Chapter 6
Local Food for Local Schools: An analysis of the impact of local procurement for a school feeding program in Burkina Faso[1]

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Abstract: Food assistance response options have been expanding, in particular toward local and regional procurement (LRP) of foods in place of transoceanic deliveries. Relative to transoceanic deliveries, LRP generally saves costs and reduces delivery time. However, evidence related to other concerns—including product quality or risks of upward pressure on consumer prices – and claimed benefits—such as improved profitability for local suppliers or increased recipient satisfaction with rations—remains still thin. This paper presents findings on these issues from local food purchases for a school feeding program in Burkina Faso. We first confirm that LRP results in significant savings in time and cost relative to transoceanic deliveries. Second, we determine that LRP generally met quality and safety standards as well as did shipments from the United States. Third, while local purchases had no impact on market prices, grain deliveries were associated with downward pressure on grain prices in distribution markets. Fourth, suppliers involved with LRP experienced positive learning impacts and profitability gains. Recipients also were more generally satisfied with local commodities, although they appreciated the preparation advantages of U.S.-sourced commodities. Our findings indicate that LRP programming has both synergies and tradeoffs.

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I. Introduction

International food assistance needs have traditionally been treated as a problem of availability, and therefore approached through transoceanic delivery of foods produced in donor countries. However, quite often food is locally available, but certain individuals or populations lack access to it. In such cases, a better approach might be to purchase foods locally and/or provide those in need with the means to do so (Barrett and Maxwell 2005).

Food assistance donors have increasingly recognized that food insecurity is often a problem of access or utilization, not availability, and have expanded options for both the procurement and delivery of food assistance. Further expansion of funding for flexible food assistance choices, such as the local sourcing of foods, may hinge, in part, on evidence that purchasing locally can minimize costs and improve timeliness, and that the quality of foods purchased in developing countries can be assured (USDA 2009). It is also essential to understand the impacts of local food purchases and distributions on local market prices, and whether local purchases can benefit local producers or recipients relative to traditional food aid shipped from the donor country.

These questions are important for two reasons. First, agencies must avoid causing inadvertent but predictable harm. Second, LRP may have desirable impacts beyond the cost efficiency and improved timeliness objectives commonly cited. This paper assesses the tradeoffs and synergies associated with locally purchasing foods for a school feeding program in the land-locked Sahelian republic of Burkina Faso. We exploit a rare natural experiment to directly compare the outcomes of recipients and producers living in LRP communities with food aid recipients and producers in matched nearby communities that received transoceanic food aid handled by the same agency. This uncommon opportunity allows us both to look across various performance indicators to offer a holistic view of the impacts of LRP and to generate rigorous, direct comparisons of LRP versus food aid shipped from the donor country along multiple dimensions: cost, timeliness, food quality and safety, recipient satisfaction, and smallholder producer profitability. We find important synergies, such as purchasing locally saves agencies cost while also supporting local producers. There may also be tradeoffs, however, such as if local purchases provide food quickly but at higher cost for some (typically processed) commodities.

II. Background

a. Food Assistance and LRP

Local and regional procurement (LRP) of food assistance is not a new practice. While the bulk of food assistance was traditionally provided in-kind, LRP has increased as a proportion of global food aid from about 17 percent in 2000 to 33 percent in 2005 to 67 percent in 2010.[3] This change has been driven by policy reforms in Europe, Canada and, most recently, the United States (US), and the bulk of LRP purchasing has been undertaken by the United Nations' World Food Programme (WFP). Because the US only began large-scale LRP in 2008, US-based nongovernmental organizations (NGOs) are relative novices at the practice, which remains politically controversial.

Two key, established advantages of LRP are its potential for cost savings and faster delivery relative to transoceanic food aid shipments. A range of studies comparing purchases in sub-Saharan Africa to

[3] Data from the World Food Programme online International Food Aid Information System, http://www.wfp.org/fais/reports (Accessed October 10, 2011).

transoceanic deliveries finds cost savings of between 13 and 50 percent.[4] A comparative study in sub-Saharan Africa found that transoceanic food took on average 21 weeks, whereas locally or regionally procured foods took five or six weeks respectively; other studies have found similarly dramatic savings in time.[5] These advantages helped secure US Congressional approval for a LRP pilot program, run by the US Department of Agriculture (USDA) under the 2008 Farm Bill, and LRP funding through supplemental international disaster assistance funding to the US Agency for International Development (USAID).

Other claims and concerns about LRP abound but lack rigorous or widespread evidence. For example, there has been much concern expressed regarding the potential of LRP to harm consumers in the source region by driving up local food prices, but there has been no price analysis of which we are aware to investigate those concerns. One likewise hears concerns expressed about whether foods procured in low-income countries can meet the quality and safety standards humanitarian agencies employ with traditional, transoceanic food aid; but we know of no careful studies of those concerns (Villa and Mathys 2011). On the flip side, claims have been made that purchases may benefit local producers by various avenues, including reducing transaction costs, enhancing access to markets, or inducing learning and improved farming practices.[6] Likewise, some observers hypothesize that locally purchased foods may be more culturally appropriate or otherwise preferred by recipients to equivalent commodities sourced in distant donor countries (USGAO 2009). Such claims have been exceedingly difficult to test, however, in the absence of clean comparative analysis of LRP relative to transoceanic food aid delivery, a comparison we are uncommonly able to make in this paper.

b. Burkina Faso

The Burkina Faso project presents a unique and important opportunity for analysis of LRP for three key reasons. First, Burkina Faso is a priori one of the best cases for LRP, in that it is both a primarily agricultural country with significant grain and legume production and it is land-locked, making transoceanic shipment of food time-consuming and expensive. Second, it is an extremely poor country in a region that is perpetually in need of food assistance. Understanding the risks and benefits of different food assistance methods in Burkina Faso and the surrounding region is particularly pertinent. The non-emergency nature of the program further engendered a focus on the impacts of the purchases themselves on other stakeholders. Finally, and most importantly, the delivery of local foods in Burkina Faso coincided with simultaneous delivery of US-sourced foods under a USAID Multi-Year Assistance Program (MYAP) implemented by the same agency in a zone contiguous to the LRP zone. This natural experiment provided an ideal opportunity for identification of the impacts of LRP relative to transoceanic food aid deliveries. By directly comparing performance along multiple dimensions – cost, timeliness, quality and safety, recipient satisfaction, smallholder producer profitability – we are uniquely able to evaluate the many claims made for or against LRP and to explore some of the potential synergies or tradeoffs among the various objectives advanced as people argue for or against LRP as a mode to resource food assistance in low-income countries.

c. The Local Education Assistance and Procurement Project

Under USDA pilot funding, Catholic Relief Services in Burkina Faso developed the Local Education Assistance and Procurement project (LEAP) to integrate local procurement into a long-standing school feeding program. LEAP provided food to 364 schools in 8 departments in the Gnagna and Namentenga provinces

[4] OECD (2005), Lentz and Barrett (2007), Tschirley and del Castillo (2007), USGAO (2009). For a summary, see Upton and Lentz (2011).

[5] US GAO (2009). Again, for a summary of various studies see Upton and Lentz (2011).

[6] See a discussion of these claims in Tschirley and del Castillo (2007) or any of the extensive documents concerning WFP's Purchase for Progress (P4P) program (http://www.wfp.org/purchase-progress).

(see map, Figure 1). The 58,127 students received 20 daily rations per month over the period April to June 2011. Each ration contained 180 grams of millet, 45 grams of cowpeas (a small white bean nutritionally comparable to lentils), and 25 grams of Vitamin-A fortified vegetable oil.

Figure 1 : Map of LEAP in Burkina Faso

The Distribution Region and Schools

The need for school feeding in the Gnagna and Namentenga provinces stems in part from generalized poverty and food insecurity. The provinces are characterized by primarily subsistence farming. Our survey results indicate that on average, farmers dedicate about 60 percent of their land to cowpeas and peanuts, which serve primarily as cash crops.[7] The remainder is dedicated to subsistence production of millet, sorghum, rice, and maize. Agriculture is rain-fed and subject to the whims of the Sahelian climate. In some years the region is affected by droughts and/or floods that jeopardize production even in 'good' years, almost all farmers in the region are net buyers of food and rely on small cash crop harvests to meet all non-food needs and supplement food needs in the dry season. In addition, due to a shortage in storage technology and the need to meet pressing needs, most farmers sell right after the harvest when prices are low, even when they may have to buy the same foods later at higher prices.[8] Many aggregators only travel to local markets at the peak time, so farmers who fail to sell early risk having to travel further and pay prohibitive transport costs, which undermines the potential benefit of waiting for a higher price.

The school feeding program is also of great importance for the recipient schools and children. Many families cannot afford to prepare lunch at home, so children often go without a mid-day meal in the absence of a school feeding program. It is also common for families in rural areas to live far from schools; a very large number live between four and six kilometers from the nearest school, making it challenging for children to go home for a mid-day meal even one could be provided.

[7] Averages come from the random survey of 310 farmers, members of farmers' associations in the 12 LEAP and MYAP departments of the Gnagna and Namentenga provinces described in section III below.

[8] This phenomenon is common, and linked to the lack of credit availability. Poor rural farmers effectively take out high interest loans by selling their product early, paying de facto "interest" in the form of the foregone higher price and the additional cost of buying the same food later (Barrett 2007; Stephens and Barrett 2011).

Schools bear several costs in running a feeding program. These include daily food preparation, cooking fuel, in some cases milling, and additional cooking supplies such as salt, potassium, and water. These costs, while small in absolute terms, are significant for the school communities. Schools manage them in diverse ways. School cooks, universally mothers of students at the school, work in teams that often rotate members. More than half of the LEAP schools rely on volunteers; schools that offer payment pay on average $4/month per cook per month, in cash or food. In some cases the cooking responsibility is shared equally across all school mothers. Each afternoon a different child is told to inform his or her mother that she is assigned to cook lunch the next day. As for supplies, wood for cooking fuel is almost universally gathered in the forest and brought in by the students. Salt and potassium together cost schools on average 800F ($1.80) per week. This is often drawn from the yearly contribution from the parent teacher associations (PTAs), but in some cases the cooks have to bring the potassium themselves on the days they prepare the meal. Some schools finance these supplies by selling the packaging materials in which they received foods.

