1967-1975); 2) increase rice production for export and local consumption thus promoting land use to obtain maximum yield (1975-1977); 3) sought loan from World Bank to expand the extension delivery system and implemented Training and Visiting System to cover all the provinces (1977-1992); 4) shifted from direct extension services to put emphasis on human resource development for extension personnel and farmers (1993-1999); and 5) emphasizes farmer's and community's participation in the learning process and formulation of their own development guidelines thus role of extension worker has become facilitator and coordinator among relevant organizations and farmers (1999-present).

Capacity constraints

In the present capacity issues for Thailand are more complex than earlier stages of development when capacity problems were mainly production technology and capacity at the individual level. Production technology would include selecting and breeding new varieties and laboratory work. Capacity problems at the individual level perhaps require direct training and transfer of know-how technology. These problems have come to pass for most areas especially of rice, cassava, rubber and other major crops. Remaining individual level capacity issue is such as the decline of number of young conventional breeders as more and more chooses to move into bio-technology.

From individual to institutional/system level

Currently capacity issues have shifted from the individual level towards more to the institutional level and the systems level. They are such as the capacity to organize and manage effectively across many government organizations involved such as between the department of agriculture, the department of agricultural extension, department of forestry, department of land development and non-governmental organizations in the area of natural resources management. These are institutional level capacities that would include project management skills and strategic planning. At the systems level Thailand faces difficulties in trying to make relevant and effective policies and marketing strategies for the agricultural sector. Information management, networking, socio-economic analytic skills all seem to be important capacity issues for public officials in the present.

Participation, farmers and natural resource management

Another important capacity issue at the immediate level is creating links between research and implementation by involving the grass-root farmers in all stages of the development. There is a clear movement in the Thai society to promote participatory approaches in all aspects of delivering public goods and services including the agricultural sector. The concern to promote participatory approaches has accompanied growing attention on complex issues of natural resources management. Many projects are experimenting with participatory approaches. Some CGIAR Centers such as IRRI, CIMMYT and CIAT has played roles in introducing participatory practices along with other international and domestic organizations.

National capacity for agricultural science and application

There are many organizations that are involved in trying to fulfil the above capacity needs of Thailand. Document sources show that there are a variety of training and research opportunities for empowering government researchers to have the competencies that meet demands of more complex capacity issues. For example officials in the Ministry are offered training on subjects that include: computer programs such as SPSS and project management; courses on English for negotiations; knowledge management; and development of warning systems. These trainings are offered both by in-house trainers and by experts outside. The government regularly gives out scholarships for graduate and doctoral level in the field of agriculture. The DOA produces a report compiling the country's best research projects annually.

Both DOA and DOAE have concrete human resources development plans. The plans include sending officials for both domestic and overseas training. The content varies from technical knowledge, participatory methods, ethics, IT skills, and research skills to sharing knowledge, creating new knowledge and managing knowledge. For the year 2005 alone DOA has plans for 45 training courses for its officials. In its plan for the next 5 years emphasis will be put on 7 areas of expertise: **production** (plant physiology, plant breeding); **plant protection** (ecology, insect taxonomy, plant pathology, integrated pest management, biological control, chemical control); **production process development**

(soil science, cropping system, seed technology, agriculture engineering); **basic research** (biotechnology, botany, chemistry, chemistry analysis); **project management** (accounting, public administration, public relations, project analysis, human resource management); **after harvest** (food science, agriculture engineering, storage, packaging); and **others** (remote sensing, data analysis, computer science, economics, product and marketing analysis).

Training capacity

An indicator of a country's capacity of agricultural science is the number of universities that offer agriculture as a field of study.

Type of Institution	Numbers
1. Public Institutes	
Limited Admission Universities	60
Open Universities	2
Autonomous Universities	4
2. Private Institutes	
Universities	29
Colleges	30
Total	125

Of the 66 public institutes we sampled 33 institutes, including all the leading ones we found that 26 offered agriculture as a field of study. On the other hand of the 59 private institutes, we sampled 20 and found that none offered agriculture as a field of study. Therefore the interests in agricultural studies are limited to public universities.

The lack of agricultural studies in private institutions could possibly mean that there is no capacity in the private sector for agricultural studies or it could also mean that there is no demand for agricultural studies from the students.

The leading public institution that is well-known for the field of agriculture is Kasetsart University, which is situated in Bangkok. The word 'kaset' itself means 'agriculture' and 'kasetsart' means 'the science of agriculture'. The university houses three out of four CGIAR Centers that have offices in Thailand. They are IRRI, CIAT, and IWMI. The fourth one is ICRAF, which has an office in Chiangmai University up in the North part of the country. Therefore the locations of all the CGIAR Centers are located in public universities. This is an indicator that there is a close relationship with CGIAR Centers and the capacity of these public universities in the field of agriculture.

Example 1: Data of CGIAR Trainings and Kasetsart University

There are 541 names of people on the Thailand ex-trainees list. Of the 541 names, 69 names were faculty members or students of Kasetsart University. Of the 69 names of people from Kasetsart University, 30 were trained by IRRI, 32 were trained by CIMMYT, 5 were trained by CIFOR, and 2 were trained by IWMI. The word 'trained by' here includes those that were sponsored by these CGIAR Centers to undergo trainings offered elsewhere or by collaborations with CGIAR Centers.

CGIAR Centers	Number of people	Type of Training
IRRI	30	Mixed of degrees and non-degrees
CIMMYT	32	All were non-degrees
CIFOR	5	All were non-degrees between 2002-03
IWMI	2	All were for PhD from 2000 onwards

Of the 30 people that were trained by IRRI, 17 were confirmed to have stayed in Kasetsart University after completion of the trainings. They are all associate professors or professors in one of the academic departments of the university. This shows that IRRI did have influence on building the capacity of Kasetsart University, which is one of the leading national partners in Thailand.

Example 2: Data of CGIAR Trainings and Department of Agriculture, Ministry of Agriculture

Of the 541 names, 48 names were researchers from the Department of Agriculture. Of the 48 names, 44 were trained by IRRI and 4 were trained by CIMMYT.

Department of Agriculture

CGIAR Centers	Number of people	Type of Training
IRRI	44	33 degrees and 11 non-degrees
CIMMYT	4	All were non-degrees

Of the 44 people that were trained by IRRI, 33 were trained for degrees. Of the 33 people trained for degrees, 24 stayed with the department. Some of whom have now high positions in the department, such as senior researchers and deputy directors of each research area. This is another example of the influences of IRRI that had on researchers in the most important public research institute on agriculture. Thus IRRI was a very important actor that helped shaped the capacities of national agriculture research institutes in Thailand.

From training recipient to training provider

Another indicator of improved capacity in the case of Thailand is that it has gradually transformed itself from being a recipient of training to become a facilitator of platforms for learning at the international level such the Agroforestry Management and rice breeding. Thailand offers direct training and facilitates learning for neighbouring countries in the region such as Laos and Cambodia and some outside the region such as India and Bangladesh as well. Universities have also provided scholarships for people in the region to come to study agriculture in Thailand. In Mae Jo University alone there are students from over 15 countries studying Agroforestry Management.

The contribution of CGIAR Centers

Relationships between the NARI the CGIAR Centers have changed through out the years. In most cases the relationship has evolved from the NARI being the recipient of training/learning activities, to being a partner of the CGIAR Centers in designing and implementing training/learning activities, and then to being the leader in the relationship. The NARI, particularly the Department of Agriculture, the Department of Agriculture Extension, and the Rice Research Institutes show tremendous leadership in setting their own agenda for research and goals for the organization and the advancement of agriculture sector as a whole. Partly this is due to general efforts of the Thai government to rely less on direct foreign assistant in all aspects. Also it is due to Thailand’s own developmental stage that the people have become empowered to know where they want to go and how they want to get there. Another factor is the budgetary constraints of the CGIAR Centers. Interviews confirm that in the present most of the funding for collaborative projects come from the Thai government and that CGIAR Centers such as IRRI would work as the middle-man to bring people together.

The case of the Ubon Rice Research Center

At present Ubon, the leading rice research center in Thailand is involved in the CURE network facilitated by IRRI. The following is an extract from a fieldnote of discussions with four senior scientists all of whom had previously been trained by IRRI.

Thailand has moved production from domestic consumption to commercial purposes. Breeders need to try to reduce the risk for farmers. The rain fed lowland areas have unfavourable conditions such as draught, soil quality, and flood. Therefore newer varieties are needed to resist these conditions. They are also incorporating more farmer participatory methods such as in variety selection processes to test in the fields.

When asked what CURE did for them, they said “the objective is to facilitate sharing experiences among scientists. The researchers might be funded from elsewhere. The major source of funding actually came from the government. When we do collaborative projects we make sure that both sides benefit. The advantage is to exchange and learn from other countries. IRRI serves as the middle-man to bring people together. If we had to do it on our own we would not be able to do it as well. IRRI works as the coordinator.”

On the importance of training, the response was that IRRI’s training is still very important for younger scientists. They are conventional breeders and that is not enough to train others when related fields such as socio-economic or bio-genetic issues are becoming more important. Currently IRRI has provided less training for Thais. Thais are giving more training to Laos. This is an indication of an increase of capacity in Thailand.

Usually they work through the DOAE to transfer the technology they’ve built but sometimes they also conduct preference analysis directly with the farmers together with DOAE. They see that there are problems of capacity in Thailand such as: the number of young conventional breeders because most are moving into bio-technology; there needs to be a stronger connection between basic research and applied research; researchers are doing well but policy-makers need to be educated; there is lack of knowledge and experience on project management (project leader, evaluation, budget). These are generic project management skills, but by working with IRRI “we have to practice project management, so we get the kind of training as well”.

When asked about evidences of impact, they gave the experiences of ‘farmer participatory variety selection’ program (This is part of a series of projects spun off from experiments done under CURE). The program was originated by us under the Rockefeller funds. We used IRRI’s program to incorporate it. CIMMYT began the participatory work. “We had farmer participatory method in mind already and we only went to IRRI for technical help”. (However, after reviewing the documents and other interviews, the presence of IRRI for the participatory work was very limited).

Another direct evidence of impact was the breeding of varieties insensitive to day length. Now they can grow off season. This is the direct impact of germplasm bank. “We brought in the materials from IRRI and crossed them with the local variety. We would never bring in the direct germ because of the quality that does not meet the Thai standards.” When asked if training was important in the process, the answer was “We cannot separate out between the germplasm bank and the training.”

Currently 80% of the land uses the improved varieties. They are trying to work closely with IRRI to develop a new variety.

This case underlines:

- The changing role of what was the most significant IARC in Thailand;
- The continued importance of CGIAR links – but in new formats;
- The importance of training – as well as its indivisibility in the view of many interviewed from research and germplasm provision.

A reducing role?

The CGIAR Centers activities, thus, has changed both in terms of content and method of cooperation with the NARI. There has been a steady decline in the number of researchers the CGIAR Centers has trained in Thailand. The majority of the ex-trainees who are still working are now in their 50s. Most are very active in their fields and have become leading scientists and top-managers in key public organizations. Interviews reveal that ex-trainees especially the active scientists feel that the trainings they have received were very valuable for them. However, they also eluded that offers of training/learning has come from many channels not only the CGIAR Centers such as through governments of Australia, Swiss, and Japan; or through networks with domestic universities such as Kasetsart University, Chiangmai University, and Ubon Ratchathani University.

Aggregate contribution made by CGIAR

There were a total number was 541 names in the dbase of Thai ex trainees. Of these the total number traced was 249 (46%). The result of tracking is the following:

Found and still working in the same field with the same organization	148
Found to have moved to a different job or to a different field or to study abroad	6
Searched and asked but the names were not familiar or not heard of	55
Retired or have passed away while in the organization	40

Almost all of the ex-trainees belong or use to belong to either a government organization or a public university. If we add the number of people who are still with same organization or the same field (148) with the number of people who have retired or have died while in the organization (40), the total is 188 people. That is 75% of the number of people traced (188/249). It is reasonable to conclude that most people were trained by the CGIAR Centers remained in the field of agriculture and continued to work either for public organizations or public universities.

New forms of training and learning

As the role of the NARI shift from being the recipient to leading the relationship, the nature of training/learning activities has changed as well. Previously much of the relationship relied on personal ties between leaders of CGIAR Centers and departments. However, now as most of these people have retired the connection is fading rapidly. This is especially true for IRRI and other centers that are not directly involved in natural resource management type activities. Centers such as IWMI and ICRAF that work more towards general natural resource management are still active and have a growing presence in the country.

Instead of merely producing trained scientists or focusing on basic research, the NARI are looking for more exposure to learning in the areas of policy making, regulations, and market strategies. Also they are looking for a more interdisciplinary approach in training and learning. An example given is that: breeders of rice need to know about the environment and ecological aspects of the new type as well.

There is also a need to move more towards social sciences by blending more between economic, social, political knowledge with hard core sciences. Interviewees confirmed the important role that CGIAR Centers can play as facilitators of knowledge sharing platforms. It could be through conferences, consortiums, research, courses and so on. The value would be an international body that scientists and practitioners from different countries can share knowledge on an equal basis on the above capacity issues.

In addition there is now more activity that is conference/workshop/network based and a reduced level of individual training out of country as the table below suggests.

The people that were sent on these conferences and trainings were mostly from the Rice Research Institute of the Ministry of Agriculture and Cooperatives. Some of them are leading researchers in the country. By comparing the names of people who went on these conferences and trainings sponsored by IRRI more than once, and the data of ex-trainees that we tracked in June 2005, it is found that all of the people have stayed in the same organization, which is the Rice Research Institute.

