Assessing the impacts of agricultural research on nutrition and health

Wageningen, 4-5 July 2014, Inception workshop for 5 selected case-studies under SIAC Objective 3

Workshop Report (11 September 2014)

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1 - Introductory session

Erwin Bulte introduced the rationale for SPIA to fund a series of impact studies under SIAC. The idea is for these studies to improve understanding of the links between agricultural research and improvements in nutrition and health. This work should be complementary to (rather than duplicating) the work of A4NH. The objectives of the workshop are: 1) to help the individual projects start off in the direction most likely to deliver credible evidence; 2) Seek possible synergies across projects regarding measurement of nutrition outcomes in particular.

Maggie Gill gave a brief overview of the role of the ISPC within the CGIAR system, and summarized some outcomes from the 2013 ISPC Science Forum in Bonn, which focused on agriculture, nutrition and health. From a measurement perspective, one of the key findings from that set of meetings was the agreement that measurement across the whole diet is important for generating strong evidence of nutrition impact. Another was an appreciation of the multiple factors that constrain our ability to achieve nutrition outcomes. Two follow-on initiatives were highlighted – a meeting in DC in late September 2014 that follows up on methodological issues for evaluation and a special issue of the journal Food Security featuring papers inspired by the Science Forum.

Tim Kelley and James Stevenson gave an overview of SPIA’s work and the key aspects of the SIAC work program up to 2016, with a focus on the opportunities for researchers to participate in future calls for proposals, workshops etc.

2 - Focus on the five commissioned studies

Catherine LaRochelle presented the project on assessing impacts of the adoption of high iron bean (HIB) varieties on iron intakes of rural vulnerable populations in Rwanda (Virginia Tech, CIAT, HarvestPlus, Rwanda Agricultural Board). An RCT focusing on boarding schools in Mexico has shown that a feeding program with high-iron beans can improve iron deficiency status after 6 months, but there are a number of unknowns regarding the process of adoption, harvest, cooking, consumption of these beans and the dose-response relationship – how much consumption is needed to see a health benefit? Rwanda has the highest per capita bean consumption in the world, and the best estimate from HarvestPlus is that one third of Rwandan farmers are growing HIB.

A number of methodological issues were raised: Hawthorne effects (changes in behaviour from the process of measurement taking place) in particular related to the recall data on consumption of the beans and the provision of specific bowls and plates with known volume; and the process of matching adopters and non-adopters and the search for a valid instrument to find exogenous differences in adoption. The only major logistical issue noted was a delay in receiving a research permit from the Rwandan government, though this is not expected to delay any aspects of the research other than the process of taking a census of HHs in selected communities. The expected adoption rate of 35% remains unverified until the survey teams can get into the field for the listing exercise.

In discussion, the issue of bioavailability was introduced by Inge Brouwer – that a stable isotope study had shown that rates of absorption of iron from HIB are lower even if total iron content is higher so there is no extra benefit from consuming HIB. Alan Dangour explained the role of phytate in limiting bioavailability – that it should be as close as possible to zero from a nutrition perspective, but that agronomic trade-offs mean that it is still present in varying levels in different bean varieties. Rachel Glennerster noted that the identification strategy (matching, search for an instrument) is precarious. Is there an exogenous shock that might have led to a subset of farmers purchasing more
seed (i.e. something that would represent a valid and convincing instrumental variable)? The other option being considered is a regression discontinuity around altitude given variability in adoption with altitude, though that may not be sufficiently sharp as a cut-off. Finally, there was significant disagreement among the group regarding the relevance of measuring anemia. Anemia is not equivalent to iron deficiency but may actually be the ultimate public health goal that HIB is directed towards. The nutritionists in the group argued that, ideally, the study should measure, in addition to anemia, changes in iron deficiency status, since this is the intended intermediary mechanism leading to reduced anemia. However, if a sub-sample were finger-pricked for anemia testing, the sample was powered for it, and the causal identification strategy was strong, the results would likely be persuasive evidence (to an economist – nutritionists may not be sufficiently impressed) regarding the impact of HIB on anemia.