The Procurement Modalities

The three goods delivered to schools were provided through three different purchasing methodologies. A summary of the quantities purchased of each commodity, by region and supplier, is provided in the Appendix (Table AI).

Vitamin-A fortified vegetable oil was purchased from processing companies through a competitive tender for over 72 metric tons (MT) posted in the capital city newspaper. The resulting contract with the winning bidder specified the quality criteria that had to be demonstrated by independent certification, as well as delivery quantities, locations, timing, and that payment would occur upon receipt of the delivery notes from each recipient school.

For the purchase of 143.5 MT of millet, the LEAP staff identified viable producers' cooperatives within the Boucle de Mouhoun region, the pre-identified surplus millet production region nearest to the distribution zone (at a distance of roughly 500 kilometers). Four large unions were identified who together could supply the quantity required by the program. Each union was composed of between about 600 and 5000 individual members divided into between 22 and 87 small associations. The unions are organized structures, designed in part for transmitting trainings and information to a large number of smaller organizations and farmers that also serve a role similar to that of large wholesalers. The cooperatives aggregate millet from small farmers in order to supply large clients. For all of these groups, the experience selling to a purchaser like CRS was not new, as most of them had prior experience selling to the Government or the WFP.

Since the distribution region is itself surplus in cowpea production, the project involved the schools directly in the purchases of cowpeas through vouchers distributed to PTAs. As there were no large cooperatives in the region, a total of 22 small farmers' associations, of between 10 and 58 individual members each, were identified and selected. The cowpea quantity purchased was very small relatively to national production, but quantities were very significant for the farmers' associations and farmers directly involved. The average association member sold 0.4 MT total in the 2010-2011 season; 90 percent reported having sold less than one ton, and over half sold less than a third of a ton.[9] The LEAP purchases represented over half of the total surplus quantities produced by all members combined.

[9] Averages come from the random survey of 310 farmers, members of farmers' associations in the 12 LEAP and MYAP departments of the Gnagna and Namentenga provinces described in section III below.

III. Methodology and Results

We first consider timeliness and cost relative to transoceanic food aid shipments, then results with respect to quality standards. We will then address price impacts, benefits for producers, and lastly recipient preferences.

a. Timeliness, Cost, and Product Quality

Delivering quality foods in a cost-effective and timely manner is a core objective of any food assistance program. We compare the exact timing of the LEAP and MYAP activities, as well as exact commodity and delivery costs. The National Laboratory performed quality testing for both the LEAP and the MYAP commodities, so we compare reported results from the same testing facility. We then examine the relative opportunities for managing quality shortfalls. Since safe storage and maintenance of quality of tested goods was also a concern, we examine the relative recipient appreciation of the quality of foods, as well as approximate percentage discarded due to foreign matter and other problems.

i. Timeliness

Timeliness is of greatest importance for recipients in the case of emergency food assistance. For non-emergency food programs such as school feeding programs, time-consuming procedures can be pre-planned well in advance so as not to affect program performance. However, timeliness remains important in any food program; the ability, for example, to be sure to meet a pre-determined delivery deadline for schools is essential. The average length of delays in different parts of the process differs between LRP and transoceanic food aid, as does the ability to manage and compensate for unexpected delays and complications.

First, we compute the number of elapsed weeks between initiating procurement to delivery to schools under the MYAP and LEAP projects, averaged across all three commodities. We define the key comparable events of importance across the LEAP and MYAP programs as follows. The award date is the date on which the funds are awarded by the donor. Initiation of procurement is the date of the call forward for the MYAP, and the date of identification of domestic suppliers for LEAP. The time at which the foods are made available for quality testing is the date of arrival in the warehouse for the MYAP, and the date of assembly in suppliers' warehouse for LEAP. Finally, we consider the date of actual delivery to schools. These dates are presented in Table 1. From identification of suppliers to delivery took on average 15.3 weeks for LEAP, versus 47 weeks for the MYAP; local procurement took only one-third of the time to deliver.

Table 1 : Comparative Timing, LEAP & MYAP

KEY DATES	LEAP		MYAP	
	Date	Weeks (from Procurement Startdate)	Date	Weeks (from Procurement Startdate)
Call Forward / Identification of suppliers	Dec 15, 2010 - Jan 28, 2011	**0**	**Jun 8, 2010**	**0**
MYAP: Shipment from U.S.			*Dec 16, 2010*	*27*
MYAP: Arrival in Lomé			*Jan 16, 2011*	*32*
Availability for Quality Testing	**Feb 15, 2011**	**9**	**Jan 27-Apr 18, 2011**	**33 to 45**
LEAP: Contract for oil	*Mar 23, 2011*	*14*		
LEAP: Contracts for millet	*Feb 17-Mar 7, 2011*	*9 to 12*		
Delivery to Schools	**Mar 25-Apr 7, 2011**	**14 to 16**	**Apr 14-Jun 3, 2011**	**45 to 51**

Several factors created additional delays for both programs, in particular for the MYAP. Firstly, the time from call forward to port delivery for the MYAP was 32 weeks, whereas the median delivery times for U.S. emergency shipments more generally have been found to be closer to 20 weeks (USGAO 2009, Barrett and Maxwell 2005). The MYAP commodities faced significant delays between arrival at the port in Lomé and arrival in Ouagadougou. The goods arrived in Lomé during a period of civil unrest in Côte d'Ivoire following contested presidential elections. Many governments had boycotted Côte d'Ivoire's port of Abidjan, diverting traffic to the ports of Tema (Ghana) and Lomé (Togo). The port of Lomé had already experienced increased traffic in recent years due to changes in fee structures that chased clients away from neighboring Cotonou (Benin). Hence the port was over-burdened, and the availability of transit vehicles from Lomé to Ouagadougou was limited. Such difficulties are not uncommon in many regions that receive food aid deliveries. Subsequent difficulties within Burkina Faso may have contributed to the excessive delay in final delivery to schools. The government of Burkina Faso was responsible for delivery from Ouagadougou to schools, and during the period planned for delivery there were student uprisings due to police violence which led to government service suspensions.

LEAP likewise experienced unanticipated delays, due to these political complications as well as the newness of the purchase experience, such as in drafting contracts and arranging quality testing. However, since the suppliers themselves were responsible for delivery and did not receive payment until after product was received at the schools, they had a strong incentive to meet contractual deadlines.

Table 2 : Comparative Timing, Several Commodities and Programs^

	LRP	**Food Shipped from US**	**Difference**
Commodity 1	Millet (1)	SF Bulgur Wheat (12)	
Weeks to delivery	15.29	35.6	20.31***
Commodity 2	Cowpeas (1)	Lentils (8)	
Weeks to delivery	15.57	33.96	16.39***
Commodity 3	Vegetable Oil (1)	Vegetable Oil (2)	
Weeks to delivery	9.86	36.19	26.33***
Commodity 4		Rice (32)	
Weeks to delivery		36.53	
Commodity 5		CSB (9)	
Weeks to delivery		32.87	
Commodity 6		Cornmeal (1)	
Weeks to delivery		22.43	
Cross commodity average	15.29	34.96	19.67***

Numbers in parentheses are numbers of observations of U.S. commodity deliveries. These include "truncated" deliveries over the period, or those not yet arrived at the time of submission of this draft. The end delivery times reported are hence slightly conservative estimates of actual delivery times.

*** Indicates statistical significance at the 1% level.

^ Source: Lentz et al. (forthcoming)

These direct comparisons of the timeliness differences between two programs run by the same agency are supported by a broader comparison of the timeliness of LEAP to the average delivery time to Ouagadougou across 71 different transoceanic food aid shipments over the same period, covering a range of commodities and programs run by a variety of agencies (Lentz et al. 2012). The transoceanic deliveries took on average 19.7 weeks longer (15.3 weeks on average for LEAP, and 35 weeks on average for transoceanic deliveries). This difference is statistically significant at the 1 percent level. These results, presented in Table 2, corroborate prior studies' findings of considerable timeliness gains from LRP.

ii. Cost

A salient concern in any food assistance program is cost, especially as food prices rise and donor funding for food assistance is on the decline. Cost savings can enable a program to reach more needy people or to increase ration sizes for recipients. Costs are often evaluated per unit of quantity (e.g., metric ton) delivered, although it may be more meaningful to evaluate cost per calorie, gram of protein, or ration of a certain nutritional value (Villa and Mathys 2011). LEAP and MYAP rations could be evaluated differently depending on priorities, as they differ in micronutrient content (see Table AXI). The agency chose rations to be identical by weight and very similar in basic nutritional content between the two programs. We compare the cost relative to commodity weight, ration size in grams, gram of protein, kilocalorie, and child served with 60 daily rations.

The cost basis is slightly different for LRP versus transoceanic food deliveries. For the MYAP the agency paid commodity cost, ocean freight, internal transportation, shipping and handling (ITSH) to Ouagadougou, and quality testing. LEAP expenses included commodity costs, quality testing, additional administrative cost related to the voucher system, and delivery from source regions to schools. Other administrative costs and overheads are excluded, since they were undertaken at similar costs through the same office.

Costs per ton for each commodity are presented in Table 3.[10] The US vegetable oil was purchased at a much lower price, due in part to a change in the world price of vegetable during the period and in part due to the ongoing crisis in Côte d'Ivoire that led to importation constraints. However, the higher price that LEAP paid for vegetable oil was largely compensated for by the cost of ocean freight for the MYAP vegetable oil. The per ton costs for the millet and bulgur delivered were $438.60 and $895.20, respectively, for cowpeas and lentils $585.02 and $1,095.09 respectively, and for vegetable oil $2,112.04 for LEAP and $1,857.64 for the MYAP. Lentz et al. (2012), comparing LEAP costs against those from 71 different food aid shipments to Burkina Faso from the US during the same period find very similar results.