Some observations:

- The number of people that were sent from IRRI -Thailand for the trainings show a steady decline.
- Overall more people have been sponsored for conferences rather than trainings. This could be an indicator of IRRI playing more role as a facilitator of knowledge sharing rather than being the sole knowledge provider.

IRRI - Thailand	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of conferences that IRRI - Thailand was affiliated (Conference site in Thailand)	22 (6)	23 (2)	17 (4)	16 (4)	26 (7)	21 (5)	0	19 (4)	16 (2)	18 (5)	n/a
Number of people that were sent from IRRI - Thailand for the conferences	53	61	43	25	77	71	0	47	76	141	n/a
Number of trainings that IRRI - Thailand was affiliated (Training in Thailand)	15 (3)	7 (1)	6 (1)	9 (2)	11(2)	9 (2)	2 (1)	7 (1)	8 (0)	5 (0)	1 (0)
Number of people that were sent from IRRI - Thailand for the trainings	54	18	26	13	24	33	17	22	9	9	1

* Source: This table was put together from the lists of conferences and trainings IRRI – Thailand had given to the research team in electronic files in June 2005.

* In the year 2001 because of the 9/11event most conferences were cancelled.

As the NARS become equal partners with the CGIAR Centers some conflicts have occurred and can escalate if not careful. The case of a retired IRRI scientist who crossed Thai Jasmine Rice with Indian Rice and tried to patent it, which caused mistrust of IRRI among Thai officials is a case in point.

Thailand is now creating its own germplasm bank in order to secure its own resources for competition.

Impact of the CGIAR Centers in Thailand can be clearly seen in rice and cassava. Currently 80% of the land that grows rice uses the improved varieties, which were developed from the germplasm bank. Cassava is purely produced for export and Thailand holds about 80% of the world market. Further discussion on impacts will be illustrated in case studies.

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ANNEX XVIII

Case studies from Thailand

1. COMPANION MODELING CASE STUDY

Center: IRRI, Theme: NRM, methods

Introduction

IRRI has had a long presence in Thailand. Its relationship was strong especially with the Rice Research Institute which is part of the Department of Agriculture (DOA). However, in the last few years due to several factors IRRI's role in the country has reduced dramatically. These factors are such as: IRRI's own budget crunch; the DOA's strong capacity in developing its own germplasm bank and funding researchers; the government's overall strategy to move from a receiver of foreign aid to be the provider of aid to neighbouring countries; and the maturation of the rice industry in the country.

The following case represents the decline of direct role of IRRI in Thailand but at the same time still play some vital role for enhancement of agriculture related technologies and knowledge in the region through networks and collaborations.

Companion Modeling Approach

Integrated natural resource management (INRM) is a complex issue which needs interdisciplinary knowledge. Modeling is increasingly seen as a suitable approach to examine complex resources management problems. Modeling should proceed iteratively from simple to more complex representations of the system dynamics. These iterative, applied, action-research-oriented modeling activities should be implemented in close interaction with field work and stakeholders in looking for solutions to the real-world problem under study. Stakeholders should play an important role in the construction and the validation of such models. This collective learning process for INRM is called "companion modeling" approach.³⁰

The Beginning

In 1993, a team called GREEN (French acronym for "renewable resource management and environment") was created by Center for International Cooperation in Agricultural Research for Development (CIRAD) in France. The researchers of the team developed modeling activities to better understand the interactions between social and ecological dynamics. Their main research theme is the decision-making process. They adopted and developed a tool called 'multi-agent systems' (MAS) from the field of modeling. They further developed a 'companion modeling (ComMod) methodology for the use of MAS tools within the community of approaches dealing with participatory modeling for collective learning and action. The ComMod method uses role games to acquire knowledge, build a MAS model and validate it, and use it in the decision-making process dealing with collective resources management.³¹ In 1995, researchers of GREEN began to propose training courses on MAS modeling for integrated natural resource management (INRM).

³⁰ Bousquet and Trebuil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.2.

³¹ Bousquet and Trebuil. "Introduction to companion modeling and multi-agent systems for integrated natural resource management in Asia" (2005 Draft, forthcoming) p.1-3.

Meanwhile in Thailand in 1998, Dr. Benchaphun Ekasingh and her colleagues from the Multiple Cropping Center at the Faculty of Agriculture, Chiang Mai University (MCC-CMU) began to organize the first training course in Asia on MAS and INRM. In 1999 Dr. Benchaphun asked the GREEN team to organize a two-weeks training in MCC-CMU.

In the IRRI front, since 1995, it has been mandated by the CGIAR to convene the Ecoregional Initiative for the Humid and Subhumid Tropics of Asia, Ecor(I)Asia, which is one of eight ecoregional programs aimed at tackling complex natural resource management (NRM) issues at the regional scale.³² As part of the effort to fulfil its tasks, in 2000 IRRI hosted a similar training by the same GREEN team in Los Baños Philippines. The key person from IRRI was DR. S.P. Kam who is an expert on MAS and GIS. From these starting points IRRI and CIRAD began a joint collaborative research project based in Bangkok. The project relied on funding from Asia IT & C initiative of the European Union (EU) for three years, and some from IRRI and CIRAD as well.

The Project – Training³³

The objective of the EU project was to *train* Asian lecturers and researchers on MAS for social sciences and INRM by inviting 12 internationally renowned European researchers to deliver one-week courses in Thailand on different aspects of the subject. The training courses were held from October 2001 to April 2004. In total there were 12 courses.³⁴ The first course was a two-week training sessions and the eleven courses that followed were one-week sessions. The courses were conducted in three collaborating universities: Chulalongkorn University; Chiang Mai University; and Khon Kaen University.

The target size of the trainees per session was 16-20. The trainees are from 11 countries³⁵ and institutions including CIAT, ICRAF and other CGIAR Centers. Most of the trainees, however, were graduate and post-graduate students, young university researchers and some officials from the Ministry of Agriculture and Cooperatives in the case of Thailand. The trainees were from various backgrounds such as: economic & social sciences; agriculture sciences; land-use & GIS; ecology & biology; agriculture extension; computer sciences; and health sciences.³⁶ By the end of the project a core group of trainees were identified.

Different combinations of teaching methods and tools were used during each course. Generally, on each day, two 90-minute lectures alternate with presentations of case studies, group exercises, hands-on exercises, or personal work. The sessions used mainly visuals – video projections. Slides, key reference papers, CD-Rom with these files, software, and computer exercises were provided to the trainees.

³² Guy F. TREBUIL. "IRRI-Cirad Project Activities in Thailand for 2002 : Report to the Department of Technical and Economic Cooperation", International Rice Research Institute. 7 March 2003

³³ Bousquet and Trebil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.4

³⁴ Aside from the above forthcoming book chapter, I also used a poster "Interdisciplinary Training on Multi-Agent Systems (MAS), Social Sciences and Integrated Natural Resource Management (INRM) in Thailand". Produced by IRRI-CIRAD-DOA project.

³⁵ The trainees were from Thailand; Philippines; Vietnam; Indonesia; Malaysia; Bangladesh; Bhutan; India; Japan; France; and Germany.

³⁶ Bousquet and Trebil. "Training on Multi-Agent Systems, Social Sciences, and Integrated Natural Resource Management: Lessons Form an Inter-University Project in Thailand". (2005 Draft, forthcoming) p.5

Networking, exchanges and group dynamics were sustained by the subscription of each trainee to a global electronic discussion list linked to a website designed for MAS users in INRM (<http://cormas.cirad.fr>). On the website trainees can find reference papers and tutorials, completed case studies, new version of software, opportunities for further training and a library of already developed MAS models.

Capacity Enhancement

To put in short this case demonstrates that training has transfer knowledge on MAS to Asian scientists. Some evidences are such as:

- Currently there are 14 applications being developed in five countries: 7 in Thailand; 2 in Philippines, Vietnam and Indonesia; and 1 in Bhutan. These are personal projects on INRM. This shows continuation of efforts on behalf of the trainees to improve skills in this approach.
- Four trainees have continued to take training course in France on MAS modeling using CORMAS.
- MAS approach has been integrated in 4 Master of Science theses in four countries.
- Seven trainees have made proposals for doctoral level in the field and have been accepted to universities in France, Japan, Canada, and Thailand.
- Some have presented their applications in papers for conferences.
- Some have begun to teach MAS for INRM modules in their universities, particularly in Thailand and Philippines.
- The trainees have become trainers when they run their own short courses and workshops for MSc students particularly in Ubon Ratchatani University, Chulalongkorn University and Khon Kaen University.
- Currently CIRAD is collaborating with Chulalongkorn University to establish an international graduate program in this field in Thailand.

The above are mainly contributions made possible through capacity enhancement at the individual level. However these training sessions have created a close link between trainers and trainees and among the trainees. The links have created a close network of individuals in Asia and Europe who are leaders in the field. There has been a starting effort to set up Asia Pacific Social Simulation Association (www.apssa.net) and organize a conference on MAS for INRM in Asia. Thus capacity at the network / institutional level is also enhanced but at the moment perhaps in the early stages. The trainees have become more interdisciplinary-minded. But the remaining question is how much would that translate into changes in their professional practices at their respective institutions. There is no evidence of impact at the policy level yet.

IRRI's Involvement

IRRI's actual role in the project is limited though critical at certain stages. Through Dr. S.P. Kam of IRRI, CIRAD researchers (one former IRRI official) agreed to set up an operation unit for the training courses in IRRI's office in Bangkok. The salaries of CIRAD researchers came from CIRAD, and the funding came from EU. IRRI provided the office space and some funding for the courses.

Dr. S.P. Kam was one of the trainers and taught one course of the total 12 courses. She also developed the MAS models in the beginning. According to an interview with CIRAD researcher, Dr. Kam was perhaps very different from other IRRI scientists. The interviewee said IRRI tends to have a very narrow focus "They look only at the roots of rice, not even the leaves". He said "Bit by bit, IRRI fell out of the project because they were not doing the systems approach". The end of 2005 Dr. Kam is leaving IRRI to go to another CGIAR Center in Penang. However this also reflects the shifting focus of IRRI's efforts which have downplayed Thailand in favour of other countries in the region.

As for other CGIAR Centers in Thailand, ICRAF and CIAT came for training but their interests did not continue. As for NARI, officials in Department of Agriculture (DOA) also attended some courses but because they were to mono their approach their interests also did not continue.

In the present CIRAD is moving ahead with its activities of further expanding the training / learning objectives, target groups, and collaborating projects in the region. IRRI's presence has completely disappeared, except for a few minor papers presented on the subject by Dr. Kam but they were not joint-papers with CIRAD.

Conclusion

In sum this case represents the reducing role of IRRI in Thailand. It collaborated with CIRAD on the project but learning and training activities were all managed by CIRAD. It participated briefly as one trainer led one training course, and provided office space for the project. However, it played a role in initiating the courses in Thailand to meet the demands of local researchers, especially those in Chiang Mai University. This case shows that IRRI has tried to follow CGIAR's shift of focus to IRNM with variable success.

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Interviews

Dr. Guy Trebuil, GREEN Research Unit, TERA, CIRAD

Dr. Benchaphun Ekasingh of MCC, Chiang Mai University

Mr. Varong Naivinit, Chulalongkorn University PhD student who is in the core group of trainees. Dr. Guy Trebuil is his advisor.

2. INTEGRATED CASSAVA CROPPING

Center: CIAT Theme: NRM, Crop Protection

Introduction

CIAT has the world's largest collection of cassava germplasm. In Asia region the center has been active in Thailand, Vietnam, China and Indonesia. In the case of Thailand, CIAT collaborates closely with Department of Agriculture (for research), Department of Agriculture Extension (for extension work), and a private organization. Currently Thailand exports about 2 million tons to EU and 2 million tons to China annually.

The CIAT scientist in Thailand said in an interview "CGIAR keeps telling us to do basic research and give it to the national institutes to give to extension to give to farmers. Then they ask us about the impact! That is impossible if we don't go down to the farmers!" Thus CIAT's work is mainly with farmers and not at the policy level or coordination level.

The following case is based on CIAT's project called "Improving the Sustainability of Cassava-based Production Systems in Asia" funded by the Nippon Foundation.³⁷ The objective of CIAT's project is to enhance the adoption of more sustainable production practices by involving farmers directly in the development of site-specific most-appropriate practices through farmer participatory methods. Sustainable production practices would both help farmers increase their income and in protecting the soil resource base from degradation as a result of nutrient depletion and erosion.³⁸ Soil erosion was seen as one of the most important problems among farmers.³⁹

The CIAT project is divided into two phases. The first phase (1994-1998) of the project developed and tested mainly a Farmer Participatory Research (FPR) methodology. This first phase included offering introductory course on FPR methodologies in Thailand for researchers and extension workers from the four countries. Also in 1997 and 1998, in-country Training-of-Trainers (TOT) courses in FPR were held in the four countries. A total of 127 researchers and extension workers were trained (35 Thais); and 155 farmers participated in the FPR trials (32 Thais).⁴⁰

The second phase (1999-2003) aimed to use the methodology, implemented in a simplified version in many more sites, and further developed and used various farmer participatory extension (FPE) methods.⁴¹ In phase two 338 FPR trials were conducted in Thailand and 584 were conducted in Vietnam. By 2003 the project was working in 33 sites in Thailand, 31 sites in China, and 34 sites in Vietnam. Originally the aim for Thailand was 15 sites and Vietnam was 16 sites. FPR in Indonesia did not continue.