Isabelle Baltenweck and James Rao presented their project on assessing the impacts of dairy hubs in Tanzania (ILRI, Emory, Tanzania NARS). There are many small-scale dairy herds in Tanzania and 97% of milk consumption is raw milk. A dairy hub can be one of two models – either simple bulking of raw milk from multiple producers to sell to traders (no new technologies used) or bulking and chilling the milk. Both types of hubs also provide producer services to a greater or lesser extent; e.g., access to inputs, market information, etc. The Tanzania hubs are all different from one another, reflecting local preferences and practices. The East African Dairy Development (EADD) project has shown that producers in hubs have higher production, and the SIAC project aims to look at the potential for nutrition impacts. The project was chosen by SPIA both because dairying has been proposed as an important channel for nutritional improvements and because the formation of hubs represents the kind of institutional innovation that a number of CGIAR centers have been exploring in recent years.

Methodologically, this project is rather problematic in its current configuration. The study was conceived as a quantitative study monitoring outcomes for 30 villages in the project. However, power calculations have not been carried out and there is a binding constraint on the number of villages that can be included in the study, determined by the resources for the project implementation. From the discussion with the proponents, it was clear that there is an insufficient number of villages in both project and “control” (this is not a randomized design) villages to allow for a with vs without comparison – the study would be under-powered. The economists in the group suggested some changes that would allow for differences in participation within villages, so as to gain some variation in (at least the intensity of) treatment at the household or individual level. But this seems not to be possible. As a result, the methodological problem is not easily resolved – there is no way, apparently, of scaling up the intervention to a greater number of villages. The consensus of the group in the end seemed to be that it was better for the project to be largely qualitative and with detailed analysis of hub villages. The qualitative evidence can be compared to the proposed theory of change, i.e., that participation in hubs leads to increased milk sales, increased income and increased milk consumption for the household which, although not measured in this study, would often lead to improved nutrition.

Ram Fishman presented the project on assessing the impacts of new irrigated horticulture schemes in Senegal (Columbia University, GWU, MDG center Dakar). This study is a randomized control trial taking place in 70 villages chosen randomly to participate in the project. These would be compared to 70 control villages. The treatment is the installation of drip irrigation systems on under-utilised, commonly owned land in the villages. Eligible households (50 HHS per scheme, selected through a lottery) in the project villages receive a small plot of land and the benefits from the commonly-owned and commonly-managed irrigation scheme.

Methodologically, the identification issues are taken care of by the randomization, so the discussion focused on the nutrition measures and the rationale for their use. The minimum adequate diet and a measure of dietary diversity were the two recommended mainstream indicators that were recommended for use in the project. The expected impact mechanism is an increase in consumption of a range of fruits and vegetables, either from own production or via increased incomes. Women’s empowerment and time use (the scheme focuses on women and there could be trade-offs over their time use) are also the subject of measurement challenges for this project, though there is emerging good practice in these areas. The only major weakness with this study is its dependence on the project intervention, which is a three-way cooperation between the governments of Italy, Israel and Senegal and already
subject to significant delays in planned implementation. Some skepticism was also expressed concerning the strength and robustness of the causal pathway from production to consumption, but this is in some sense one of the main questions of the study.

**Menale Kassie** presented the project on the impact of the integration of legumes into maize systems, through intercropping and rotations in Malawi and Ethiopia, on nutrition (CIMMYT, Lilongwe University, EIAR). This study is based on two rounds of data collected by CIMMYT in 2010-11 and 2013-14 from a large sample of households in both countries. A follow-up survey in 2015 focuses on nutrition outcomes, measured through recall data on food expenditures and on dietary diversity scores.

Methodologically, this study attempts to identify causal effects from legume integration by applying a variety of econometric techniques (multinomial endogenous switching regression; instrumental variables; difference in differences) and examining the sensitivity of the results to changes in these estimation strategies. Regardless of the method, there will always be some set of assumptions that needs to be made in order to identify an effect from observational data such as this. The fact that the nutrition data has not yet been collected gives an opportunity for the economics-focused team to reach out and find good advice from the right people on how best to do this.