The LEAP ration contained more fat and protein than the MYAP ration. Hence, the combined daily MYAP ration cost $0.04 per kilocalorie, $1.60 per gram of protein, and $0.62 per gram of fat, whereas the combined daily LEAP ration cost $0.02, $0.95, and $0.36, respectively. One can likewise look at the cost per student for the three month ration (an estimated 20 per month, or 60 daily rations). On average, LEAP cost $9.48 per child and MYAP cost $15.41 per child for the three-month period. As LEAP cost 38% less, this case certainly confirms prior findings of significant cost savings from LRP.

[10] The agency in this case did not pay for delivery of MYAP commodities from Ouagadougou to schools; the Government of Burkina Faso bore that expense. As such, a conservative estimate is included for comparison, based on the delivery cost of vegetable oil (per ton from Ouagadougou).

Table 3 : Comparative Costs ($/MT), LEAP and MYAP

	LEAP	MYAP
Commodity Cost (& Vouchers)		
Millet / bulgur wheat	$ 339.27	$ 386.73
Cowpeas / lentils	$ 546.45	$ 585.85
Vegetable oil*	$ 2,065.00	$ 1,322.12
Ocean Freight and Transport to Ouagadougou		
Bulgur wheat	N/A	$ 442.87
Lentils	N/A	$ 442.87
Vegetable oil	N/A	$ 477.41
Transport to Schools**		
Millet / bulgur wheat	$ 80.78	$ 50.00
Cowpeas / lentils	$ 20.02	$ 50.00
Vegetable oil	$ 47.04	$ 50.00
Quality Testing		
Millet / bulgur wheat	$ 18.55	$ 15.60
Cowpeas / lentils	$ 18.55	$ 16.37
Vegetable oil*	N/A	$ 8.10
TOTALS		
Millet / bulgur wheat	$ 438.60	$ 895.20
Cowpeas / lentils	$ 585.02	$ 1,095.09
Vegetable oil	$ 2,112.04	$ 1,857.64
Cost per Child (for three months)***		
Combined Ration	$ 9.48	$ 15.41

* For LEAP, the vegetable oil cost per ton includes quality certification.
** For MYAP, CRS did not pay transport to schools from Ouagadougou; this cost is a conservative estimate based on the oil cost / ton from Ouagadougou (the MYAP schools are on average further from Ouagadougou than the LEAP schools).
*** This cost is based on the ration of 180 grams of grains, 45 grams of legumes, and 25 grams of vegetable oil per day per child, for 20 rations per month or 60 total rations.

iii. Quality

The LEAP project was subject simultaneously to the quality standards specified by its contract with the USDA, those suggested by CRS headquarters, and those of the government of Burkina Faso. The standards differed in coverage, definition, and in the levels demanded under certain criteria, but generally speaking the Government of Burkina Faso standards were more stringent, demanding a slightly lower moisture content and less foreign matter. The various criteria, and averaged national laboratory results, are summarized in Table 4.

Table 4 : Quality Testing, *Standards* and *Results*

Quality Criteria	Millet		Cowpeas		
	USDA Contract	Result (Avg)	USDA Contract	GoB	Result (Avg)
Moisture Content	≤ 11%	5.8%	≤ 13%	≤ 12%	8.7%
Damaged Grains	---	---	---	≤ 1%	17.7%
Broken Grains	≤ 1%	0	≤ 1%	---	0.0%
Foreign Matter, organic	≤ 1%	0	≤ 2%	≤ .75%	0.4%
Foreign Matter, inert	---	---	≤ 1%	≤ .25%	0.2%
Live Insects (per 100g)	0%	0.25	0%	0%	0.095
Aflatoxins (ppb)	---	0	---	≤ 10ppb	0.0396

A few of the LEAP samples were found non-compliant with the government standards. In the case of millet, the single violation was a sample containing a live insect. The farmers' cooperative responsible for the violation was instructed to treat and clean the stock prior to delivery. Non-compliance in the cowpea procurements was related mainly to the presence of dirt and broken beans, criteria not required by the USDA and/or not involving health risks. The laboratory recommended that the product was safe and could be sorted by recipients. This demonstrates an important advantage of LRP. Non-compliant commodities can be returned to LRP suppliers for replacement or treatment, whereas U.S. commodities rotten or damaged during shipment can only be rejected or dumped; they are never replaced.

None of the U.S.-sourced commodities delivered to Ougadougou failed to meet product quality and safety standards. However, 3 percent of the bulgur wheat and 5 percent of the lentils intended for Burkina Faso did not arrive or were rejected on arrival at the port. Therefore, in this case we find no support for concerns that LRP runs greater risks of losses due to quality or safety problems. Not only were LRP losses less than those from in-kind food aid shipments, but substandard LRP deliveries could also be corrected, which is infeasible for transoceanic deliveries of unacceptable quality, which then sometimes get diverted and consumed, posing unintended health hazards.

As a check against the laboratory results, we asked recipients, on a scale of 1 to 5 (1 for "almost all rejected" and 5 for "almost all consumed"), what portion of the foods received could be prepared and eaten, relative to what portion discarded due to damage, pests, and foreign matter. While this measures recipients' perceptions of food quality and safety rather than actual food safety, we find a statistically significant difference in favor of the MYAP commodities. Recipients also reported that the LEAP commodities, in particular the millet, required more cleaning. Although perceptions of food quality may overstate the safety of transoceanic bulgur wheat relative to locally procured millet and these perceptions cannot replace testing, these findings are consistent with the observation that the rejection of transoceanic lots took place before delivery to recipients. It also underscores products that require cleaning may increase the costs borne by recipients, a problem that may be more likely with locally-sourced foods relative to transoceanic shipments, as in this case.

b. Market Price Impacts

A core question surrounding LRP concerns how prices respond in both level and volatility to the procurement and distribution of food assistance. Purchasing foods by definition increases the demand in the source market used, which can increase consumer prices. Likewise, food distribution can augment supply and thereby decrease prices. If prices change, there are both winners and losers. For example, poor local consumers may be harmed by a price increase, but poor producers may be harmed by a price decrease. Of course, there may be no price impact if, for example, markets are sufficiently integrated with

other market sources so as to respond with flows in volume as opposed to changes in price, or if the purchases or distributions are too small to affect even poorly integrated local markets.

Confounding factors that can simultaneously influence prices pose a key complication in estimating the price impacts of food assistance procurements or distributions. In some cases, food assistance is provided in response to shocks to local market prices caused by, for example, increases in world food prices or local transport costs, a local climate shock, or seasonality, in which case it is very easy to misinterpret a positive association of food purchases with higher food prices as reflecting a causal impact of food procurement. While including controls for many observable confounding variables can help reduce the likelihood of biased estimates of the statistical relationship between food procurement or distribution and market prices, we know of no reliable statistical means of establishing the causal impact of food assistance on market prices.

With that crucial caveat in mind, Garg et al. (2012) econometrically estimate the market price and price volatility impacts of LRP activities in seven different countries. That analysis, which we briefly summarize here, includes millet and cowpea prices in Burkina Faso under LEAP.[11] The analysis employed monthly time series data from January 2000 to July 2011 in seven markets: Bogandé in the distribution region, Dédougou in the millet source region, and five central markets.[12] Controlling for the consumer price index (CPI), transport CPI, temperature and precipitation data, local seasonality in harvests, and global market prices for cowpeas and millet, Garg et al. (2012) estimate the association of LRP procurements and food distributions in Burkina Faso with price levels and price volatility – measured as the standard deviation of prices – across space, time, and commodities. [13]

The Garg et al. (2012) analysis found that cowpea and millet procurement had no statistically significant relationship with cowpea or millet retail prices in any market in Burkina Faso. Likewise, there was no statistically significant association between procurements and market price volatility. However, millet distribution – as distinct from procurement – had an economically and statistically significant negative association with retail market prices with a one month lag. Millet distributions also had a positive and statistically significant association with retail price volatility in Burkina Faso Thus the price impacts analysis, which must be interpreted with care given the impossibility of pinning down causality cleanly in the observational data, fail to reject the null hypothesis that local procurement in Burkina Faso had no impact on market prices, although there is some suggestion that food distribution had some effect in millet markets only. Of course, market price impacts of distribution would be felt no matter whether commodity is sourced locally or in the donor country and thus does not reflect adversely on LRP *per se*.

c. Producers and Recipients

A unique aspect of the Burkina Faso country study is that LEAP distributions occurred in communities near very similar communities with contemporaneous MYAP distributions by the same operational agency. By controlling for other variations between the two sets of communities and between individual households,

[11] Vegetable oil price effects could not be econometrically estimated due to a lack of a high-quality vegetable oil price series that preceded procurement activity.