Beginning of the Second Phase – On Training

By 1998 project staffs from the first phase had gained experience and were resource persons for TOT courses in the second phase. Also manuals on farmer participatory approaches were prepared in Thai, Vietnamese, and Chinese. The manuals include hardcopy manuals as well as videos and CDs.

³⁷ End-of-Project Report, p.3

³⁸ End-of-Project Report, p. i

³⁹ End-of-Project Report, p.49

⁴⁰ End-of-Project Report, p.5

⁴¹ Impact Assessment Report, p.6

After 1999, the training shifted from TOT courses for researchers and extensionists that focused on tools and methodologies used in participatory diagnoses to training of local extension workers and key farmers from each pilot site.⁴²

The number of participants in the FPR training courses amounted to a total of 726 people, counting from 1994 to 2003 in the four countries. There were 244 Thais and 292 Vietnamese. And of the 726 about 200 were researchers and extensionists; and about 400 were farmers and local extension workers. Some participated more than once.⁴³

The training would target one sub-district extension worker together with two farm leaders from a project site - the three people were to form a 'FPR team'. These team members often become leaders or coordinators of the FPR trials or committee members of the 'Cassava Development Villages'. The training courses helped create the cadre of people with knowledge and experience in farmer participatory methodologies and motivated them to extend the project to more sites. The courses also motivated and empowered local extension workers and key farmers to work as teams.

Some of the trainees were also sent to participate in three international / regional training courses: Farmer Participatory Research and Gender Analysis, Vietnam 1999 (2 Thais and 1 Vietnamese); Participatory Monitoring and Evaluation (PM&E) Training Course, Philippines 2000 (2 Thais); and Participatory Research and Development, Philippines 2002 (3 Thais and 1 Vietnamese).⁴⁴

Content of the Project

At the start of the second phase villages were selected based on discussions with officials at different levels; a Rapid Rural Appraisal with the farmers; and willingness of local leaders to collaborate. The farmers from the selected pilot sites were then taken to visit the demonstration plots or visit other villages where farmers had already conducted the FPR trials and had adopted some selected practices. The farmers then evaluated the demonstration plots, score all the treatments and select a few of most interest to try out in FPR trials on their own fields. The researchers and extension workers help farmers to select appropriate treatments, stake out plots and establish the selected treatments.

Aside from FPR erosion control trails, farmers could also tested other technology components such as: new varieties, fertilizer practices, intercropping, weed control and even pig feeding with cassava roots and leaves. During harvest time, a field day is organized so farmers from different villages could gather to evaluate and discuss the results of the various treatments. Farmers would then select the best treatments for either furthering testing or for adoption in their production fields.

After 2-3 years the farmers would by then decide on the most suitable practices. Project staff would help the farmers to find necessary varieties or other inputs such as fertilizers. The project also used various Farmer Participatory Extension methodologies such as: organizing cross-visits of farmers from one village to another; field days; FPR training courses for farmers and local extension workers; and setting up community-based self-help group called "Cassava Development Villages". So instead of working with individual farmers, they worked with organized groups.

⁴² End-of-Project Report, p.40-41

⁴³ End-of-Project Report, p.40-41

⁴⁴ End-of-Project Report, p.41

Results of the Project

Outputs of the project in Thailand are the following:

- By 2003 farmers in 24 villages had planted a total of 145 km of vetiver grass hedgerows.
- Almost all had adopted one or more recommended new varieties.
- CIAT and national researchers were able to design and develop a Farmer Participatory Model used for the development of sustainable cassava-based cropping systems in Asia.
- Some knowledge on cropping systems was formed such as: the reasons why intercropping technology is completely rejected by Thai farmers; the behaviour of farmers in using chemical or non chemical fertilizers.⁴⁵

Outcomes are such as:

- According to FAO data, cassava yields in Thailand increased 3.74 t/ha (27%) with a total value of 86.4 million US dollars.
- Including China, Vietnam and Thailand it is estimated that for all of Asia yields increased 2.88 t/ha (22%) resulting in additional income for cassava farmers valued at 248 million US dollars per year.
- Land allocation to cassava production is expanding, and it is expanding at a faster rate on hillier terrain.
- More careful cassava production concerning soil erosion. Thus more sustainable agriculture practices.

Evidence of Capacity Enhancement

Based on the Impact Assessment Report

This case has two interventions: the NRM technologies that were introduced; and the participatory approach that was used to promote adoption of the new NRM technologies.

The outcome of the project can be divided in to two types: behaviour and productivity. The impact assessment report concluded that the project had significant impact on adoption of soil management technologies, and both project technologies and participation in the project influenced behaviour and productivity outcomes.⁴⁶ An indicator for behaviour change is the increased area of land used to grow cassava especially in Thailand in more hilly areas. Farmers have been able to do so because they have decided to adopt hedgerows such as vetiver grass. This shows that with new technologies the farmers can expand their crop to more environmentally sensitive areas. An indicator for productivity is the cassava yield. The report found that the increase in cassava yield of participants compared to non-participants was slightly higher.⁴⁷ According to the End-of-Project Report, the adoption of more balanced fertilization, of soil conservation practices and intercropping was significantly higher for participants compared to non-participants. The Impact Assessment study also showed that the adoption of the hedgerows was positively and significantly related to expansion of the total cropped area and cassava area.

The farmers' participatory approach helped increased adoption of technologies and also helped empowered the farmers. The report says that the participation is related to the enhance knowledge, experience and managerial capacity.

⁴⁵ End-of-Project Report p. 45-46

⁴⁶ Impact Assessment Report p.16

⁴⁷ Impact Assessment Report p.13

Farmers' participation also had a reverse affect on the researchers/scientists. It enhanced the researchers' technical knowledge on ways to prevent soil erosion and it contributed to the researchers' appreciation for farmers' knowledge.

In the impact assessment study, the authors also discuss the benefits of participatory research for partner institutions. The main partners in Thailand can be divided into two groups: the researchers – Kasertsart University, Department of Agriculture, the Land Development Department (LDD), and the Thai Tapioca Development Institute (TTDI); and the extension workers from the Department of Agriculture Extension (DOAE).

The study found that researchers felt they benefited mostly from the new knowledge on soil fertilization that they learned from CIAT. Also they felt they were able to increase their understanding of farmers and their environments. Thus an impact of the FPR approach is providing feedback to research on end-users preferences.

As for extension workers, they felt they benefited most in terms of improved efficiency and motivation. Efficiency comes from easier work because of the clear goals, and cooperation from their supervisors, farmers and other officials. Motivation comes from the knowledge that living standards of farmers have improved and the feeling that farmers are motivated.⁴⁸

Both the researchers and extension workers felt they benefited mostly from improved work management, which includes such as: the ability to apply FPR approaches to other crops, changing nature of the extension work from teaching to facilitation; and the Department of Agriculture's acceptance of FPR approach as new policy. Both researchers and extension workers were better able to identify the role of farmers in the research and technology transfer process. They learned the needs of farmers and thus are better able to propose solutions and target research more adequately.

The main constraint that the two groups feel they face is internal management as oppose to constraints from external economic and market conditions or lack of knowledge. Internal management consists of government policies and operating budgets.

Based on Interviews

Concrete evidences of new knowledge being generated are such as co-authored papers and single authored papers, international symposium posters by researchers in both Department of Agriculture and Department of Agriculture Extension.⁴⁹

Another evidence of enhanced capacity is the fact that now DOA and DOAE has duplicated CIAT's participatory approach to use in cooperation with Laos and Cambodia. For Cambodia the crop is maize rather than cassava. The government also has bilateral ties with China and cassava related research is one of the areas of concern.

The interviewee said that public agencies in Thailand do not cooperate very well with each other. Sometimes DOA decides to also do extension work, while DOAE sometimes also does research work. CIAT has played the middle-man or referee to bring all the players together and assign clear roles for

⁴⁸ Impact Assessment Report p. 23

⁴⁹ They are such as 1. "Effects of Methods of Land Preparation on the Yields of Four Cassava Varieties in Thailand" by W. Watananonta, S. Tangsakul, S.Katong, P. Phetprapi, S. Jantawat, N. Samuthong, R.H. Howeler, June 2005. The authors are from DOA, TTDI, Kasetsart University, and CIAT; 2. "Cassava in Thailand-Present Situation and Future Potential" by W. Watananonta. Paper prepared for workshop at Field Crops Research Institute, Dept. of Agriculture, Thailand, June 2005.

each agency. However, agencies have not been able to push cassava related concerns on to the national level. Different from other crops, there has never been a national conference on cassava.

CIAT has mainly contributed by being the knowledge generator and facilitator of participatory approach. It is also the channel for researcher to share knowledge. Thus, despite the fact that CIAT had very little contribution financially, its presence in the country is was very valuable.

Existing Capacities

It is important to take note the existing capacities in Thailand that helped CIAT's project to be successful. In Thailand both the government and the private sector namely, the TTDI have been very active in cassava research, extension, and training of cassava farmers. From 1993-2000 TTDI trained about 30,000 farmers and distributed about 40 million stems of new varieties free of charge to farmers.⁵⁰ Also from 1993 to 1998 the Thai government spent over US\$1 million per year for the multiplication and distribution of new high-yielding cassava varieties. In 2002/03 the new varieties cover 98% of the total cassava area in the country. The End-of-project report states that, in Thailand many farmers in the pilot sites had already adopted new varieties before the Nippon Foundation project started; but they may have changed from one new variety to another as a result of FPR variety trials conducted as part of the project. However it is difficult to conclude the affects of the project on adoption of new varieties because new varieties were adopted by farmers all over the country.

Another existing capacity in Thailand is the strong contribution and dedication of the King and his Royal Projects. The result that the farmers that participated in the project adopted the practice of growing vetiver grass hedgerows is perhaps mainly because of the efforts of Royal projects to promote soil and water conservation. The government provided free vegetative planting materials and the LDD helped in setting out contour lines. It is one technology that CIAT learned together with the farmers from existing research rather than a technology that was introduced by CIAT.

Another point worth mentioning is the fact that now farmers grow vetiver hedgerows covering 580 ha in 24 project sites but that is only 0.1% of the total cassava growing area in Thailand. This is because not all cassava areas have erosion problems.⁵¹

Also regarding soil conservation practices, the End-of-Project made an observation that the adoption of more or better fertilizer use and closer plant spacing, almost universally adopted by farmers for economic reasons, may actually have contributed more to erosion control than any of the soil conservation practices adopted as a direct result of the project.⁵²

Current Capacity Concerns

Due to high oil prices in the present (August 2005) the Thai government is searching for new alternatives. Cassava is one of the potential crops to make ethanol gas. Thus demands for cassava might dramatically rise in the near future. The DOA is involved in planning and researching on the subject.

⁵⁰ End-of-Project Report, p. 45

⁵¹ End-of-Project Report p. 49

⁵² End-of-Project Report p. 51

CIAT – Thailand in the Future

Regarding CIAT, currently its activities are winding down. They will no longer hire internationally recruited staff because of budget constraints. All the work will be transferred to regional / domestic staff soon. According to the soon-to-retire scientist, who has been in CIAT for over 35 years, CIAT's focus seems to have shifted from traditional research to increase cassava yield to 'natural resource management' type of work. The activities of participatory approaches at the farmers' level are perhaps evidences of such shift.

Conclusion

This case would fall in the category of a 'closer to farm/extension' case that involves 4-5 partners. The problem CIAT sought to overcome dealt with cropping systems. They aimed to include farmers in developing better cassava production practices that would be sustainable: which means increasing farmers' income and protection of soil degradation. The main theme of the project is Farmer Participatory Research (FPR) approach.

In the first phase they trained researchers and extensionists of the central agencies in classroom settings on FPR and technologies to enhance sustainable cassava productions. In the second phase, together with those trained in the first phase, CIAT and partners of NARI, trained the local extension workers and leading farmers on FPR in villages and demonstration field settings. This second group would then implement the approach for enhancing adoption of new technologies to prevent soil erosion in the villages.

Learning occurred mainly for researchers in DOA (NARI) and extension worker both national and local levels (NARI); leading farmers; and the CIAT researchers as well. Through the project CIAT and partners were able to develop the appropriate model for FPR. The model is now being implemented by the Thai partners with other crops and with other countries nearby. The capacity results are evident mostly at the individual level: all the participants now know FPR approaches and have used it for supporting adoption of technologies to prevent soil erosion. At the institutional level: FPR techniques have gained importance and acceptance; through FPR approach researchers and extension workers are better able to work together; cassava cropping systems are more sustainable

In sum the NARES capacity that was developed are: the researchers' and extension workers' ability to conduct and lead participatory approaches; new knowledge on FPR that was generated; new tools to prevent soil reduction that was developed together by researchers, extension workers, and the farmers; and greater cooperation between NARS scientists, extension workers and farmers.

Regarding the 'Evolution Framework' this case would be mainly in the 2nd stage about *managing cropping systems and the beginnings of NRM*. The project's goal was to include farmers in developing technologies to prevent soil erosion while sustaining increase in yields. The project also supported using chemical fertilizers to maintain land quality, and high yields. CIAT in Thailand has slowly moved from focus on new varieties of stage 1 to sustainable practices. Although its focus is directly on the farmers and extension workers and participatory approach, it is not in the 3rd stage because it has not moved towards research on livelihoods, markets, agronomy nor it is focused on large areas of less favourable lands.

