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Adoption and Impact of Cooperation-88 Potato in China



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BACKGROUND AND CONTEXT

Potatoes have become increasingly popular amongst Chinese consumers, and the water saving and storage capacity of the crop have made it a target of Government promotions. Potato production is a means of generating income as well as improving food and water security. Getting the right varieties to Chinese farmers to meet the growing and changing consumer demands is thus important. In this analysis we track the impacts of a variety developed by CIP in partnership with Chinese researchers and find that tremendous benefits have been generated – and are still accruing.

Starting in the mid-1980s, in response to the devastating effects of late blight (LB), the [International Potato Center \(CIP\)](#) and [Yunnan Normal University \(YNNU\)](#) collaborated to develop a late blight-resistant potato variety—the Cooperation-88 (C88). C88 was officially released in 2001 and quickly became popular covering 400,000 hectares, mostly in Yunnan Province, by 2009. Its success was attributed to its high yield, high quality, and good taste, in addition to LB resistance.

This brief reports the findings of a rigorous assessment of C88's adoption and economic impacts. Researchers used household and community surveys to estimate current and historical adoption rates of C88, identify factors associated with its adoption (and disadoption), and assess the economic benefits of C88 diffusion to producers and consumers in Yunnan.

DATA AND METHODOLOGY

This study relied on a household survey, conducted from July to September 2015, representative of Yunnan potato producers. The sample included 615 households located in 41 villages. Information was gathered on household and farm characteristics, adoption of potato varieties, potato production, and market participation. DNA fingerprinting was used to confirm the genetic identity of C88 in the 141 sample plants taken from farmers' fields. Community-level focus group discussions provided information on the dynamics of potato varietal adoption, village characteristics, and costs of production of C88 compared with the variety it replaced.

Village- and household-level econometric models were used to analyze awareness of C88, probability and intensity of adoption, and probability of disadoption. To quantify economic benefits on producers and consumers, an economic surplus analysis—with varying assumptions about market conditions and the effects of increased production on prices—was completed.

At a stakeholder workshop in February 2017 in Kunming, Yunnan Province, representatives from industry, government and academia identified C88 value-chain bottlenecks and opportunities for development.

C88 PERSISTS AFTER MORE THAN 15 YEARS, WITH LARGE ECONOMIC BENEFITS

C88 is still a fairly popular potato variety. During winter in southern Yunnan Province, when LB resistance is particu-

larly important, C88 was planted on more than 55 percent of the total potato area (33,000 out of 60,000 hectares). Most production was transported to chip and starch processors who depend on the winter crop to maintain year-round processing. During the 2015 late spring season, 18.5 percent of the area was planted to C88. About 23 percent of potato-farming households grew C88 during the late-Spring (largest) season (Table 1). This percentage jumps to 33 percent when considering only households in the 71 percent of villages with awareness of C88. Together with other major varieties planted in Yunnan (Xuanshu-2, Qingshu-9, and Lishu-6), more than 30 percent of Yunnan's potato area was planted with genetic material originating from CIP.

Table 1. Self-reported adoption of major potato varieties in Yunnan, late spring 2015

VARIETY	ADOPTION RATE (%)	% HOUSEHOLDS ADOPTING	# DOMINATED VILLAGES
Cooperation-88	18.9	23.2	9
Hui-2	22.7	26.1	10
Weiyu-3	16.1	18.2	7
Xuanshu-2	6.2	8.8	3
Mira	13.7	16.6	7
Qingshu-9	3.9	9.3	1
Lishu-6	3.3	4.2	1
Lishu-7	5.4	6.8	3
Gamma-2	1.2	1.8	0
Others	8.7	14.3	

Adoption of C88 has had large economic benefits in Yunnan. Depending on assumptions about markets, the estimated present value of benefits from planting C88 in Yunnan ranged from a low of US\$ 2.84 billion to a high of US\$ 3.73 billion.

C88 is heavily used in food processing. C88 is not only consumed at the table by consumers but also used in the chip, french fry, and starch-processing sectors. The stakeholder workshop estimated that 60-70 percent of chip processors still use C88 and have a strong preference for

the variety, with Atlantic variety from the northern provinces filling the gap.

DNA fingerprinting of self-identified C88 plants confirmed that over 97 percent of fresh samples (leaves and tubers) were C88. Genetic identity of all other self-reported varieties was not confirmed.

Distance from processors affects adoption rates. The prefectures of Kunming, Qujing, and Honghe have the highest adopted area of C88, followed by Lijiang, Dali, and Chuxiong, which are farther from processors. Prefectures located far from Kunming, the province capital, have nearly zero adoption.

Analysis of determinants of adoption suggests that extension officers target commercial farmers for C88 seed dissemination. Larger farms and those with more access to external labor are more likely to grow C88. Further, the total area under potato cultivation in a village is a strong and positive predictor of adoption and its intensity.

The seed market is the greatest bottleneck to expansion of cultivated area, according to value chain actors. High-quality seeds can only be produced by seed companies. However, in 2016, 98 percent, or about 2.45 million tons of all potato seeds used by farmers in Yunnan were own seed. Seed companies produced approximately 50,000 tons of seeds, of which only 1,000 tons were C88. Because of these dynamics, seed quality has suffered—resulting in declining yields and decreased LB resistance.

SOURCE

CIP (2017). *Adoption and Diffusion of C88 Potato Variety in China: Spatial Variability of Productivity Gains and Cost Savings and Value Chain Development*. Unpublished report submitted to the Standing Panel on Impact Assessment (SPIA) of the ISPC: International Potato Center.

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