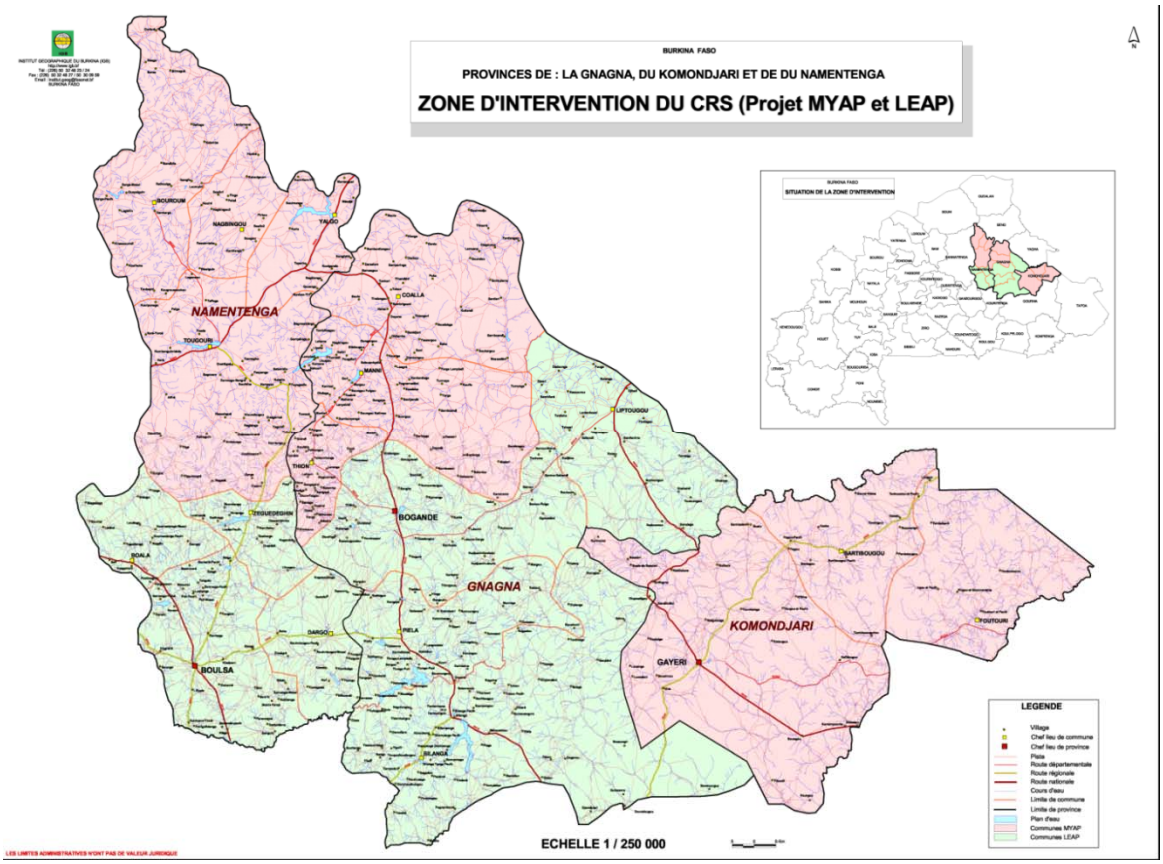
[12] The central markets included Sankariaré in the capital city of Ouagadougou, as well as Bobo Diolasso, Pouytenga, Léo, and Yalgo.

[13] With just one procurement per LEAP commodity, Garg et al. (2012) could not estimate the effect of LEAP procurement alone, so they combine LEAP and WFP purchasing activities to estimate the impact of LRP purchases, regardless of the implementing agency.

we can use this natural experiment to isolate how producer and recipient outcomes differed by the sourcing of the commodities distributed in these otherwise nearly-identical programs. Outcomes related to impacts on food recipients and suppliers were assessed through post-distribution surveys in both the LEAP and the MYAP regions. This involved three surveys:

(1) A cowpea producer survey covering personal and production characteristics, sales results, management practices, trainings received, and credit access.
(2) A school survey administered to the head school cook, covering preferences for local versus U.S. commodities across a range of consumption and preparation attributes.
(3) A school director survey covering school characteristics, such as quality of infrastructure, distance to markets, enrollment, attendance, and composition of students.

Figure 2 : The LEAP and MYAP Intervention Regions



Identification of the causal impacts of LRP relied on the use of the MYAP region as a control condition against which the "treatment" of local sourcing of distributed food was compared. While the choice of departments for LEAP versus MYAP distributions, and of farmers' associations within those departments, was not random, the regions are closely neighboring (Figure 2). There is a great deal of cultural similarity, and all face similar conditions in terms of ecological constraints, infrastructure, and access. In addition, sampling was done after stratification by department allowing for department-level fixed or random effects, which permit us to control for unmeasured or unobservable factors that differ throughout the provinces.

i. Producers

Some advocates of LRP argue that purchasing food from local suppliers can strengthen markets and smallholder livelihoods and profits (Tschirley and del Castillo 2007). By comparing the experiences and outcomes of farmers whose associations sold cowpeas to CRS against those cowpea farmers in neighboring communities (including MYAP communities) whose associations were not eligible to sell cowpeas to CRS, we can identify the impact of CRS' procurement activities on smallholder producers who are members of the farmer associations with whom CRS contracted.

The analysis of the effects of LRP on producers focuses only on cowpea producers who lived in the LEAP distribution areas or areas nearby. The millet suppliers are cooperatives that encompass the entire production region, and hence there were no closely neighboring but non-participating cooperatives from which to derive a control group. In the Gnagna and Namentenga provinces, however, there are farmers' associations that are similar to the cowpea suppliers and did not participate in local purchases. The purchases of cowpeas directly from smallholders also provided an opportunity to examine the impacts of LRP on a uniquely small scale.

We drew 20 farmers randomly from the lists of all association members in each of the eight LEAP departments for a sample of 160 prospective LEAP suppliers. We then identified all associations in proximity to the MYAP schools, and randomly selected 150 farmers from those associations in four departments, for a control group of 150 farmers. As sampling weights varied by department, all the statistical results reported below are adjusted accordingly.[14]

We examine the effect of membership in an association that sold to LEAP, which can be thought of as an intent-to-treat (ITT) effect. We also consider just those who sold to the association that sold to LEAP this year, generating an average-treatment-effect-on-the-treated (ATET) that can, however, be subject to selection effects for which we cannot adequately control. Outcomes of interest are examined according to the following econometric model:

$$y^* = \alpha + \beta_0 LEAP + \boldsymbol{X}'\boldsymbol{\beta_1} + \boldsymbol{D}'\boldsymbol{\beta_2} + \varepsilon$$

where y* is the outcome of interest, $\boldsymbol{\beta_0}$ is the coefficient of interest either on the association membership (ITT) or direct participation (ATET) indicator variable for LEAP suppliers, $\boldsymbol{X}$ is a vector of individual controls, $\boldsymbol{D}$ is a vector of department/enumerator fixed effects, and ε is a mean zero, iid, normally distributed error term. Characteristics that vary within and between groups and that may affect outcomes are included as controls in $\boldsymbol{X}$. A description of the outcome and control variables used, and mean differences across a range of characteristics, are presented in Appendix Tables AIII, AIV, and AV, respectively. Ordinal outcomes are examined similarly using a fixed effects ordered logit model, and binary outcomes likewise with a fixed effects logit model.

The post-distribution survey examined two key categories of outcomes: farmer knowledge and behavior, and farmer sales or profitability. Questions were asked for the project year (the 2010-2011 agricultural season) and the prior year (the 2009-2010 season), and we hence examined the difference in differences, or the degree to which the project year improved relative to the prior year for farmers in LEAP associations (ITT) or direct participants who sold to LEAP (ATET).

[14] The total members of farmers' associations identified and sampled, and resulting sampling weights, are provided in Appendix Table AII.

Farmer Knowledge and Behavior

Although unconditional comparisons between LEAP and MYAP zone farmers reveal no statistically significant differences in practices, the multivariate econometric evidence does reveal important, statistically significant differences. These results are summarized in Table 5.[15] LEAP purchases led direct participants to engage in improved storage practices. Members of LEAP farmers' associations also demonstrate better knowledge of quality criteria for cowpeas. A variable was constructed indicating the number of USDA-relevant quality criteria recognized by farmers, including lack of insects, minimum of foreign matter, and the moisture content. Once again, while there was no statistically significant difference between the two regions in a bivariate test, the multivariate regression results indicate that those in LEAP associations had greater knowledge of these standards than did farmers in the MYAP region, whether or not they participated directly in the purchase.

Table 5: Behavioral Impacts

	Member of LEAP Association (Intent to Treat)	Direct Participant (Treatment on Treated)
Storage	---	++
Quality Knowledge	+++	+
Small Investments	+++	-

The "+" or "-" symbols indicate a positive or negative coefficient; the number of signs indicates the significance, +/-, ++/--, +++/--- for 10%, 5%, and 1%, respectively.

The difference between bivariate and multivariate tests for these variables may be explained in part by the fact that the farmers in the MYAP region received more training in agricultural techniques, many of which pertained to quality criteria and storage practices, leading perhaps to improved practices and knowledge relative to those in the LEAP region before local purchases began. By controlling for the number of trainings received in the regression analysis, we can isolate the impacts of LEAP separated from complementary smallholder training interventions. While storage practices may not have changed for non-participating members, knowledge of quality criteria improved even for those not directly involved.

Farmer Profitability

Possible indicators of profitability include ordinal self-reported improvements in profitability relative to last year, the purchase price and revenue received by farmers, and transaction costs, or the time and distance travelled in order to sell a given quantity. Profitability and transaction cost impacts are summarized in Table 6.[16]

[15] As these result from an ordered logit regression, the magnitudes of coefficients are not pertinent. As such, Table 5 summarizes only the direction and degree of significance. See Appendix Tables AVI.5 and AVI.6 for the full econometric results.

[16] See Appendix Tables AVI.1 through AVI.6 for the full econometric results.

Table 6 : Profitability Impacts of LEAP

	Member of LEAP Association (ITT)	Direct Participant (ATET)
	Random Effects, OLS or Ordered Logit	
Price Received		
Price received for cowpeas in project year (CFA)	+106** *(+49%)*	+115 *(+53%)*
Reported difference from the prior year^	HIGHER	HIGHER***
Profitability		
Reported difference from the prior year^	LOWER	HIGHER***
Revenue		
Revenue from cowpeas in project year (CFA)	+28,194*	+29,444*
Change project year relative to the prior year (CFA)	+27,156** *(+41%)*	+19,933 *(+30%)*
Travel and Time, project year relative to the prior year		
Individual transactions to sell cowpeas (#)	-5 *(-75%)*	-4 *(-60%)*
Number of trips taken to sell cowpeas	-1** *(-59%)*	-1** *(-59%)*
Total distance travelled to sell cowpeas (km)	-20 *(-61%)*	-30** *(-91%)*
Time travelling to sell cowpeas (min)	-47* *(-47%)*	-53** *(-52%)*
Other time spent selling cowpeas (min)	-76* *(-45%)*	-59* *(-35%)*

Note: The random effects estimator provides more efficient estimates of the coefficients than a fixed effects model; however, it can suffer from bias (and hence be inaccurate in direction or magnitude). In this case, Hausman tests revealed that the random effects estimator is in unbiased, for all outcomes save "Revenue for cowpeas this year" and Revenue "Change this year relative to last year." The full results for both estimators are included in the Appendix.

^ These outcomes were ordinal, and estimated using the ordered logit random effects model.