Last but not least, it would be interesting to discuss the appropriate role of CIAT in terms of scientific research. As this case demonstrates, CIAT was strong for participatory approaches to enhance extension work. Participatory approaches are not hard-core science research like developing new varieties that CIAT might have originally intended to focus on. Currently since the new 1997

Constitution that mandates participatory approaches in all public activities; participatory approaches are supported and developed by many institutions. Therefore the nature of CIAT's contribution will have to be revised if it were to have a distinct contribution to the Thai society in the future.

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3. AGROFORESTRY LANDSCAPE

Center: World Agroforestry

Theme: Agroforestry, NRM

Introduction

World Agroforestry Center (referred to here by acronym ICRAF) has a country office in Chiangmai University, in the Northern region of Thailand. The office was set around 1996, since then ICRAF has been active in projects on Landscape Agroforestry focusing mainly in the Mae Cheam Watershed area. All of the projects are under the overall direction of the global CGAIR system-wide "Alternatives to Slash and Burn" (ASB) Initiative.

Capacity Issues

In the past 10 years capacity issues⁵³ for Thailand in the area of Agroforestry in the upland area were such as:

- The lack of basic data to analyze and plan for land use in the upland areas; this includes detail maps both for official use and for villagers' use. Without proper scientific maps, disputes could not be resolved. Disputes about land use occurs between groups such as: upstream and downstream villages; side-by-side villages; and villagers and Department of National Parks officials
- At the individual level there is lack of expertise among local administrators and regional government officials in using common knowledge and computer software to analyze data to produce information for decision-making in the area of land use, which includes; which crops to grow where; boundaries of conservation forest, national parks, community forests, villages; the changes and patterns of land use among the villagers; river flows and soil

⁵³ According to interviews with NARI scientist, ICRAF staffs, professors and partners

erosion problems and so on. At the NARI level there are only 3 people in the country with PhDs in Agroforestry.

- At the structural level, the government structure does not enhance the field of agroforestry because forest matters are responsibilities of the Ministry of Natural Resources and Environment. On the other hand agricultural issues are responsibilities of the Ministry of Agriculture and Cooperatives. Like other areas of public services, team-work and integration among public agencies is the exception rather than rule in Thailand. Currently there is still ambiguity as to which organization is the official liaison with ICRAF, the Ministry of Agriculture and Cooperatives or the Ministry of Natural Resources and Environment.
- The above capacity issues also relates to the lack of university curriculum on agroforestry and the lack of integrated national policies.

Despite the above issues there were also capacity strengths ⁵⁴ :

- On the technical side - prior projects by other organizations had begun to experiment with “participatory land use planning” (PLP) methods in the area. Maps and models proved to be useful tools for discussions and negotiations about land use zones. Villagers were to develop their own maps, and their own rules for land usage.
- At the structural level - prior projects by other organizations had already shaped the Watershed Management Networks – a multi-village, multi-ethnic group to coordinate land use management across larger sub-watershed landscapes in the area.
- At the policy level - The 1997 Constitution has provisions; on local participation in natural resource management; and on decentralization. Also a Community Forestry Legislation is under consideration.

ICRAF’s Project

Realizing the above issues, throughout the years, ICRAF has worked on various sub-projects that can roughly be divided into three phases (superficially divided for simplicity, in reality phase one and two, time-wise, overlapped considerably). ⁵⁵ In the first phase ICRAF concentrated on researching and developing scientific-knowledge of local land use. The second phase involved applying scientific knowledge to enhance villagers’ participation in watershed management in the Mae Cheam area. The third phase focuses on bringing the acquired knowledge to the regional level and also to affect the national policy level. This case study will focus on activities of the first and second phases.

In 1996 the Royal Forest Department (RFD) ⁵⁶ of Thailand established a project called “the Northern Mountain Region Agroforestry Research and Development Project”, which became the official framework for ASB – Thailand consortium. This marked the first phase of ICRAF’s activities. The Thai partners initiated the interest to collaborate. The activities were to build from previous and on-going pilot research and development projects. The goals of the project were: 1) to understand processes & dynamics of land use change in Northern Thailand that is important for Montane Mainland Southeast Asia (MMSEA); 2) help develop technologies and policies that can improve land use management in the region. The hypothesis in the beginning of the activities was: understanding and better managing land use change in the mountains of northern Thailand would help both the local area and other areas of MMSEA. Funding came from mainly Asian Development Bank, Ford Foundation, and Rockefeller Foundation. A concrete result of the first phase is a comprehensive report. The report focuses on

⁵⁴ Synthesis Report (p.31-32)

⁵⁵ According to an interview with senior policy analysts of ICRAF – Thailand in May 2005

⁵⁶ Key actors in The Royal Forest Department later on moved to the Department of National Parks, Wildlife & Plant Conservation after restructure of government agencies in 2003.

trends in mosaic patterns of land use in the Mae Cheam region, especially land use practices of mountain minority communities and their impact on environmental services of upper tributary watersheds.⁵⁷

The First Phase

During the first phase training/learning activities occurred mainly between researchers of the center in collaboration with Chiangmai University professors including graduate students and the Royal Forestry Department (RFD). The RFD supplied maps of watersheds; maps of forests; knowledge on natural resource management; and knowledge on existing and previous projects in the area. Chiangmai University professors used connections with the military to obtain district and sub-district maps; analyzed the socio-economic aspects; environmental aspects; and national policies and local government. ICRAF staff provided knowledge on GIS and modeling; managed the data collection efforts; exchanged information at the national through symposiums organized by the Thai government; and exchanged information at the international level such as with World Resources Institutes (WRI) and SE Asia Network for Agroforestry Education (SEANAFE). Thus ICRAF supplied both technical scientific skills and acted as a broker to transfer ideas to-and-from the international level.

The scientific research consists of collecting quantitative data on various topics about the area to produce GIS analyses such as: population; living standards; land use; crops grown; movement of people; river flows; villages; roads; level above sea water and etc. During the process of data collection and analysis, training occurred for graduate students of the university who helped with the project under the supervision of Chiangmai University professors. This could be considered indirect training, however. By far, most direct learning opportunities occurred between ICRAF staff, professors, and RFD scientists under a 'peer-to-peer learning through joint research' mode.

During this first phase there were some direct training involved as well. ICRAF staff trained central government officials in the RFD and local government officials in the region on topics such as: computer programs to draw maps (ArcView, ArcGIS); and how to make a GIS data-base. The trainings were conducted through a 'learning by doing' mode, usually with one or two computers for the trainees to try. However, this was not the focus of the first phase; ICRAF would conduct training when it was requested. These trainings did, however, help ICRAF to have a known presence in the area and helped build networks with the local government officials, which were important for phases two and three to follow. Also the trainings helped local authorities to have basic knowledge to further sustain map making activities in the area.

According to the Synthesis Report, an important component of ASB in Thailand is the issue of 'farmers in the forest' or ethnic minorities in the Mae Cheam area that faces land use problems such as opium production, shifting cultivation, rural poverty and the impact of their land use on protected forest areas and environmental services. The second phase of ICRAF's activities moved much closer to this group of farmers.

⁵⁷ "Landscape Agroforestry in Northern Thailand: Impacts of Changing Land Use in an Upper Tributary Watershed of Montane Mainland Southeast Asia. Synthesis Report: 1996-2004." David Thomas, Pornchai Preechapanaya, Pornwilai Saipothong. (p.10) I will refer this as the "Synthesis Report".

The Second Phase

In the second phase, ICRAF received a grant from the Rockefeller Foundation to continue the center's efforts in developing science-based tools that can help improve local participatory watershed management and facilitate its integration into higher-level natural resource management policies and programs.⁵⁸ The science-based tools constituted two projects: participatory mapping; and monitoring water quality and rain levels with basic scientific tools. Following are the details of the two projects.

Participatory mapping activity is an extension to scientific research conducted in the first phase. ICRAF has chosen to work in 8 sub-districts with close collaborations with CARE-Thailand, who have been active in the area for over 20 years, under the Collaborative Natural Resources Management Project. The project aims to strengthen village conservation committees, watershed management networks, sub-district governments to manage local natural resources.⁵⁹

The process of participatory mapping is the following: needs assessment with the villagers; ICRAF staff prepare a simple map of the village; have villagers/farmers help identify land use, types of forests, names of streams/rivers according to local language, and landmarks; ICRAF staff return to office computer to make digital printout, compare with other maps and make a comprehensive map; return to village for verification; prepare common maps for government official use; hold meetings with village networks and officials to solve land usage disputes; and update maps as necessary.⁶⁰

The other activity is promoting the use of basic scientific tools to monitor water quality and rainfall in the villages situated in the Mae Cheam region. These tools are such as plastic bottles to measure rain levels; using simple thermometers to measure humidity; and observing aquatic insects to determine water quality. These tools were developed from elsewhere such as PhD dissertations and the Green World Foundation – a Thai NGO. They were introduced to the project by a key scientist of RFD who is an active partner with ICRAF. The villagers participate by regularly collecting data on rainfall, stream temperature, soil erosion, water quality, humidity and so on. Then ICRAF compiles the collected data annually to make a report and give back to the villagers. The report is used by the villagers to understand their environment and to monitor any changes.

The major mode of training/learning for this phase is direct training to villagers on how to use the simple measurement tools, how to read results, and regularly record results. Also there is direct training/learning about how to make maps, read maps, and make use of maps for natural resources management in the village and between villages. The villagers 'learn by doing' and those trained have become confident to the extent that they can teach others in the village and also in other villages through the watershed management network.⁶¹ Training occurred in 78 villages for a total of about 312 villagers and 20-30 local government officials and other NGO staffs.

Other modes of training/learning includes supervised degrees to masters and PhD students both from Thailand and from the U.S; learning by doing with partners such as CARE-Thailand, village organizations, and ICRAF local staffs themselves (two Thais and one Karen); mentoring or peer learning with Chiangmai University professors and specialists from RFD. Thus the target of training/learning in the second phase includes: villagers and villagers' organizations; NARI scientists,

⁵⁸ "Developing Science-Based Tools for Participatory Watershed Management in Montane Mainland Southeast Asia" Final Report to the Rockefeller Foundation. David Thomas, Pornchai Preeshapanya, Pornwilai Saipothong. ICRAF. 2004.

⁵⁹ Synthesis Report (p. 28)

⁶⁰ Interview with ICRAF staff July 2005.

⁶¹ Interview with two villagers July 2005.

university professors and graduate students; The settings were workshops, seminars; laboratories for computer work; research partnerships; and networks with other groups engaged in the Mae Cheam Watershed area.

Summary of Learning/Training

In sum, this case study includes both formal training and informal learning. The formal training is ICRAF staff training NARES (local administrators, villagers, partner NGO, RFD officials) on computer software for map making, map reading, participatory map making methods, monitoring the environment techniques. The settings are usually in local government small buildings or in the villages that is being demonstrated. The informal learning is ICRAF scientists collaborating with Chiangmai University professors doing joint research on GIS analysis or an ICRAF scientist is an advisor to graduate students working on their theses. There were a total of 13 PhD students (7 Americans, 1 Canadian, and 5 Thais) and 13 Master level students (11 Thais, 1 Japanese, and 1 Laotian) that were involved at some point in the activities of phase one and two from 1998-2005. All of their researches contributed one way or another to natural resources management in the Mae Cheam area. Also informal learning occurred through research, meetings, seminars, with scientists from the RFD and other Universities such as Mae Joe University working on Agroforestry.

Results / Impact

Results/contribution of the training/learning would include:

- The fact that villagers now have and can use simple and acceptable tools to monitor the environment and land use (individual level). One village upstream was able to warn villages downstream of dangers of landslide and flood in advance when they realized that the rainfall was very high consecutively for days in their area. This helped prevented serious damages.
- There is participatory map making that helps articulate local land use zoning for use in negotiating and working towards localized land use agreements. Maps are used as scientific tool to negotiate with officials on various land use disputes. (individual and community level)
- The above results help empower villagers to have knowledge and confidence in their own NRM strengths. (community and network level)

Evidence of impact at the organizational levels and policy levels are such as:

- In collaborations with partners, ICRAF is currently beginning to test/apply Mae Cheam's ASB findings in other watershed sites with financial support from the Thai government. Also ICRAF is extending its activities to the whole Mekong Region.
- The Mae Cheam Watershed Management Network is becoming stronger. It is the first watershed network to receive funding from the government of 1.3 million baht this year (2005) under the national program to Restore the Ping River Basin. Within the Network there are 25 sub-watershed groups. The 8 sub-watershed villagers that participated with the participatory methods are now planning to train representatives from other sub-watersheds with little official help from ICRAF.
- According to interview, ICRAF's presence fills in the gap in Thailand's government structure that does not facilitate Agroforestry. ICRAF's ideals and goals support integration of agricultural, forestry, natural resource management and community building. This approach is very much needed in Thailand as the country is moving from relying on one-land one-crop mentality to more sustainable and diverse natural resources management practices.

There are negative/weak points to be considered as well:

- Some of the villagers were paid to collect data for both map-making and monitoring the environment. Now after the project is complete some villagers are not continuing the process. Therefore the maps are not updated regularly and the data analysis for environmental monitoring is not complete.

- The maps ICRAF made uses 'words' to label the various land use. But some villagers cannot read. CARE –Thailand has developed a new way by using the actual crop seed as symbol for villagers to know what is planted where. So they can see and feel the real corn seeds, rice, tea leaves and other crops on the map.