**Rachel Glennerster** presented the project on the impact of NERICA rice in Sierra Leone on potentially shortening the hungry season in rice-dependent areas by bringing forward the date of the first harvest (MIT, Innovations for Poverty Action, International Rescue Committee, Sierra Leone Agricultural Research Institute). In the study area, every August of each year, 80% of the sample households regularly skip meals due to the high cost of food in the hungry season. The study is an RCT with NERICA seed offered at three prices (full-price, half-price, or free), with and without agronomic training. Early results have shown that there is a yield penalty for adopters who do not receive training (compared to local varieties). This reflects the difficulty of growing NERICA and the need for training. But early indications suggest that there may be significant positive impacts on nutrition that are related to the early maturation of the NERICA rice. The nutritionists at the workshop expressed skepticism about the mechanism and about the likelihood of finding nutrition impacts related to early duration; but the large size of the study and the randomization seem to provide strong *prima facie* evidence for some effect. Workshop participants agreed on the need to explore this further and to understand better the channels of causation.

Some concern was expressed about the proposed approach to measuring nutrition impacts. Body Mass Index is arguably not appropriate for a population of under-5s; but there was some lack of clarity over whether it is simply a noisy measure or an inaccurate one. The nutritionists in the group argued that weight for height would be the best measure to use in this context, and this advice was taken on board. Dietary diversity can only be calculated at the household level for this study, even though it was recognized that individual-level dietary diversity is strongly preferable.

### 3 – Open discussion

**Alan Dangour** made a number of general observations. Regarding the design of the individual projects, there is often not a very good fit between the original design of the studies and the desire to measure nutrition impacts as many of the studies have not been designed for that purpose. Per Pinstrup-Andersen recently noted that there are now too many RCTs but the truth is that it is hard to get the right answers from other designs. DFID – BMGF now have put out call for large trials (3 – 5 years, $3 million per study) for intervention studies and this is an opportunity for a much more concerted effort to document nutrition impacts.

The study teams need to think very carefully about the pathways they are attempting to document - what will the intervention do and what can the study actually demonstrate? If, for example in the case of the dairy hubs, the rationale is to change the availability of milk then if that’s what it will do, measure milk availability, rather than attempt to estimate causal effects on income or dietary diversity. Validating even small incremental steps along the hypothesized impact pathway is still very useful. Inge Brouwer and Alan were the only nutritionists in the room and it was felt strongly that the studies needed to bring in a nutrition perspective. This was intended as an observation,
not a criticism. This was supported by James Garrett who emphasized the need to distinguish between the different possible impact pathways as the intermediate impact indicators will likely vary in each case, e.g., if under-2 year children’s nutrition is targeted then relevant indicators are mother’s time use, food availability and household income.

Inge Brouwer encouraged SPIA to try and standardize the measures across these projects. Can we focus on diet diversity for women and minimum adequacy for children of particular ages? This would allow us to address intra-household allocation issues. However, Rachel Glennerster re-emphasized the point that not all studies have consumption data per person. This is not just an issue of data availability from surveys – in some contexts such as in West Africa where the family eating from a single plate is common, it can be hard to estimate individual consumption.

There was considerable discussion regarding the measurement of women’s empowerment and the use of the WEAI (Women’s Empowerment in Agriculture Index) in particular. The full version of that survey requires 3 hours of data collection and covers time use, decision-making and the feeling of agency, etc. On the other hand, the Oxford Poverty and Human Development Initiative (OPHI) modules for specific aspects could be mainstreamed into the projects relatively easily. In planning ahead, the following timelines were outlined as being the most likely scenarios:

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In wrapping up, Menale Kassie noted that this workshop was a bit special in that having such a discussion before the project helps improve the quality of the work. Isabel Baltenweck found it useful to have shared ideas regarding the agreed indicators and approaches with the expectation of further communication to come. Discussion of the design issues have been helpful. Ram Fishman stated that the workshop had been helpful and motivating.

Next step:

SPIA to circulate this note to workshop participants, requesting short response from each project about how they will respond to the main discussion points highlighted in section 2 here.