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

We find that the mean price received between the project year relative to the prior year was higher both for members of participating associations who did not sell to the association (by 49 percent) and for direct LEAP participants (by 53-82 percent). Likewise, while the ITT estimates are statistically insignificant, the ATET estimates show a significantly positive effect on profitability reported by those who sold to the LEAP supplying associations. Participants in LEAP also earned higher revenue in the project year than non-participants, by an average of approximately 30,500 CFA (roughly $60), or 70 percent relative to average cowpea revenue in the MYAP region. Revenue increased by on average 41 percent relative to the prior year for members of LEAP associations, whereas the change in revenue between the project year and the prior year was statistically significantly different between regions for participants. While the LEAP project purchased cowpeas at market price and had no discernible effect on market prices, as discussed already, we hypothesize that those who sold to LEAP received a higher price due to the fact that they waited to sell their product until later in the season, and hence benefited more directly from predictably inter-seasonal price changes than did those in the MYAP zone who sold to traders immediately post-harvest. This inference is supported by our discussions with individual LEAP supplier farmers.

Participation in LEAP also benefited farmers by saving them travel distance and time. Direct participants in LEAP travelled on average 91 percent less, or 30 fewer kilometers, to sell cowpeas; this magnitude makes sense, as many participants traveled great distances in the previous year but sold to the school within their community in the project year. They also spent less time travelling to sell than did non-participants, by a

statistically significant average of 53 minutes (52 percent). While these differences are averages, for some individuals the difference was even more dramatic. A member of the association Tidogo Hambri ("Develop Our Village") in Liptougou reported that in the prior year he took his relatively large surplus of 15 100 kg bags 150 kilometers away to Pouytenga, which took him a total of 9 hours. In the project year he travelled only 500 meters from his farm to sell the same quantity at about the same price to the local school through his farmer association.

ii. Recipients

We sampled schools by stratifying by department, then randomly selecting 15 schools from each of the eight LEAP departments and a sufficient number from each of the four matched MYAP departments to obtain 120 schools each for the LEAP treatment and MYAP control groups. As with the producer surveys, all statistical results that follow are adjusted for sampling weights.[17] School cooks were asked to rank their preferences, and their perception of students' preferences, for each commodity across a range of attributes on a scale of 1 (low) to 5 (high). They were then asked to compare the commodities with respect to preparation characteristics, likewise on a scale of 1 to 5. In addition to absolute assessments, preferences were registered relative to commodities received in the prior year to generate difference-in-differences estimates comparing LEAP schools – whose rations changed from the MYAP mix of imported bulgur wheat and lentils to locally-sourced or millet and lentils – against MYAP schools whose rations did not change.[18] As there were very few responses of either 1 (very unsatisfied / liked much less) or 2 (unsatisfied / liked less), these two categories were combined for the analysis.

The elicited rankings only order stated preferences, so first we test for unconditional differences between the LEAP and MYAP recipients' satisfaction with their rations using a Mann-Whitney median test of whether two independent samples come from the same distribution. We then integrate controls using a multivariate ordered logit model since there may be systematic, rather than merely random, differences between the LEAP and MYAP schools. Controlling for confounding factors in this natural experimental setting allows us to establish a causal relationship between receiving locally sourced foods and cooks' stated preferences for the specific commodities received.

We estimate the following ordered logit model:

$$y^* = \alpha + \beta * LEAP + \boldsymbol{X}_1'\gamma_1 + \boldsymbol{X}_2'\boldsymbol{\gamma}_2 + \varepsilon + \delta$$

$$y = 1 \; if \; y^* \leq \mu_1$$

$$2 \; if \; \mu_1 < y^* \leq \mu_2$$

$$3 \; if \; \mu_2 < y^* \leq \mu_3$$

$$4 \; if \; \mu_3 < y^* \leq \mu_4$$

where $\boldsymbol{y^*}$ represents the recipient's latent cardinal valuation of the food assistance ration, which is grouped into one of the four ordinal response options, $\boldsymbol{y}$, according to where $\boldsymbol{y^*}$ falls relative to unobserved cut-off points $\boldsymbol{\mu_1}$- $\boldsymbol{\mu_4}$. The parameter α is a constant, *LEAP* is an indicator variable taking value one for a LEAP school and zero in a MYAP school, $\boldsymbol{X_1}$ is a vector of respondent-specific controls, and $\boldsymbol{X_2}$ is a vector of school-level

[17] The departments, total numbers of schools, numbers of schools drawn, and resulting sampling weights are provided in Appendix Table VII.

[18] A few school cooks, about ten per commodity and zone, compared the commodity this year to something else provided last year. For consistency, these observations were dropped from the analysis.

controls. $\beta$is the coefficient of interest, reflecting how receiving local-sourcing of commodities affects recipient satisfaction, relative to food aid commodities shipped from the United States, controlling for other factors that might influence preferences and that might vary systematically between LEAP and MYAP schools. The coefficient vectors γ_1 and γ_2 reflect the effects of the control vectors X_1 and X_2, respectively. A description of the variables and mean differences across characteristics are presented in Appendix Tables AVIII and AIX. The error term can be decomposed into two components: ε and δ, which include respondent- and school-specific unobservable characteristics, respectively. Department-level random effects control for a number of factors that may affect the distribution of outcomes.

A summary of results for general satisfaction is presented in Table 7 (see Appendix Tables AX.1-AX.4 for the full econometric results). The column headed 'Bivariate' in Table 7 shows the Mann-Whitney test results as to in which region (LEAP or MYAP) recipients were more unconditionally satisfied with the commodity they received. The overwhelming majority of schools in both the LEAP and MYAP regions were satisfied or very satisfied with the rations received.[19] tHowever, these test results suggest greater satisfaction with the commodities received by LEAP respondents along most commodity characteristics. LEAP respondents were more strongly satisfied with the legumes received across all elicited characteristics than were MYAP respondents. The only exception for the cereal was cleanliness; the US-sourced bulgur wheat was rated as cleaner than the locally-sourced millet. Respondents complained in particular of presence of dirt and rocks in the millet, which required more sorting prior to preparation than the bulgur wheat, but did not affect its conservation (reflected in the fact that millet is still preferred with respect to storability).

Table 7 : Commodity Preferences, General Satisfaction

Criteria	Commodity Preferred			
	GRAIN (millet / bulgur wheat)		LEGUME (cowpeas / lentils)	
	Bivariate Test (Mann-Whitney)	Multivariate Test (Ordered Logit)	Bivariate Test (Mann-Whitney)	Multivariate Test (Ordered Logit)
Taste	LEAP**	LEAP	LEAP	LEAP***
Ration Size	LEAP**	LEAP	LEAP***	LEAP**
Texture	LEAP***	LEAP*	LEAP***	LEAP***
Appearance	LEAP***	LEAP**	LEAP***	LEAP***
Cleanliness	MYAP***	MYAP**	LEAP	LEAP
Storability	LEAP***	LEAP***	LEAP**	LEAP
Nutrition	LEAP	MYAP***	LEAP**	MYAP***
General Satisfaction	LEAP	LEAP	LEAP	LEAP***

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

While the bivariate tests suggest significant differences in satisfaction between the LEAP and MYAP regions, factors other than the commodity distributed may affect these differences. The column 'Multivariate' in Table 7 shows which group of recipients was more satisfied with the commodity received, controlling for school and respondent characteristics. The locally-sourced commodity remains preferred by recipients on virtually all criteria, especially for legumes. The millet is still considered less satisfactory with respect to

[19] With respect to general satisfaction with the cereal received, 3.4 percent of LEAP recipients and 1.7 percent of MYAP recipients reported being unsatisfied or very unsatisfied, and 94 percent and 90 percent (respectively) reported being either satisfied or very satisfied. For the legume received, 8.7 percent of LEAP recipients and 5.6 percent of MYAP recipients reported being unsatisfied or very unsatisfied, and 82 percent and 72 percent reported being either satisfied or very satisfied.

cleanliness, albeit with less statistical significance. The only change relative to the bivariate results regards the perception of nutritional quality; once controls are added, both MYAP commodities are perceived as nutritionally superior. The difference-in-differences estimates are qualitatively similar, so are not presented here.

The advantages of the U.S. commodities emerge when it comes to preparation. As summarized in Table 8, school cooks report that locally-sourced millet unambiguously takes more time, effort, cooking fuel, water, and oil to prepare than does imported bulgur wheat. This is not surprising, as the bulgur wheat is pre-prepared and hence designed to cook quickly, whereas the millet is raw and unprocessed. While respondents rate cowpeas as also taking more time, effort, and fuel, the two commodities are prepared together, and qualitatively most preparers stated that it was the millet that accounted for the increased demand on school resources. However, the additional resources required were primarily in time; no statistically significant differences in expenditures by PTAs for additional supplies were found between LEAP and MYAP schools. Many preparers suggested that providing millet in a pounded form would reduce cooking time and effort, while they admitted the trade-off that pounded millet doesn't store as well and may be less nutritious.

Table 7 : Commodity Preferences, General Satisfaction

Criteria	Commodity Preferred			
	GRAIN (millet / bulgur wheat)		LEGUME (cowpeas / lentils)	
	Bivariate Test (Mann-Whitney)	Multivariate Test (Ordered Logit)	Bivariate Test (Mann-Whitney)	Multivariate Test (Ordered Logit)
Taste	LEAP**	LEAP	LEAP	LEAP***
Ration Size	LEAP**	LEAP	LEAP***	LEAP**
Texture	LEAP***	LEAP*	LEAP***	LEAP***
Appearance	LEAP***	LEAP**	LEAP***	LEAP***
Cleanliness	MYAP***	MYAP**	LEAP	LEAP
Storability	LEAP***	LEAP***	LEAP**	LEAP
Nutrition	LEAP	MYAP***	LEAP**	MYAP***
General Satisfaction	LEAP	LEAP	LEAP	LEAP***

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Overall, we find that cooks and students in LEAP schools are more satisfied than those in the MYAP schools in spite of the fact that the cooks in the LEAP region bear increased preparation costs – primarily time – relative to those who receive US-sourced commodities. Several respondents in the LEAP region stated that while as cooks they preferred to receive the imported commodities, which reduce their workload, as mothers they preferred to receive the local commodities, which is why on balance their general satisfaction was greater with the LEAP commodities. These results hold across both commodities and when controlling for many potentially confounding factors.