Existing Capacities

However, having stated the above, prior to ICRAF's presence in the region, other players such as the Royal Forest Department, Queen Sirikit Forest Development Projects, The Royal Project Foundation, and Raks Thai Foundation (or CARE-Thailand) were already active in the region. Most of the knowledge used in ICRAF related projects could be traced back to those existing projects. Among them was the Sam Mun Highland Development Project (1987-94) – a large scale project focusing on opium crop substitution, which pioneered 'participatory land use planning (PLP)' methods and 3-dimensional land use models (i.e. mapping). This influenced the participatory approach of using simple scientific tools to monitor water quality and participatory mapping by ICRAF. Although, ICRAF has integrated new knowledge, developed it further, and has created platforms for learning for people from various groups that were involved such as: policy makers, scientists, professors, volunteers, villagers, neighbouring watersheds, and the international community. Nevertheless the impact made by ICRAF should not be overemphasized, especially without making credit to other organizations.

An interview with RFD official confirmed the above when he said ICRAF's contribution is only about 1% of all the research and funding the Royal Forest Department is doing. Major partners for the Ministry of Natural Resources and Environment are the Australian government, CIDA, JICA, and International Tropical Timber Organization (ITTO). Also an official from CARE said ICRAF is valuable for specific research assistance such as GIS analysis and modeling but CARE is directly in the 'development' field and has the expertise on improvement of livelihoods. CARE has been making simple maps with villagers for a long time but just has not used computer technology.

Learning / Training Analysis

This case represents mixture between a 'collaborative research case' and a 'closer to farm/extension case'. Referring to the tentative framework of 'Evolution of Agricultural Systems and the Role of CG' this case study demonstrates that there is a rough linear movement from stage two to stage three in the first and second phase of ICRAF's activities. Also the third phase from 2004 onwards ICRAF is moving towards more regional research and collaborations, at the same time showing more influence at the policy-making levels through partnering with the NARI. Evidence are such as: ICRAF's international staff becoming an active consultant for the Ministry of Natural Resources and Environment at the policy level for participatory watershed management; a proposal to Rockefeller June 2004 to conduct similar research in the Greater Mekong Region (Vietnam, Lao PDR, Yunnan).

Future of ICRAF

Currently as ICRAF plans for new activities that are extensions of phases one and two, there is evidence that priority setting is led by the NARI because ICRAF now makes proposals to the Thai government to undertake research projects and consult in Agroforestry according to the needs of the government. Therefore, this confirms that as agriculture evolves the role of the center in setting priorities diminishes. However, ICRAF would still be considered a strong partner in the subject for the Thai government especially for Agroforestry. This is so because of the ICRAF's own capacity on specific scientific knowledge on GIS analysis, and strong networks with Chiangmai University professors and other university and research centers in the region such as Vietnam, Laos, and China.

Conclusion

The case demonstrates ICRAF's activities in Thailand and the region. ICRAF is an important partner for research projects for universities. This is clear in the first phase. In research projects, learning occurs for all participants. University researchers learn as much as ICRAF's scientists themselves. There was no direct training but rather a peer-to-peer learning mode. The research relied equally on expertise from all sides. The intention to develop capacity for a particular group was not clear. It was rather to enhance the 'knowledge' on Agroforestry itself.

In the first phase there was minor direct training to the local government officials on computer and mapping skills. This was not the major aspect of the project. But it did help lay the foundation of knowledge for local administrators on the subject in order to prepare them to the second phase.

In the second phase there was direct contact with the villagers, NGOs, local administrators in the field under studied. The training / learning occurred through the activities of making maps and implementing tools to monitor the environment together with the villagers. The intention was to develop the villagers' and the communities' capacity in natural resources management. ICRAF had a distinct role in putting together existing knowledge from partners, including the Department of Forestry and Chiang Mai University to develop and implement these tools.

Evidence of capacity enhancement for the villagers is such as some usage of maps to resolve land-use disputes. However the question still remains as how long the activities of environment monitoring will continue once ICRAF has stopped its interventions. Also it is nearly impossible to assess its contribution to great goals such as poverty reduction or sustainable agriculture. But the concept of having a map for decision-making of land use should somehow contribute to finding solutions to slash and burn practices in Thailand.

However, overall ICRAF's activities are seen as positive and successful. This is due to the existing strong capacity of the NARS and the potential of villagers' networks to take on large scale IRNM projects. ICRAF shows efforts to shift its focus to the region and to the policy-levels in Thailand. One last observation is the fact that this case relies largely on the leadership of the long serving ICRAF scientist in Thailand. ICRAF's role is expected to diminish when he retires. The table below summarizes this case for both phases.

	NARS Capacity	Outcomes	Results
<i>Productivity, intensification and yields</i>	-	-	-
<i>Managing farming systems</i>	More graduate students know scientific knowledge for GIS analyses and modeling, socio-economic analyses, environmental impact studies. (esp. phase 1)	More research generated. More experts in the field of Agroforestry.	Better research on specific practices of agroforestry and NRM for upland Thailand.
<i>Bridging the 'adoption gap'</i>	<ul style="list-style-type: none"> • Participatory Mapping • Participatory monitoring of environment by using simple tools • Village organizations strengthen (esp. phase 2) 	Greater uptake of innovative technologies. Updated maps to use in natural resources management disputes: upstream and downstream villages; community forest boundaries and national parks.	Solving disputes, cooperating-strong network in managing the watershed area. Sustainable, planned land use. Monitoring environment and capacity building/empowering villagers
<i>Policy, national level impact</i>	Scientific research to support tools for participatory NRM and pilot projects to make/advocate policies (future phases)	Enhance new initiatives to expand participatory practices of NRM to other watershed areas of the country	Other watershed areas can learn from Mae Cheam area. Hopefully resulting in sustainable NRM schemes. National policies moving in the same direction.

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"Landscape Agroforestry in Northern Thailand: Impacts of Changing Land Use in an Upper Tributary Watershed of Montane Mainland Southeast Asia. Synthesis Report: 1996-2004." David Thomas, Pornchai Preechapanya, Pornwilai Saipothong.

Interviews

1. ICRAF staff

- Mr. David Thomas (CM office) – International Scientist
- Ms. Anantika Ratnamhin (CM office)
- Mr. Sonat Natee (Mae Chaem office)
- Mr. Sunthorn Sepan (Mae Chaem office)
- Mr. Thanat Promduang (former project staff)

2. Partner staff

- Dr. Pornchai Preechapanya, the Royal Forestry Dept.

- Mr. Wuthikorn Khojornrungrot (CARE Thailand)

3. Volunteer villagers involved

- Mr. Somyos Chokskullert
- Mr. Sudee (Village Head)

ANNEX XIX

Vietnam country report

Introduction

Vietnam is a country with agricultural based economy. The agriculture sector has achieved a high and stable growth which has turned Vietnam from a food deficit country into the world's second-largest rice exporter. This achievement thanks to the change from centralize economy to market oriented one of macro-policies, besides, the rapid changes in science and technology in agriculture has played a crucial role to these achievements.

Despite these high successes, Vietnam still is a poor country with low agricultural productivity. In order to become a strong country, the state has increase investment in agricultural research for rapid change in science and technology.

Important policies on science and technology in agriculture

According to the Master Plan for Agricultural Research in Vietnam, the Government intends to increase investments in science and technology, focusing on the seed sector and on technical procedures for higher economic efficiency besides maintaining the activities of existing research institutions (UNDP/FAO VIE 98/019.08, 2001).

Agricultural Research system

Information and new technology in agriculture can transfer to farmer via several ways: agricultural research system and agricultural extension under the management of Ministry of Agriculture and Rural Development, Agricultural Universities (under the management of Ministry of Education & Training and Ministry of Science & Technology).

Agricultural research system

Vietnam has 32 agricultural research institutes and centers, of which 22 are under the Ministry of Agriculture and Rural Development (MARD). Coordinator for Research fund is granted through Ministry of Science and Technology, but research institutes are under MARD's control. Some projects and programs are managed by Ministry of Science and Technology, some are managed by MARD. Agricultural Research institutes are classified into 3 kinds: the specific research institutes specializing in technologies, soil and fertilizers, plant protection, post-harvest technology, etc. The others are regional research institutes such as Vietnam Agricultural Science Institute (VASI, Northern), Southern Agricultural Science Institute, Mekong River Delta Rice Research Institute, etc. Some specific research institutes such as National Tea Research Institute, Coffee Research Institute, Sugarcane Research Institute etc are under the management of enterprises.

Agricultural Colleges

Research from Agricultural Colleges can be funded from Ministry of Education and Training or Ministry of Science and Technology. Their findings can contribute directly to farmers/farmer clubs or via co-operatives as well as extension system by short training courses. There are joint research among agricultural institutes, agricultural colleges, extension agencies, international non government organizations or even national non government organizations. However, this integrated information system link is weak. (Chart 1)

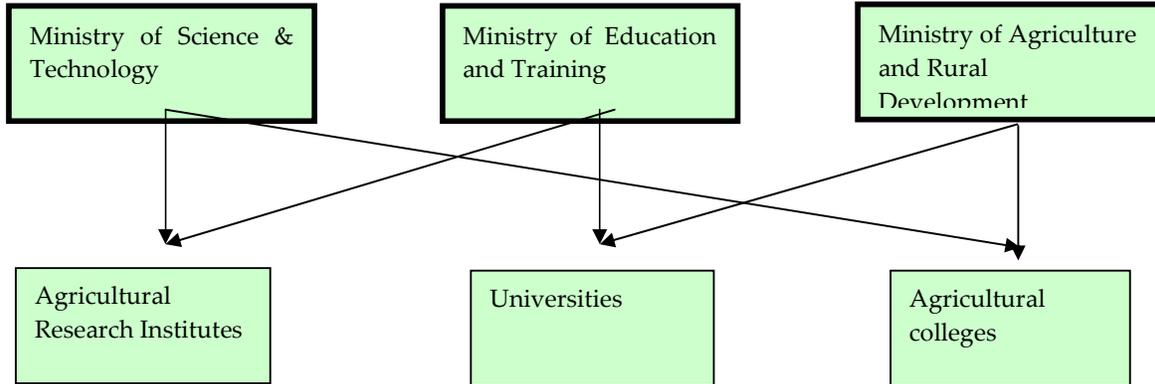


Chart 1: Agricultural research organization

Agricultural Extension System

The official extension system was established in 1993, under the management The Department of Agriculture and Forestry Extension of Ministry of Agriculture and Rural Development (MARD). The system ranges from the central to the grassroots. It has organized on four levels: The national (central) department, the provincial (Extension Center), the district level (Extension Station), and the village (extension agencies/ or Farmers Clubs).

Information and new agricultural technology can deliver to farmers by official extension system via many channels. (i) Companies (private/public) have provided farm inputs and others service units. They also play an important role in agricultural extension when they deliver their products directly to farmers or advertise their products via mass-media. The other organizations (i.e. Youth groups, Women's organizations, Farmer associations) play an intermediate role in providing information and supporting technology transfer to farmers, either directly or in cooperation with the official extension system. In provincial level, Extension Center plays a main duty in addressing extension program from Agricultural and Forestry Extension Department of the MARD and link other organizations that has worked in agriculture. At district level, extension station is the one to put into the practice extension programs. There is also the joint among agricultural organization to carry out extension activities. At village level, extension agents joint with agricultural organization (agricultural colleges) address directly to farmers or farmer groups for transferring technology (Chart 2)

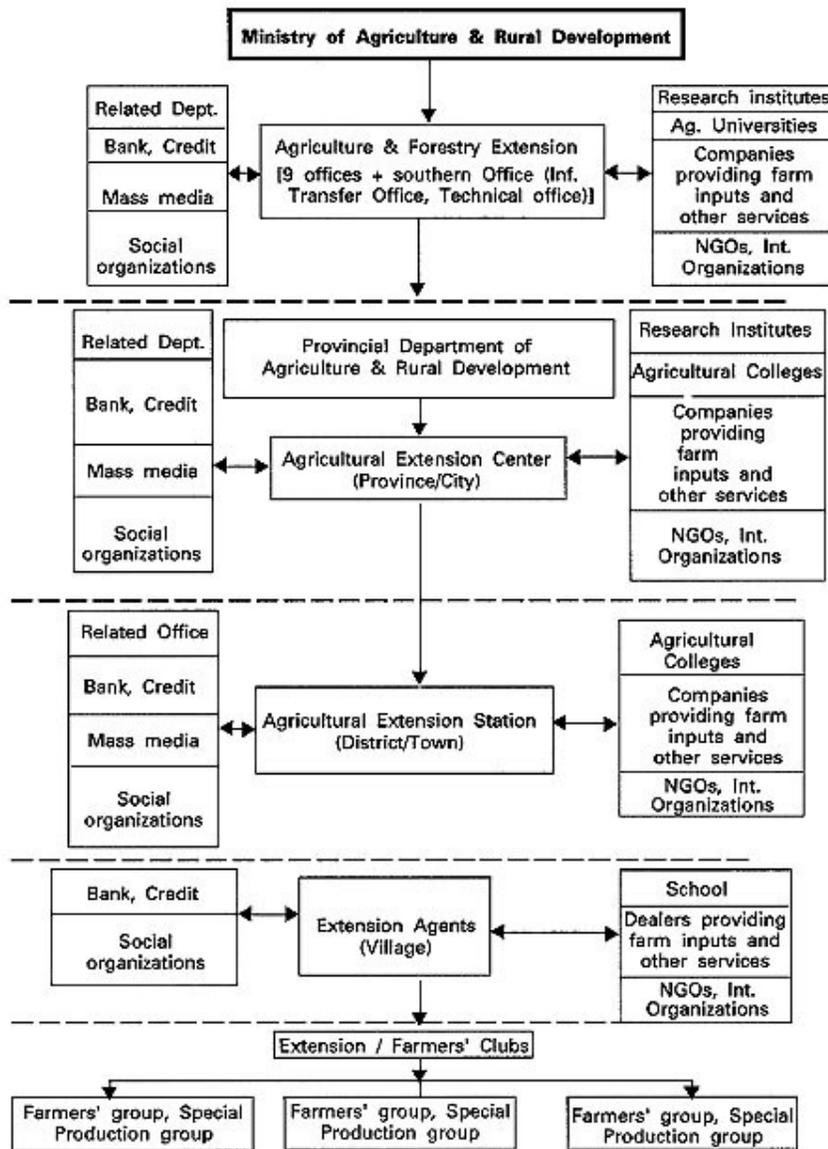


Chart 2. Agricultural extension system

Source: Food –Fertilizer Technology Center (FFTC). The flow of information in the national extension system and current information needs in Vietnam

CGIAR and Vietnam collaboration

Vietnam has collaborated with many International Agriculture Organizations in order to develop its agriculture and rural development in which Consultative Group in International Agricultural Research (CGIAR) is one of them.

The International Rice Research Institute (IRRI)

IRRI was established in 1960 to conduct research that helped developing countries grow more rice . Its financial support came through the Consultative Group on International Agricultural Research

(CGIAR). The Institute's interdisciplinary approach was based on close collaboration with national agricultural research system and advanced laboratories worldwide. Vietnam and IRRI have enjoyed a long, fruitful history of collaboration by adoption of IR8 in 1968. After reunification of the country in 1975, IRRI and Vietnam has re-established contact. Planting modern rice varieties of short duration, improved management of resources, and appropriate government policies in agriculture had planed with the help of IRRI. These activities included:

Improvement of rice varieties

Exchange of germplasm between Vietnam and IRRI had been established from 1968, since then, a total of 42 breeding lines had been released. Since 1983, IRRI had helped Cuu Long Rice Research Institute for developing hybrid rice technology for farmers in Mekong Delta provinces. In 1992, CLRRI released IRRI hybrids IR6461H and IR6416H as URL1 and UTL2 in demonstration field. Hybrid Rice Center, Vietnam Agriculture Science Institute, Northern Vietnam has continued to do this research for releasing hybrid rice varieties in Northern and Central Vietnam.

Vietnam also participated on the International Network for Genetic Evaluation of Rice (INGER) coordinating by IRRI for exchanging and evaluating of promising breeding lines among rice -growing countries.

Germplasm conservation

Vietnam's participation in IRRI's germplasm conservation program had resulted in 1,895 registered accession and 10 samples of three wild rice species. Since 1995, IRRI had collaborated with Vietnamese institutions to carry out research using on- farm conservation of the gene pools (Fact about Cooperation-Vietnam and IRRI).

Biotechnology.

Vietnam is a member of ARBN (Asia Rice Biotechnology Network), via this activity, IRRI helped CLRRI in variety selection strategy via photon marker. This method helped in rice variety selection which resistance to brown plant hoper (BPH), Blast, tolerance to acid sulfate soil and diseases. With this program IRRI has trained for CLRRI one Post Doctor, 1 Ph.D. The collaboration IRRI-CLRRI on "Micro Nutrition Dense Grain Quality in Gene Transformation and Golden Rice project has done. Besides, CLRRI is one member of Consortium of Eco-tilling Functional Genomic, when ever they need, they can take the material with them go to IRRI for analyzing.

Sustainable rice farming systems

Research in integrated pest management (IPM), integrated nutrient management, "3 reductions 3 gains" for improving farmer benefit in rice production, improved water management and rice based farming system was new dimensions for sustainable intensive agriculture in Vietnam.

Social Sciences an economic researches

IRRI has collaborated with several Vietnamese institutes for conducting social sciences and economics research in the country: The Impact of adoption modern rice technology, the experience in hybrid rice adoption, and gender issues in rice based farming system.

Training of Vietnamese scientists

Human resource development had been emphasized in Vietnam-IRRI collaboration. From the beginning up to 2004, there was 639 scientists have trained at IRRI of which 28% are female. Almost of them has followed group training. Many of them held key position in Vietnam agricultural Institutions. (Table 1)

Table 1 Vietnamese scientists have been trained at IRRI 1964- 2004

Period	MSc	Ph.D	Research Fellow	Non-degree	Group training	Total	Female	% female
1964-1975	2	2	2	8	16	30	7	23.33
1976-1994	25	7	5	82	222	341	76	22.29
1995-2004	19	17	0	97	135	268	98	36.57
Total	46	26	7	187	373	639	181	28.34

Sources: Vietnam-IRRI partnership and IRRI 's Training Center

CIMMYT in Vietnam: Collaboration between NMRI and CIMMYT in 2001- 2005 period

Activities	Duration	No. of participants	Fund (US\$)	Results
Project: Asian maize biotechnology network				
1. Genetic Diversity Analysis 2. MAS for quality protein maize 3. Mapping of drought tolerance in maize	2002- 2004	20	30,000	Enhanced capacities in applying Biotechnology in maize breeding
Project: Improving farmer's income through enhanced maize productivities in drought prone environments in East and Southeast Asia				
1. Evaluating and selecting germplasm from both CIMMYT and Vietnam for drought tolerance 2. Developing new varieties from selected Germplasm 3. Disseminating new varieties into productions	2005- 2007	30	13,300	Beginning from July, 2005
Other cooperation				
1. Conducting testing new varieties which are developed by CIMMYT in 2 locations of Vietnam 2. Visits, workshops: annual, there are about more than 10 NMRI staff attending short training course or study tour, which organization by CIMMYT. There also are about 5- 10 visits Vietnam of CIMMYT experts for training, Scientific workshop, meeting 3. Change information: CIMMYT usually send NMRI new publications and annually, NMRI send reports to CIMMYT	annual	6		

The activities of the first project:

- Offering a training course on biotechnology in selecting maize varieties in Vietnam for 20 persons
- Equipping a biotechnological lab. With the value US\$ 10,000
- Analyzing genetic diversity of 300 seed's sources from CYMMYT and NMRI

It is difficult to evaluate the impact of the collaboration between CYMMYT and Vietnam because it was continuing from years long ago. However, we can say that the help from CYMMYT has contributed to the maize development in Vietnam via the training and material.

CIP-Vietnam

A. General Background

CIP has collaborated continuously with Vietnam since 1981 up to the present. The CIP-Vietnam relationship is very useful in root crop development. Its activities in Vietnam can be classified into five categories:

1. Consultancy

CIP's scientists have visited Vietnam via consultancy activity. It helped Vietnam in enhancing capacity of NRIs via training activities even during the time Vietnam was under USA's embargo. Eight CIP scientists have contributed as long term consultants between 1982 and 2005. In addition, Vietnam's government offered the Friendship Decoration to CIP's Director General, in 1993 for the acknowledgement the good collaboration between Vietnam and CIP in R&D in cassava, sweet potatoes and other root crops in Vietnam.

2. The role of catalyst in looking for funding for Vietnam

Since 1981 up to now, CIP has played a catalyst role to help Vietnam in getting fund for many international projects to undertake research in root crops.

- i) IDRC, Singapore has funded for Vietnam in the Genetic Selection root crop project.
- ii) The R&D in planting potatoes by hybrid potatoes seed. This project is divided by two phases:
 - Phase 1: 1994 – 1997
 - Phase 2: 1997 – 2000

The program included Vietnam, Philippines, Indonesia and Sri Lanka. Thanks to it Vietnam has planted 4000 hectares potatoes by hybrid potatoes seed every year at that time. From 1997 to 2000, Vietnam was granted a project: Hybrid True Potatoes Seeds by ADB via the catalyst of CIP. This program helped VN planting 4000 hectare potatoes per year. The program integrated crop and livestock: sweet potatoes-Pigs run by Ms. Nguyen Thi Tinh.

3. Material supplied

Since 1982 up to the present, CIP is continuously offer root crop seed for VN:

- Potatoes seed by HYB-TPS (Hybrid true potatoes seeds);
- Germplasm Potatoes distribution. This program has helped Center for Root Crop at VASI created a lot of good potatoes varieties such as: KT-2(1995), KT-3 (2000) and VC-3806 (2002);
- The program of HyB-TPS with many seeds have sent to Vietnam from CIP such as HPS II/67 (Hong Ha 2 in Vietnam name), HPS 7/67 (Hong Ha 7).

In the present time, CIP has given for VN the two seed sets:

- -Late Blight (*Phytophthora infestans* Mont. Der Bary);
- -Potatoes seed with virus resistant .

Regarding R&D in sweet potatoes, Dr. Peter Van Dezags, the CIP's scientist and Dr. Mackey, IDRC's scientist has established a group in looking for fund to do research in sweet potatoes in Vietnam. Later, in 1989 the three Vietnamese scientists : Dr. Hoang Kim, Dr. Nguyen Van Quang and Dr. Mai Thach Hoanh left for the Philippines to attend a short training course in selection PTC of root crop via the advisory of Dr. Per Van Dezags. Due to the successful of this program, in 1991, IDRC approved a project to establish root crop program for all the three regions of Vietnam.

4. Scientific document

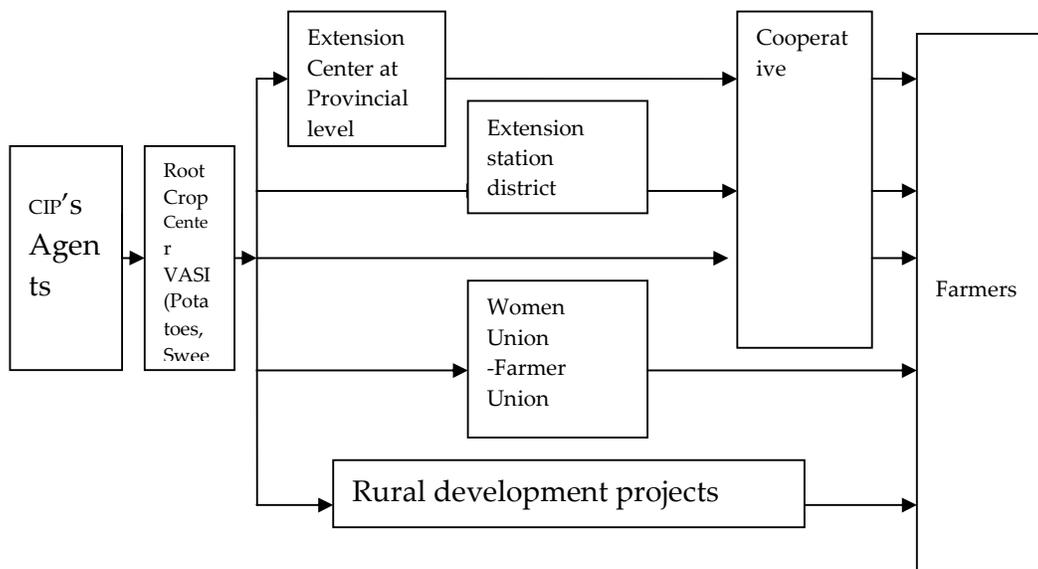
CIP has sent a lot of valuable scientific document in method of research and other valuable scientific document. This has improved research capacity in potatoes and sweet potatoes of Vietnamese scientists.

5. Training

CIP has helped Vietnam in enhancing NRI capacity by funding to Vietnamese instructors and researcher to pursuit degree course as well as non-degree course. There are at list three instructors to gain Doctor of Philosophy ⁶²and approximate 10 persons who have gotten master degree via CIP's scholarship⁶³. It was around 150 person times going to CIP's locations in the Philippines, Indonesia or other CIP's locations in the world for attending short training course in root crop (please see the list of ex-trainees, VASI).

CIP's methodology in training and approaching to farmers via scientific agents, extension workers, short training course, classroom, laboratories practice. (Germplasm Management, Seed selection, etc.) As well as on farm research through cooperatives or women and farmer union via method of learning by doing. The network has approached farmers in divers channel as presenting in the figure below.

Figure 1 Network in Root Crop development in North and Center, Vietnam



Nowadays, there are several programs from VASI in connecting with CIP's locations:

1. Program of integrated between Cropping and Livestock in Sweet potatoes-Pigs.
 2. Research on Potatoes seed selection.
 3. Scientific material, visiting scientists, consultancy.
 4. Collaboration with Root crop Center in the Northern Philippines via CIP
- CIP's Scientists visit VASI twice a year.

⁶² Dr. Pham Hong Duc Phuoc (Former Head, Department of International relationship, Nong Lam University, HCM City)

Dr. Pham Xuan Tung (Deputy Director, Institute of Agricultural Science of South Vietnam)

Dr. Vu Dinh Hoa (Head, International Relationship, Hanoi Agricultural University)

⁶³ Mr. Dao Huy Chien, Director, Root Crop Center, VASI

CIP direct managed the program in seed root crop selection. This is collaboration among CIP-VASI- and Department of Agriculture and Rural Development- Da Nang province (Center Vietnam).