IV. Summary: Tradeoffs and Synergies in Locally Sourcing Foods for School Feeding Programs

These results reveal that local food aid procurement, even on a very small, localized scale, can work well in a non-emergency context. There exist positive synergies that can be exploited. However, there are also tradeoffs that need to be considered, and risks that, while avoidable, must be carefully monitored and managed.

A key synergy that emerges is that both purchasing agencies and local suppliers face reduced costs. CRS paid 25 percent less purchasing the three commodities, and suppliers travelled on average 61 percent less and spent 52 percent less time selling them. Suppliers also received higher prices by waiting to sell, although the LRP purchases did not impact market prices controlling for seasonality and other confounding factors. Agency purchases also led to benefits in learning about product quality and storage practices among smallholders in the supplier farmer associations.

These benefits are perhaps more likely to occur when agencies purchase on a small-scale involving direct interaction with smallholder farmers. Buying smaller also, however, entails tradeoffs, particularly with respect to assuring product quality. Products from smallholder suppliers are more likely to be heterogeneous. Quality testing has to be done more meticulously, and other follow-up measures are often necessary to assure quality. Buying from larger suppliers can help with quality assurance, and also reduces the number of necessary contracts and transactions. In addition, for some processed products, such as vegetable oil, the considerable comparative advantage of modern, large-scale donor country processors may offset, or even trump, the added transport costs of transoceanic deliveries.

How to weigh this set of tradeoffs depends on the objectives and context of the program. The advantages of buying from large suppliers may be essential, for example when buying quickly to meet emergency needs. However, a non-emergency LRP program such as the school feeding program we study can plan ahead and directly integrate development-related goals, such as working directly with smallholders. Assuring quality standards may in this case require additional logistics and testing costs; but these logistics and costs are demonstrably smaller than ocean freight. It may entail more advanced planning as well, such as in identifying smallholder suppliers and working with them in advance to improve quality in the prior planting season. However, even an entire growing season in the Sahel may take less time than it does to transport goods from the US to Ouagadougou. These additional activities can still yield cost and time advantages relative to transoceanic shipment.

Other tradeoffs may exist, as in this case, regarding the nature of the commodities supplied. Transoceanic shipments can include semi-processed foods, such as pre-cooked bulgur wheat, that may not be available locally and that reduce preparation costs for recipients. One way to handle this may be to use a fraction of the saved cost to support processing costs locally, especially if the local commodity is otherwise preferred, as in the Burkina Faso case with respect to millet. It may, for example, make sense to provide vouchers for milling to severely liquidity constrained schools in order to compensate for the burden of processing foods in a more raw form.

The prospective disruption of local markets by agency procurement or distribution activities is an ever-present concern. While there is no evidence of local procurements in Burkina Faso affecting market prices, food aid distribution was associated with statistically significantly lower and more volatile market prices for millet, in spite of the relatively small quantities delivered. This underscores the importance of ex ante response analysis to assess the appropriateness of local purchases and distributions for local markets as well as ongoing market monitoring by food assistance agencies (Barrett et al. 2009).

The simultaneous implementation of school feeding programs in neighboring departments in Burkina Faso by the same agency, with one program using locally-sourced commodities and the other importing food from the United States, afforded an uncommon natural experiment for studying the impacts of LRP along a variety of different metrics. The results reported here strongly support the permanent incorporation of LRP in the international food assistance policy toolkit. While there remain cautions concerning market price impacts, food quality and safety, and the cost of processed products that necessitate careful ex ante

analysis and ongoing monitoring and evaluation, the evidence clearly indicates the potential for major timeliness and efficiency gains as well as benefits to local smallholder suppliers and recipients who prefer locally sourced products. The prospective synergies and tradeoffs among these various criteria reinforce the need for donors, operational agencies and intended beneficiaries to clearly articulate their priority objectives during the design phase of food assistance programs.

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Chapter 6 Appendix

Table AI: Suppliers and Quantities, by commodity and region

Region	Province	Department	Association/Union/Company Name (and meaning)	Quantity Purchased (MTs)
Cowpeas:				
Est	Namentenga	Boala	Wend la Conta ("God Provides")	2.8
			Kiswensida ("Trust in God")	3.4
		Boulsa	Lagem-baoré ("In the Same Grainery")	6.8
			Songnaaba ("Help Our Leaders")	2.9
			Wendeso ("In God's Hands")	19.6
			Basnere ("Seek a Good End")	3.9
			Teegwende ("Have Faith")	10.5
			Manegdeketa ("Continue to Improve")	
		Dargo	Teegtaaba ("Trust Eachother")	5.6
			Wendsongdo ("God is Our Aid")	4.8
			Baoyam ("Seek Wisdom")	1.5
			Teegwende ("Have Faith")	1.3
Centre-Nord	Gnagna	Piela	Boayaaba ("Love Eachother")	21.4
		Bilanga	Taami-Mani ("Better to Unite")	5.3
			Kanyoapori ("Continue to progress")	5.3
		Bogandé	Union Findyaaba ("Together for Development")	24.8
			Poogoundiman ("We took one step, but two is better")	13.7
		Liptougou	Tidogou Hambri ("Develop Our Village")	4.7
			Taangnabou ("Think Alike")	5.3
			Total Quantity of Cowpeas Procured (MT):	143.5
Millet:				
Boucle du Mouhoun	Nayala	47 Departments	Union des Groupements pour la Commercialisation des Produits Agricoles de la Boucle du Mouhoun (UGCPA)	54.1
	Mouhouh			
	Kossi			
	Banwa			
	Les Bale			
	Sourou			
	Mouhoun	17 Departments	Union des Groupements des Producteurs pour la Commercialization des Céréales (UGPCC)	99.6
	Kossi			
	Nayala	47 Departments	Union Regionale de Producteurs de Sémences (URPS)	319
	Mouhoun			
	Kossi			
	Banwa			
	Les Bale			
	Sourou			
	Nayala	6 Departments	Union des Groupements des Producteurs de Cereales de Nayala (UGPCER)	155.4
			Total Quantity of Millet Procured (MT):	628.1
Vegetable Oil:				
Centre	Kadiogo	Ouagadougou	Etablissement Moussa Ouedraogo et Frères (EMOF)	72.2
			Total Quantity of Vegetable Oil Procured (MT):	72.2

Table AII: Sampling Weights, Farmers in LEAP and MYAP zone

Province	Department	LEAP Associations			MYAP/Comparison Associations		
		Sample	Of	Weights*	Sample	Of	Weights*
Gnagna	Piela	20	30	1.5	---		
	Bilanga	20	58	2.9			
	Bogande	20	231	11.6			
	Liptougou	20	63	3.2			
	Thion	---			35	159	4.5
	Manni				35	100	2.9
Namentenga	Boulsa	20	57	2.9	---		
	Boalla	20	33	1.7			
	Zeguedeguin	20	51	2.6			
	Dargo	20	43	2.2			
	Yalgo	---			45	45	1
	Tougouri				35	39	1.1
TOTALS		160	566	28.30	150	343	9.51

* The probability weight, integrated into the multivariate regressions, is calculated as the inverse of the probability that each farmer was chosen from among all the associations in his/her

Table AIII: Variable Definitions, Producer Control Variables

Control	Variable Description	Variable Label	Variable Definition
Program and Participation	Member of LEAP Association	*Member of LEAP Association*	= 1 if member of an association that sold to LEAP, 0 otherwise
	Sold to LEAP	*Member, & Sold to CRS*	= 1 if sold cowpeas through the association to LEAP, 0 otherwise
Respondent-level, demographics	Age	*Respondent age*	In years
	Gender	*Female*	= 1 if respondent is female, 0 otherwise
	Level of Education	*Level of Education*	= 0 if no literacy = 1 if Koranic school only = 2 if some literacy = 3 if some primary school = 4 if some middle or high school
	Religion	*Muslim* *Animist* *Protestant*	= 1 if Muslim, 0 otherwise = 1 if Animist, 0 otherwise = 1 if Protestant, 0 otherwise (remainder are Catholic)
	Household Size	*HH Size*	Total number of HH members, defined as those who eat and sleep within the household
Respondent-level, production characteristics	Land cultivated, 2010-2011	*Land Cultivated (ha)*	Amount of land cultivated this season (hectares)
	Land allocation to cowpeas	*Allocated to Cowpeas*	Percentage of land allocated to cowpeas (alone or associated), 2010-2011
	Cowpea as primary revenue	*Cowpeas as primary revenue*	= 1 if cowpea sales are the household's primary revenue source, 0 otherwise
	Trainings Received	*Types of Trainings*	Number of trainings received on agricultural techniques

Table AIV: Variable Definitions, Producer Outcome Variables

Outcome	Variable Description	Variable Label	Variable Definition
Transaction Costs	Difference in no. of transactions	*Transactions, This Year - Last Year*	Change in number of transactions in sales of cowpeas, this season relative to last season
	Difference in no. of trips for sales	*Trips, This Year - Last Year*	Change in number of trips taken to sell cowpeas, this season relative to last season
	Difference in total distance travelled	*Distance Travelled, This Year - Last Year*	Change in total distance travelled to sell cowpeas (in kilometers), this season relative to last season
	Difference in total time spent travelling	*Travel Time, This Year - Last Year*	Change in total time spent travelling to sell cowpeas (in minutes), this season relative to last season
	Difference in other time spent selling	*Total Time, This Year - Last Year*	Change in other time spent selling cowpeas (in minutes), this season relative to last season
Profitability	Most frequent price received this season	*Price Received, 2010-2011*	Price quoted as "usual price" received this season (CFA)
	Difference in sales price this year	*Sales Price*	On a scale of 1 (="much lower than last year") to 5 (="much higher than last year")
	Total revenue this season	*Total Revenue, 2010-2011*	Total revenue from cowpeas this season (CFA)
	Difference in revenue,	*Difference in Revenue, This Year - Last Year*	Change in revenue from cowpeas this season relative to last season
	Difference in profitability	*Profitability*	On a scale of 1 (="much lower than last year") to 5 (="much higher than last year")
Knowledge and Behavior	Knowledge of Quality Standards	*Quality Knowledge*	Ordinal, number of the USDA quality criteria recognized as "criteria that describe your highest quality cowpeas"
	Conservation Practices	*Improved Storage*	= 0 if ordinary bags or traditional grainery, = 1 if ordinary bags with chemicals, = 2 if bottles or barrels, = 3 if double- or triple-lined bags
	Traction-related farm investment	*Traction Asset*	Number of new investments this year, in traction goods or animals (carts, donkeys, oxen)
	Small-scale investments	*Small Asset*	Number of new investments this year, in small similarly-valued productive assets (shovels, hoes)

AV: Mean Characteristics, Producers

Control Variable	MYAP	Member of LEAP Association		Member and Sold to CRS	
		Mean	LEAP-MYAP	Mean	LEAP-MYAP
Age (years)	39.62	40.32	0.7	40.31	0.69
Gender (Female=1)	53%	41%	-12%***	41%	-12%*
Level of Education (ordinal)	1.29	1.43	0.14	1.43	0.14
Religion:					
Muslim	23%	46%	23%***	46%	23%***
Animist	14%	11%	-3%	11%	-3%
Protestant	19%	11%	-8%	11%	-8%*
Catholic	39%	32%	-7%**	32%	-7%
Ethnicity:					
Gourmantché	47%	51%	4%	51%	4%
Mossi	44%	47%	3%	47%	3%
Peulh	2%	0%	-2%**	0%	-2%
HH Size	10.9	12.6	1.7***	12.6	1.7**
Land Cultivated 2010-2011 (ha)	3.03	3.61	0.58*	3.61	0.58**
Land Allocated to Cowpeas	64%	53%	-10.5%***	53%	-10.5%**
Cowpeas as Primary Revenue	54%	78%	23.8%**	78%	23.8%***
No. Trainings Received:					
Management Practices	0.505	0.561	0.056*	0.56	0.055
Storage	0.307	0.528	0.221	0.53	0.223***
Marketing	0.036	0.057	0.021	0.057	0.021
Different Types	1.44	2.02	0.58***	2.02	0.58**
Outcomes of Interest					
Small Asset Purchases (percent)	5.8%	8.1%	2.3%	8.1%	2.3%
Quality Knowledge (ordinal, 1-4)	1.14	1.02	-0.12	1.09	-0.05
Storage Practices (ordinal, 1-4)	2.47	2.47	0	2.57	0.1
Profitability (ordinal, 1-5)	3.77	3.74	-0.03	3.75	-0.02
Price Received (project year, CFA)	191	248	57***	271	80***
Difference in Revenue (project-prior, CFA)	11747	31798	20051***	32441	20694***

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AVI.1: Producer Impacts, Results for Direct Participants (Treatment on Treated), Random Effects OLS

	Transactions, This Year - Last Year	Trips, This Year - Last Year	Distance Travelled, This Year - Last Year	Travel Time, This Year - Last Year	Other Time, This Year - Last Year	Price Received, 2010-2011	Total Revenue, 2010-2011^	Difference in Revenue, This Year - Last Year
Age	-0.077668	0.0039829	-.9598155**	-1.532971*	-1.072903	4.327977**	-357.3148	-254.2053
	(.1396207)	(.0167424)	(.4609203)	(.9074955)	(1.548289)	(1.81502)	(659.2811)	(534.1984)
Female	-1.758446	-.76394*	36.12691**	62.80889**	67.28788*	34.26095	-6847.483	-10429.42
	(3.457848)	(.3985357)	(11.43686)	(23.53563)	(37.33937)	(42.95344)	(16323.04)	(14098.48)
Level of Education	0.1217589	-0.0223849	-0.8336792	1.71034	-5.001476	-3.874147	-7290.704	-8796.179
	(1.292701)	(.158576)	(4.482726)	(9.311981)	(15.63308)	(17.07603)	(6408.702)	(5420.056)
Muslim	3.136501	-0.27471	29.66399**	45.09219	47.77596	-108.4507**	1865.223	10077.1
	(3.95346)	(.4642756)	(13.30148)	(27.52173)	(44.95681)	(50.21269)	(18695.86)	(15351.16)
Animist	1.852436	-0.2425303	39.85238**	92.22828**	50.37879	-109.5274	3905.885	-2681.72
	(5.472064)	(.6359921)	(19.39137)	(39.00942)	(63.87445)	(69.02434)	(24668.24)	(21517.08)
Protestant	-0.6033793	0.0528244	15.79059	22.60869	42.17242	-136.3814**	-8184.873	1556.713
	(5.039547)	(.6235066)	(16.56614)	(33.44684)	(56.32269)	(67.04526)	(25295.15)	(21068.06)
HH Size	-0.169328	-0.0335487	0.9793622	1.969064	-0.4985057	-0.3757215	4109.95**	822.9049
	(.3239893)	(.0388631)	(1.0945)	(2.234533)	(3.627087)	(4.177422)	(1522.065)	(1337.694)
Land Cultivated (ha)	0.835551	0.1219255	-12.72479***	-25.51001***	-16.73673**	-17.21718*	3604.779	2180.16
	(.754027)	(.0933037)	(2.311496)	(4.715169)	(7.607874)	(10.02821)	(3665.389)	(3224.611)
Allocated to Cowpeas (%)	-.1799198**	-0.007207	-0.2273888	-0.5649788	-1.266206*	1.655514**	-176.0987	101.1652
	(.0629957)	(.0071742)	(.2190449)	(.4219218)	(.7204239)	(.7730844)	(283.8803)	(253.0582)
Cowpeas as Primary Revenue	-2.451699	-0.2479543	-11.71426	-40.6719*	-61.48543*	45.97451	35756.55**	15620.84
	(3.226542)	(.4064095)	(10.85954)	(21.86649)	(35.32351)	(43.68127)	(16255.08)	(13905.39)
Types of Trainings	-0.7779529	-0.0953685	10.21579**	14.88054*	13.36434	-2.905065	-5990.058	-3970.362
	(1.204402)	(.1423818)	(3.737829)	(7.774322)	(13.18323)	(15.33379)	(5797.102)	(5001.227)
Member, & sold to CRS	**-3.875029**	**-1.030246****	**-29.85551****	**-52.99828****	**-59.19213***	**115.1114****	**29444.23***	**19933.29**
	(3.035797)	**(.3893137)**	**(10.45772)**	**(21.48624)**	**(35.34313)**	**(41.9418)**	**(15352.11)**	**(12491)**
Constant	20.15719*	1.867172	41.35239	99.68909	151.6887	10.26569	12734.58	13913.27
	(10.91622)	(1.331662)	(40.3814)	(82.43739)	(135.7422)	(143.129)	(55760.19)	(48616.56)
Number of Observations	125	169	81	85	77	168	156	132

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

^ For these outcomes the Hausman Test rejected the consistency of the Random Effects model. However, the coefficient of interest in the fixed effects model for"Total Revenue, 2010-2011" is similar in magnitude and significance; the coefficient of interest in the fixed effects model for the "Difference in Revenue" is smaller in magnitude, and likewise not significant.

Table AVI.2: Producer Impacts, Results for Direct Participants (Treatment on Treated), Fixed Effects OLS

	Transactions, This Year - Last Year	Trips, This Year - Last Year	Distance Travelled, This Year - Last Year	Travel Time, This Year - Last Year	Total Time, This Year - Last Year	Price Received, 2010-2011	Total Revenue, 2010-2011	Difference in Revenue, This Year - Last Year
Age	-0.012396	0.0582811	-1.425196**	-3.020537**	-2.802282**	8.576968	-395.8525	-355.8942
	(.3047598)	(.0810366)	(.4599081)	(1.01291)	(1.380039)	(5.464835)	(526.5874)	(329.3346)
Female	-2.667584	-0.547584	34.32392	76.65304**	68.42801	28.7655	-30017.41*	-8281.508
	(3.279921)	(.6599235)	(21.34753)	(36.45216)	(44.34935)	(60.38025)	(17444.27)	(9302.856)
Level of Education	-1.555033	0.0457559	-3.806871	-6.465915	-18.98899	33.08078	-135.718	-2724.025
	(2.011505)	(.2419902)	(4.272686)	(7.34273)	(15.10012)	(40.00841)	(5471.245)	(5175.389)
Muslim	3.107305	-2.705038	17.21665	44.40183	62.24943	-241.2063	-6520.911	3648.992
	(9.024168)	(2.558429)	(11.99297)	(29.8886)	(41.60993)	(146.0928)	(17928.13)	(13141.21)
Animist	-4.028284	-2.417181	26.77716	82.20805**	40.28636	-216.8467*	3360.061	-10624.16
	(9.806606)	(2.014705)	(18.42956)	(33.65063)	(72.84059)	(128.6988)	(17243.55)	(16878.9)
Protestant	-3.031575	-0.3121209	-2.079982	1.215691	49.15828	-250.2725*	7302.357	-512.4532
	(10.76164)	(.9393032)	(12.26208)	(20.08718)	(63.79818)	(132.7996)	(12805.64)	(10649.98)
HH Size	-0.3151608	-.2642612*	1.6525	2.252501	2.059339	10.58055	1468.375	-80.33017
	(.4027239)	(.154923)	(1.173508)	(2.839769)	(4.810364)	(9.463895)	(1622.953)	(1417.236)
Land Cultivated (ha)	1.85612	0.5170797	-11.21834**	-21.92142**	-11.43024	-45.25662*	8380.573**	2591.228
	(1.704951)	(.3265267)	(5.470531)	(9.495403)	(13.23031)	(26.43255)	(3318.788)	(3637.007)
Allocated to Cowpeas (%)	-.5709548*	-0.014976	-0.1302774	-0.1946383	-1.43829	7.656198**	-208.0533	-79.60978
	(.3149761)	(.0163239)	(.1783529)	(.3684211)	(1.338026)	(3.744957)	(326.2467)	(254.2146)
Cowpeas as Primary Revenue	-0.9567435	0.6981488	-24.41626**	-62.34203**	-90.09987**	-35.43091	3308.747	-790.7956
	(4.772109)	(.6703348)	(10.59024)	(27.94195)	(42.89442)	(65.0586)	(10890.23)	(9722.359)
Types of Trainings	1.003205	-0.6081929	6.999591*	4.315145	10.69883	21.41625	-3855.919	-8348.802
	(2.448212)	(.3911381)	(4.174083)	(9.445991)	(16.90956)	(43.25356)	(6731.448)	(7520.486)
Member, & sold to CRS	**-5.943021**	**-0.5864358**	**-43.23915****	**-82.99175****	**-75.62225**	**176.5988****	**30461.87***	**2449.304**
	(4.943203)	(.9308118)	(18.86823)	(32.86381)	(49.37447)	(82.32528)	(18162.89)	(17429.1)
Constant	52.21384*	0.1253729	71.44923**	169.537**	248.7001*	-222.0452	-9013.601	38045.26
	(28.21179)	(3.738424)	(34.14584)	(78.91582)	(148.4338)	(317.8562)	(42247.47)	(40288.94)
N	125	169	81	85	77	168	156	132
R-Squared	0.284878	0.2990568	0.5642797	0.5135973	0.3723135	0.4041505	0.3908116	0.1989852