ICRISAT in Vietnam

The Legume Research and Dev. Center (LRDC) at Vietnam Agricultural Science Institute (VASI) has collaborated ICRISAT for years. Almost of its staff were trained at this center, besides the increasing of knowledge on their major field, they have improved their capacity in research methodology and a scientific report. Furthermore they knew how to collaborate with international scientists and doing international projects. Since 1988 up to the present, ICRISAT has continued to help this center with many activities:

- 1988-1993 Project on farm research network. This is a Cereal Legume Asian Network (CLAN).
- 1995-2005: A project on Improving Watershed management. There are several countries participated in this project such as China, India, Thailand and Vietnam. The ICRISAT played a crucial role on this project. It is divided into 2 phases: the first phase was in principal research (1995-2000) and the second phase was expanded to the extension activity for farmer involving (2000-2005). The main theme of this project is improving the natural resources management of sloping land in Northern Vietnam. In this context, soil is protected and increasing its fertility via rotating peanut with maize seasonal during a year. Via this project, there were 4 staffs to be trained in short time and 2 staffs with Master degree by the ADB's scholarship.
- - The "Program for Farmer Participatory Improvement of Legume Grain in Rainfed Asia" (IFAD Technical Assistant Grant No. 532 ICRISAT 2002-2005) included Vietnam, China, India and Nepal. In Vietnam, there were several National Agricultural Research Institutes that involved to this activity including (i) National Institute for Plant Protection, (ii) The Legume Research and Dev. Center (VASI), (iii) Institute for Vegetable Oils; Aromas and Cosmetics Ho Chi Minh City; (iv) Vietnam and Plant Genetic Department (VASI). One international workshop was held on 12-17 May, 2005 in Vietnam for exchanging the research findings. It also offered for 2 Vietnamese scientists visited China via the exchanged scientist program among the participated countries. Poor farmers gained from this program in improving their crop productivity via the following activities:
 - Transferring new technology
 - Giving new varieties,
 - Multiplying variety training

In this activity, the Legume Research and Dev. Center at VASI invested variety, fertilizer and pesticide for farmers with free of charge in the first time, and later, farmers can multiply themselves. The activities of this program followed these steps:

- Training farmers at Cooperatives' offices;
- On farm training practice, especially for minor people farm (Tuyen Quang province, Northern Vietnam);
- It was evaluated the results on the first season at the harvest time by the evaluation team including government officials at Provincial and District level : the Department of Agriculture and Rural development, Extension staffs and commune's officials. On this occasion, there were also many other farmers invited as observers. Farmers who involved on this program selected suitable varieties themselves for the second season on harvesting time with the consultancy of VASI's scientists. Since the third season, farmers multiplied varieties and trained themselves with the technical support from LRDC, VASI. By good evaluated results, Department of Agriculture and Rural Development at provincial level would expand this activity for whole the province.

The network among the following institutes has established for legume crop extension:

- The Plant Protection Institute in charge an IPM issue;

- The Legume Research Development Center supplying variety;
- The Institute for Vegetable Oils (Department of Industrial crop);
- Extension agencies at all levels;
- Private seed company;
- Private Fertilizer company.

Via TOT (Training of Trainers), they have trained farmers to be extension agents directly; farmers exchanged their knowledge, experience, and used technologies themselves. In every workshop, farmers have presented their activities in seed production. This activity has expanded to whole area in province.

Since 1988 up to the present, ICRISAT has continued to help the Legume Research Development, VASI, to focus on peanut study. With this collaboration, it would help farmers to enhance their capacity in peanut production, scientific knowledge, increasing productivity and improving farmer income and their livelihood.

Conclusion

The collaboration among several International Agriculture Research Institutes of CGIAR has helped Vietnam in developing agricultural research and technology transfer as well as staff training. There are several top leaders of Vietnamese agriculture sectors were trained at IRRI (Dr. Bui Ba Bong, Deputy Minister, Ministry of Agriculture and Rural Development, Dr. Bui Chi Buu, Director, CLRRI...). This suggests that the collaboration has enhanced human resource development in Vietnam. Besides, the help of these institutes will be useful for NARIs of Vietnam especially in future; trade liberalization will create many challenges for Vietnam on the competitiveness among the world agricultural products.

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ANNEX XX
Case studies from Vietnam

CASE STUDY 1: SWEET POTATO AS PIG-FEED

Center: CIP

Theme: livestock, crop breeding

CIP R&D of Potatoes in Vietnam and the program of crop livestock integrated: the case of Sweet potatoes-Pig rising

CIP has helped Vietnam in development of sweet potatoes since 1997. At that time CIP and UPWARD's organization has developed a poor regions in Northern and Center Vietnam by root crop .Ms. Dai Hung Peter, CIP's scientist, introduced the program of improved integrated crop-livestock system by the case of Sweet potatoes –Pigs. Based on the needs of farmers, who did not know how to reserve sweet potatoes after harvesting .The program has supported farmers new sweet potatoes varieties, with high vine and root yield and method in processing sweet potatoes in reserving for longer use to feed pigs. There are three groups of researchers to participate to this program:

1. Agronomy group: Associate professor Mai Thach Hoanh, VASI: Dr. Nguyen the Yen (food crop);
2. Animal husbandry: Ms. Nguyen Thi Tinh;
3. Veterinarian: Dr. Nguyen Van Thach, Hanoi Agricultural University.

Regarding sweet potatoes varieties, VASI would give it to farmers with free of charge. However, they have to pay a half of cost of pig and the other half of cost to buy pig was given by CIP and UPWARD. All related document instructs how to plant sweet potatoes and process them for pig-feed was given free of charge too.

Selecting and growing sweet potatoes

In 1997, Helela, name of sweet potatoes variety was introduced to VASI with characteristics of high vine and root yield as well as high protein. It can be eaten raw by pigs. Helela was multiplied into the new variety namely H12. Its vine yield was about 25- 30 tons and its root yield was approximately at 10 tons per hectare. H12 variety can plant in drought area, it resists to dry leaf disease. Areas under this variety were about 1000 hectares and accepted as national variety. The other variety : TV1 (TQ1) was developed 1995 when Associate Professor Mai Thach Hoanh worked two months at Xuchau Institute, China. TV1 variety with a characteristic of short maturation can grow in winter season after harvesting rice. They were evaluated and planted in the area of more than 3500 hectares in Quang Xuong and Cam Thuy which are mountainous districts, belong to Thanh Hoa province. Since 2004, these varieties have expanded for planting in several provinces such as Thai Nguyen (Pho Yen districts), Ha Tay (Hoai Duc, Phuc Tho district), and BAC Giang (Hiep Hoa and Viet Yen district). The other popular sweet potatoes are K51 and KB1 with high yield in vine and root were developed at VASI can be seen in a large area in North-West Vietnam. Developing sweet potatoes returns benefit for farmers in the three aspects:

- 1) Farmer have green leaves for pig rising;
- 2) Reducing percent of fallowed land in drought area because this land covered by sweet potatoes;
- 3) Integrated planting sweet potatoes in annual trees area, wild weed can not grow, and protecting soil from erosion.

Processing of vine and root for pig-feeds

There are 3 formulas for processing pig-feed:

- 1- Fermenting fresh chopped vine and root of sweet potato plus 5% of salt;
- 2- Pre-wilting chopped vine and root of sweet potatoes under the sunshine for one day and plus 5% salt;
- 3- Using the first formula and adding 10 kg rice bran, chicken manure and 5% of salt.

Farmers can apply one of the three above formula; however, the third one was evaluated as the best. All of material is ensiled for fermenting. It requires an anaerobic environment. So the pre-requisite condition for fermentation is to eliminate as much as the air from the fermenting material. After 20 to 25 days fermenting, it can be eaten by pigs. This kind of feed can reserve for pigs to eat for 6 months.

The program of seed potatoes –pig rising has applied to 6 provinces: Ha Tinh, Nghe An, Thanh Hoa, Ha Tay, Bac Giang, Thai Nguyen where they have a large area with SP and rising pigs. Initially, they collaborated with the extension centers/stations of provinces/districts to conduct the training, but these activities failed because they could not approach farmers who are pig- rising and interested with the program. Finally, the program has conducted by the way training of trainers (TOT) and farmer to farmer (FTF) since May 2002. By this way, the program can approach the target groups with low cost. They has selected the appropriate communes and chosen 3 participants for each side to open the course training to trainer (TOT). The 2 participants should be leaders of the commune such as Head of Farmer, Women Veteran...etc Unions. The third person has to be a farmer, who is planting sweet potatoes and rising pigs. With this way, after attending the course, participants would open the course for farmer to farmer (FTF).

- The course lasts 4 days with the contents as following;
- 2 days for organization and method of processing,
- 1 day for sweet potatoes planting technique and
- 1 day for veterinary aspect.

Using LCD and Over head projectors, Ms. Nguyen Thi Tinh has given them a lot of pictures on the SP planting and feed processing as well as the way for pig rising at the course .All the material were supplied to farmers by the organizer with free of charge.

The program in practice: 6 farmers were interviewed in Aug.8, 2005 in Hong Tien village, Phu Yen district, and Thai Nguyen province:

1) Ms. Nguyen Thi Dung , Head, Farmer union

She attended TOT training course in May, 2002. There were 30 participants from 7 provinces⁶⁴ in Northern and North southern coast attended this course.

After attending this course, Ms. Dung organized 4 farmers to farmers training courses (FTF) with the same contents for 120 participants during 3 years from 2002 to 2004. The first course was organized at her house and the rests at the Cultural House of the communes. In comparison with the traditional way with the new method in pig rising, farmers can save a lot of money and time because of not to buy much vegetable and cooking feed for pig. Besides, the quality of pigs is good, it has not much fat and fast growth. Income from pig rising has increased from 20 % in 2002 to 30% in 2004. This program has benefit to farmers in many ways, women labour force is released from cooking for cultural

⁶⁴ Name of 7 provinces: Hung Yen, Hai Duong, Ha Tay, Thai Binh , Thai Nguyen, (Northern) , Nghe An, , Thanh Hoa (North Central Coast)

activities. (Ms. Nguyen Thi Dung, Aug.8, 2005). However, there were approximately 10% of participants failed because they did not follow the technique in feed processing exactly. Besides, due to the low educated, they do not know much the names of medicines and how to take care pigs when they were gotten disease. Ms. Nguyen Thi Dung suggested that the time for learning veterinary and how to take care pigs should last longer in stead of lasting only a haft day.

2) Mr. Duong Van Ho

He has trained via the FTF course from Ms. Nguyen Thi Dung in 2002. Due to good pig rising in practice, he became a trainer in TOT training course in the second course at the commune.

Mr. Ho attended the first FTF course at Ms. Dung house with the other 28 persons from the same commune. The contents of the course covered how to plant SP and feed processing as well to prevent disease from pig. After the course, he has applied the method of feed fermenting right away. Material for processing can be SP vine, cassava leaves.... Before attending the course, he used to raise only 4 to 6 pigs for each batch, but from the time he has learnt the new way in pig rising, he raises more than 30 pigs per batch.

After the first course at Ms. Dung house, Mr. Ho accompanied Ms. Dung as a role in veterinary to open the FTF training course with 40 participants. However, there were only 55% of them (22 persons) who has applied a new method, the rest 45 % refused to do because they did not believe the new method as well status quo situation they did not like to change their old habit in pig rising. According to Mr. Ho, his income increased 20 millions VND per year after applying the new method in pig rising. Beside, almost of his land is planting SP in stead of let it to be fallowed in the winter season after harvesting rice as before. He is now doing not need hire his labor. The quality of meal every day is improved with meat more than four times as before with vegetable only. With income increased, he has bought more land for his son, motor bicycle, a truck and built a new house. His life is changed from the time to attend the training course in SP-pig rising.

Suggestions from Mr. Duong Van Ho:

- This program should expand as must as it can to help farmer changing their life
- Should introduce new SP to farmers
- Should maintain the training course every year for farmers
- Should synthesis the Ex and Proof the program and multiply the success case in the commune

3) Ms. Dam Thi Thao, Head, Nong Dan Union in Hong Tien commune:

In 2002, when Ms. Thao did not participated to the program yet, she learnt how to ferment pig feed via the other farmer in the commune. She wished she would be participated to the training course. In 2003, she has participated to the training course at the Cultural House, Dong Xinh hamlet, Hong Tien commune, Phu Yen district, Thai Nguyen province. There were 30 participants, all of them from the same commune. They have learnt the new way in planting SP, fermenting pig- feed and veterinary. The most benefit for farmers is do not need to cook feed for pigs or to get vegetable every time. She has used cassava leaves, peanut leaves and other vegetable in fermenting pig- feed. Profit from rising pig has increased 3 times in comparison with the traditional method due to saving a lot of wood in cooking, not to buy much rice bran and saving time , labour force because of not to cook pig feed.

Among the 30 participants of the course, there were several persons who did not apply this method because they do not have land for planting SP, or did not apply exactly the formula in fermenting feed-pigs so pigs refused to eat. As Mr. Duong van Ho, Ms. Thao also suggested this program should maintain and expand due to more benefit to farmers.

4). Mr. Do Hong Nhi,

Mr. NHI has participated to the SP-Pig rising via the course organized by Ms. Nguyen Thi Dung. It is the first training course via FTF (farmer to farmer), all the three instructors has learnt the method of SP planting and Feed processing from Ms. Dung (Mr. Dai. Mr. Toan and Ms. Dung). This time, they were supplied a chopping machine the total participants were 30 but there was only 10 persons has applied this method in because farmers like to plant more valuated vegetable with fast in getting returns. However, they like the new SP variety, K51 because of the good eating quality and high yield of vine as well as the roots. From the time participating to the training course, Mr. Nhi has saved much more money because he did not buy much rice bran or instant mixed bran as before. According to him, the cost in pig production by the new method has reduced 40 %. He suggested the program should pay more attention on veterinary.

On that time, we have visited the other two participants of this program: Mr. Nguyen Van Thang and Mr. Hoang van Cu. All of them still rising pig with the method of fermenting pig feeds. Everybody is happy due to the large benefit of the program has brought to them.

CASE 2: THREE REDUCTIONS-THREE GAINS

Center IRRI,

Themes: NRM, Crop Protection Socio-economics

Introduction

With the introduction of policy reforms market orientation under Doi Moi in the late 1980s, rice production in Vietnam increased dramatically. Since then, Vietnam emerged from a country of near famine to become the world's third largest rice net exporter after Thailand and the United State (Vo Tong Xuan, 1995). Almost of exported rice is produced from Mekong River Delta. In the Delta , farmers grow 2-3 rice crops a year with highly amount of seed (200-300 kg/ha) because of direct seeding technique . Nitrogen applications are also high, about 150-200kg/ha. In addition, for protecting crops, farmers apply more pesticides than considered necessary.

Research findings from scientists have shown that crops enriched with nitrogen can make insect pests produce more eggs, survive better, live longer and are ecologically more fit (Lu et al., 2003). Dense crops from high seed rates and high fertilizer rates are more disease generating (Webster and Gunnell, 1992). Facing this problem, there are many programs aim to reduce pesticide use such as the project starting in Long An province (Mekong Delta) in 1994 to motivate farmers to reduce early season insecticide use (Escalada et al.,). The IPM program also motivates farmers not to use much pesticide. These programs did not emphasize the use of seed and nitrogen higher than they are needed.

At the workshop on integrated nutrient and pest management organized in IRRI on May 2002, considering the problem in rice production in Mekong River Delta, Vietnamese scientist included Dr. Pham Van Du⁶⁵, Dr. Pham Si Tan⁶⁶ and Mr. Nguyen Huu Huan⁶⁷ generated the ideas how to help Vietnamese farmers not to use much seed rate, fertilizer and pesticide as before. IRRI scientists included Dr. Heong , Dr. Pala and Dr. Roland, helped to develop this ideas became an initiative "Three Reductions, Three Gains" to help farmers easier remembering the reduction of seed rate, fertilizer and pesticide use in the context of maintaining the high yield for increasing their profit. The

⁶⁵ Head, Department of Plant Pathology, Cuu Long Rice Research Institute (CLRRI)

⁶⁶ Vice Director, Cuu Long Rice Research Institute (CLRRI)

⁶⁷ Vice-Head, Department of Plant Protection, Southern Vietnam, MARD

program namely “Three reduction, three gains” was established and first implemented in Can Tho province and then, Tien Giang province with financial support from IRRI. The objective of the program in the short run is to replace farmers’ habit in using much more inputs than it needs. This objective in the long run is reducing the cost, increasing quality of rice for sustainable agriculture. A local steering committee was established to manage the program. Now a day, this program expands to 12 provinces in a whole Mekong delta.

Methods

On March 6, 2003, the program of “3 reduction, three gains was officially launched by the Vice Chairman of the Peoples’ Committee of Can Tho, Mekong Delta with the present of Dr. Heong and Dr. Escalada from IRRI and the leaders of 12 provinces in Mekong River Delta. The program developed motivational media material via Radio, TV systems and leaflets to reach a large audience of farmer in the Mekong Delta.

Initially, two districts in Can Tho province were selected to implement the communication strategy with another district maintained as the control. Farmers participatory research method was applied. A participatory planning process involving multi stakeholder as employed to build local ownership. Focus group discussion, farmer surveys, multi media campaign planning and monitoring to assess campaign implementation. For each demonstration site, 30 volunteer farmers conduct farmer participatory research (FPR) on integrated nutrient and pest management. Every selected farm was practiced on the area of 1.000 square meters with the “three reduction method”, the remainder as a control. For the experimental area, farmers were given guidelines for adjusting seed and fertilizer. For the control area, farmers applied as their practice as a routine. For “Seed reduction”, farmers were encouraged to use drum seeder to eliminate the amount of seed from 8-10 kg per 1000 square meter. For “fertilizer reduction” farmers were trained to fertilize only when paddy rice need by comparing the colour of rice leaves with the leaf colour chart to know when they need to fertilize. For the purpose of helping farmer in “insecticide reduction”, they were advised not to use insecticides during the first 40 days after sowing.

The report showing that in Wet Season 2001-2002 the FPR was expand to 920 farmers in Tan Tap Village, Tan Thanh district, Long An province. In the same season farmers conducted 520 demonstration fields in 8 provinces in the Mekong Delata. At that time, a further 30 demonstrations field were initiated in the Central region and another 446 set up in 10 provinces in the Mekong Delta. (Nguyen Huu Huan, 2004).

Table 1: Areas under three reductions, three gains, Tien Giang province Mekong Delta, Dry Season 2004-2005 (hectares)

	District	Area
1	Cai Be	9000
2	Cai Lay	12000
3	Chau Thanh	12
4	Tan Phuoc	1599
5	Cho Gao	1000
6	Go Cong Tay	2000
7	Go Cong Dong	11000
8	Go cong City	140
9	My THo City	100
	Total	36854

Sources. Department of Agriculture and Rural Development, Tien Giang province

Table 1 shows that area under “3 reductions , 3 gains “, has enlarged.

The result from the Three Reduction , three gains campaign.

On the post –test surveys of 910 farmers in Can Tho province , for 12 months after the launching of the “three reductions, 3 gains” project showed significant reductions in farmers’ seed rates, nitrogen fertilizer and insecticide use. Seed rates dropped from 243.7 kg/ha , nitrogen fertilizer use from 103 kg/ha to 95.2 kg/ha and insecticide spray frequencies from 1.15 to 0.84 (Nguyen Huu Huan, 2004). However, potassium application increase as well as fungicide and herbicide use may be from the increase in blast incidence during the wet season.

In the other hand, the result of B.A thesis of Mr. Nguyen Anh Tuan under adviser of Dr. Tran Thi Ut, Economic Faculty, Nong Lam University in last July 2005, in total of 90 farmers in post-test, in which 45 farmers participated in the program “3 reduction 3 gains” and the reminder as a control group. The results of is present in Table 2 .

Table 2. Results from “Threes reduction, three gains, Tan Phuoc District, Tien Giang province (n1=45; control with n=30)

Items	Farmers with 3 reductions, 3 gains (n1=45)	The control (n2=45)	Differences (%)
Seed rates (kg/ha)	105 kg	130kg	
Seed cost	21.9	26.6	-21.4612
Fertilizers (US\$/ha)	102.4	109.6	-7.03125
Pesticides	38.8	42	-8.24742
Labor cost	91.5	94.8	-3.60656
Others	15.2	16.3	
			-7.23684
Total cost (US\$/ha)	269.8	289.3	-7.22758
Yield (tons/ha)	5.98	5.99	-0.17

Source. Evaluation “Three Reductions, three gains”, BS thesis, June, 2005

We can see from the results that, rice yield was almost the same between the group with “three reduction, three gains” and the control. This situation happened due to farmers in uses rice seed by reserving form the previous season, they did not select or used the suggested seed from the program.

Table 3. The results from the interview on August 19, 2005 with 7 farmers applying the “three reductions. Three gains”, in Cailay district , Tien Giang province

Items	Farmers with 3 reductions, 3 gains (n1=45)	The control (n2=45)	Differences (%)
Yield (tons/ha)	7.88	7.6	3.5
Total cost (US\$/ha)	256	292	14%

Source, Survey of households, August 19,2005

In the area with paying more attention in changing seed for farmers, the program has significant in reducing cost, and increasing in rice yield.

Lesson learnt: The program success when farmer can be support by the good rice seed.

Multiplier effects by using mass media in communication and FPR method, the program of “three reductions, 3 gains can be multiplied to large area in whole Mekong delta. This program has accredited by MARD as the scientific method for achieving sustainable agriculture in Vietnam.

Excerpt from Swiss Development Corporation Report on “Three Reductions, Three Gains”

The program, locally referred to as *Ba Giảm, Ba Tăng*, focuses on motivating farmers to reduce seed rates, fertilizer rates, and pesticide sprays. Research started in 2001 under the Irrigated Rice Research Consortium (IRRC) phase II supported by SDC. Launched in 2003 the project captured the enthusiasm and imaginations of farmers, extension workers, provincial government, the media as well as the central government officials and is spreading rapidly throughout the whole country.

The Approach

The project used a multi stakeholder planning process that involves research, extension, local governments, mass media, radio and TV stations. This process helps cultivate local ownerships and quality partnerships. It began with a farmer participatory research involving 951 volunteer farmers in 11 provinces who evaluated the effects of three reductions on their yields and incomes. These results together with focus group interviews and baseline surveys were then used in a “Message design Workshop” of all stakeholders, where they participated in creating the slogan, messages, media materials and campaign plans. When the materials pre tested and mass-produced, a highly publicized launching ceremony was conducted. Two months later a monitoring survey was conducted to determine if the materials had been well distributed. A year later focus group interviews were conducted and a post campaign survey was carried out to determine effects of the program.

Impact

The 951 farmers who participated in the evaluation found that using three reductions, they can gain higher incomes of about US\$58 and US\$35 per ha in the dry and wet seasons, respectively, thus can potentially make ~US\$93 more per year. This is equivalent to two months income of a typical household. Farmers found that the main incentive to reduce seed and fertilizer rates was the potential to reduce insecticides, since lower seed and fertilizer rates resulted in lower pest pressures. With fertilizer cost on the increase, the potentials for more savings further motivated the farmers.

The farmer experiments were repeated in three more provinces with similar results. The next challenge then was to develop a communication strategy to motivate millions of rice farmers to adopt these three reduction practices. The “Message Design Workshop” was held in December 2002, where stakeholders developed a series of motivational materials, posters, leaflets, billboards, a radio, a TV drama and an advertising plug for TV. These materials were pre tested and mass produced for distribution and broadcasting. The campaign was launched on March 8, 2002 by the Deputy Director of Agriculture of Cantho province. Launching on 8 March 2002 485,000 leaflets were distributed.

CASE 3: ENHANCING GENDER EQUALITY

Center: IRRI

Theme: Social Science

In 1992, a young Vietnamese entomologist at the Cuu Long Rice Research Institute attended a workshop in “Gender and Rice Pest” in Thailand and met an IRRI social scientist. This was her first contact with social scientist, since then she has changed her focus on farming system research to focus on gender equality.

Her work has had a number of consequences:

- It has raised awareness of gender issues in the CLRRI and had major impacts for staffing, human resource and training of Institute Staff
- It has generated a stream of gender-related studies both by the woman scientist and immediate colleagues and has led to gender being inserted into the work of other CLRRI scientists
- It has led to the inclusion of more women in the activities of the Institute, including the training it offers.

Example of training provision:

There has been a change in the regular practice of district and local training for women extension workers and farmers. Now women constitute ten percent of participants in training courses. It made a difference because women have not attended any training course before.

The themes of training course:

- Animal raising (pig, fish)
- Rice production IPM for women
- Gender in rice pest
- Plant protection

There has been continuing collaborative research with IRRI and mentoring by IRRI’s scientists. This has largely occurred within study on impact of male out migration on women in farming system. It has been assumed that male out migrants make money and send it back to their family to invest on their farm. However, money was sent back from male out migrant for home consumption only. This was because they are unskilled, their salary was not high. The lead scientist concerned has published several papers about this issue and made presentations it in several national as well as international workshops.

Another female scientist from CLRRI has now obtained a scholarship and is pursuing a Master degree in Rural development in the Philippines under IRRI supervision. She is also focusing on gender.

In addition the scientist concerned has obtained a Masters degree at IRRI and had two brief study visits to attend workshops and work alongside IRRI scientists. She has published 22 articles in journals or in conference proceedings since 1995.

The main capacity effect of this ongoing research relationship has been to change attitudes and practice in CLRRI. This has involved extensive awareness raising, feedback and discussions within the Institute. As a result, the management of CLRRI now pays far more attention to gender studies and gender equality in the practices of the Institute.

Specific outcomes and impacts related to NARI capacity:

- CLRRI had very few female staffs selected who go on to higher training or education , and none of them held leadership positions previously. Now, following trip reports, staff seminars, the preparation of papers, discussions with management and the leader of Labor Union in the institute, young female staffs are being sent to study abroad.
- Seven female staffs now hold the position of team leaders, alongside the 15 male leaders in the institute.
- The head of Agronomy department who is responsible for the NRM project, said that he included the gender issues in his project and routinely includes questions related to gender in his survey forms.
- The extension officer in the institute also reported that the local authorities having been encouraged by CLRRI now send women farmers to attend the technical training when he organized the training. The number of female farmers participating in agricultural training in local areas is also improved.
- The recruitment in the CLRRI recently also shows that more female youths are selected to work in different departments in the institute (for staffs from 30 years old or below we have 22 male and 24 female in the year of 2005).

Evaluations are also being planned to study the effects of these changes in all Provinces where the CLRRI conducts research and projects.

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