Note: Department controls are included in the regression but excluded from the table. They include binary variables indicating whether or not each respondent is a resident of: Bilanga, Boala, Bogandé, Boulsa, Dargo, Liptougou, Piela, and Zeguedeguin (Manni excluded).

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AVI.3: Producer Impacts, Results for Association Members (Intent to Treat), Random Effects OLS

	Transactions, This Year - Last Year	Trips, This Year - Last Year	Distance Travelled, This Year - Last Year	Travel Time, This Year - Last Year	Other Time, This Year - Last Year	Price Received, 2010-2011	Total Revenue, 2010-2011	Difference in Revenue, This Year - Last Year
Age	-0.0768993	0.0038652	-.8811706*	-1.475661	-1.005034	4.330697**	-353.3942	-251.9597
	(.1391721)	(.0167414)	(.4814404)	(.9244335)	(1.54028)	(1.824088)	(660.5566)	(531.1706)
Female	-2.926956	-.9987692**	29.99425**	50.6819**	49.4275	57.77762	446.6893	-4469.11
	(3.503559)	(.4107008)	(12.11572)	(24.37774)	(37.85075)	(44.5714)	(16857.37)	(14273.02)
Level of Education	0.0591979	-0.0202983	0.1093614	3.095109	-5.114648	-3.899059	-7536.964	-8852.967
	(1.286371)	(.1586232)	(4.659573)	(9.473469)	(15.57687)	(17.16819)	(6440.853)	(5388.15)
Muslim	3.359443	-0.2986065	26.09829*	42.4006	53.23742	-103.7711**	3415.853	9210.743
	(3.947338)	(.4632305)	(14.07397)	(28.28527)	(45.32759)	(50.33021)	(18639.9)	(15253.18)
Animist	2.797772	-0.0730073	43.80663**	98.26274**	60.63678	-126.1242*	-258.8699	-9344.901
	(5.507736)	(.6378183)	(20.33371)	(39.83854)	(63.68957)	(69.46671)	(24780.96)	(21688.22)
Protestant	0.3656222	0.2465181	26.78257	43.5163	73.03632	-158.2302**	-14355.3	-953.2608
	(4.973819)	(.6178835)	(17.35455)	(33.62356)	(55.32909)	(66.75285)	(25103.8)	(20780.76)
HH Size	-0.1209421	-0.0290652	0.9630119	2.068123	-0.3682386	-0.7787491	4007.157**	631.2509
	(.3256586)	(.0389592)	(1.146355)	(2.282528)	(3.618725)	(4.207919)	(1527.462)	(1337.525)
Land Cultivated (ha)	0.746054	0.1080955	-13.09205***	-26.09093***	-16.88229**	-15.55448	4135.995	2562.11
	(.7498943)	(.0929506)	(2.409285)	(4.797529)	(7.575022)	(10.03915)	(3654.224)	(3198.22)
Allocated to Cowpeas (%)	-.1793606**	-0.0076772	-0.2084794	-0.5254295	-1.105698	1.684082**	-174.2956	111.068
	(.0626599)	(.0071954)	(.2338322)	(.4363356)	(.7349101)	(.7796059)	(284.778)	(251.7135)
Cowpeas as Primary Revenue	-2.939684	-0.4000785	-14.94633	-46.48284**	-67.6106*	61.3101	40348.68**	20108.3
	(3.219699)	(.4100611)	(11.23614)	(22.02778)	(34.84308)	(44.29061)	(16455.96)	(13964.08)
Types of Trainings	-0.5203013	-0.0757499	10.49691**	16.84801**	19.3148	-4.371877	-6491.358	-5291.672
	(1.228829)	(.1435692)	(4.078933)	(8.321051)	(13.91853)	(15.54949)	(5869.714)	(5078.655)
Member of LEAP Association	**-5.090336**	**-1.056396****	**-19.7761**	**-46.56518***	**-76.62979***	**106.0503****	**28194.05***	**27156.74****
	(3.336732)	**(.3992085)**	**(13.04472)**	**(25.66767)**	**(42.41388)**	**(43.39021)**	**(15965.03)**	**(13794.96)**
Constant	20.49969*	2.145745	38.03577	93.35592	126.984	-17.34078	3001.905	6434.17
	(10.88643)	(1.336956)	(42.47844)	(84.50709)	(136.9905)	(144.4159)	(56044.14)	(48481.07)
Number of Observations	125	169	81	85	77	168	156	132

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

^ For these outcomes the Hausman Test rejected the consistency of the Random Effects model. The coefficient of interest in the fixed effects model for"Total Revenue, 2010-2011" is half the magnitude but still significant (at 5%); the coefficient of interest in the fixed effects model for the "Difference in Revenue" is similar in magnitude, but not significant.

Table AVI.4: Producer Impacts, Results for Association Members (Intent to Treat), Fixed Effects OLS

	Transactions, This Year - Last Year	Trips, This Year - Last Year	Distance Travelled, This Year - Last Year	Travel Time, This Year - Last Year	Total Time, This Year - Last Year	Price Received, 2010-2011	Total Revenue, 2010-2011	Difference in Revenue, This Year - Last Year
Age	0.0144961	0.0564736	-1.274493**	-2.68875**	-2.258393*	8.692535	-423.1842	-372.9181
	(.2984556)	(.0801424)	(.4199004)	(.9837997)	(1.273581)	(5.509396)	(522.1632)	(315.5074)
Female	-3.493791	-0.4520252	29.3061	66.12852*	58.1328	23.87544	-28780.91	-6913.137
	(3.485055)	(.5931482)	(21.22923)	(34.81194)	(42.32753)	(59.87255)	(18260.11)	(9236.628)
Level of Education	-1.363543	0.0318348	-0.4962111	-1.161542	-13.9107	31.65685	-1015.411	-2908.591
	(1.972051)	(.2390042)	(3.415078)	(6.751111)	(13.87319)	(38.20815)	(5369.152)	(5001.83)
Muslim	3.784074	-2.835305	17.40351	43.77055	60.8739	-222.7302	-5686.582	2762.097
	(8.710196)	(2.517857)	(13.62697)	(29.8267)	(41.68235)	(142.0008)	(17403.08)	(12632.66)
Animist	-2.491062	-2.390583	40.84185**	104.3184**	60.78212	-243.0805*	-2976.504	-11873.34
	(9.734485)	(2.087231)	(19.39932)	(36.18307)	(70.62648)	(129.2483)	(17950.01)	(17406.51)
Protestant	0.0069547	-0.4647931	16.76224**	34.038	89.44404	-249.0295*	1940.586	-2613.405
	(10.93924)	(.8720838)	(8.287877)	(20.57554)	(56.60078)	(128.2083)	(11798.8)	(9208.28)
HH Size	-0.3823385	-.2492367*	1.044946	1.048351	0.5749379	9.103232	1530.757	-6.252538
	(.3903027)	(.1485133)	(1.159346)	(2.597952)	(3.978939)	(8.960215)	(1521.69)	(1399.425)
Land Cultivated (ha)	1.732506	0.4941734	-11.41192**	-21.88162**	-11.10805	-41.37382	8880.626**	2729.813
	(1.586869)	(.3177814)	(5.203352)	(9.326915)	(12.56804)	(25.11199)	(3145.31)	(3457.022)
Allocated to Cowpeas (%)	-.5661927*	-0.0142931	-0.1328384	-0.2270539	-1.549217	7.518286**	-223.2649	-80.60863
	(.3096025)	(.0163675)	(.177746)	(.3763248)	(1.323)	(3.751531)	(322.4423)	(246.4325)
Cowpeas as Primary Revenue	-0.0262076	0.5987241	-21.0241*	-58.48733**	-86.56573**	-19.63239	4158.744	-1780.163
	(4.521126)	(.6314503)	(10.84193)	(27.12136)	(43.03267)	(61.51885)	(10390.18)	(9017.26)
Types of Trainings	1.282161	-0.5404122	9.657209*	9.96512	15.67808	6.779284	-6021.314	-8334.417
	(2.571921)	(.3699844)	(5.303193)	(10.01857)	(17.79849)	(40.36022)	(6202.986)	(6294.729)
Member of LEAP Association	**-5.171016**	**-2.516473**	**-26.10539**	**-9.002896**	**-87.44778**	**65.32819**	**111191*** **	**21104.69**
	(6.862008)	**(1.627688)**	**(26.30572)**	**(38.81988)**	**(85.1487)**	**(173.0413)**	**(30346.71)**	**(18621.93)**
Constant	18.00072	0.2040905	80.36274**	147.1273**	263.3571*	-211.5942	4843.116	48326.68
	(14.3334)	(3.516099)	(35.82696)	(56.21811)	(145.6852)	(286.5767)	(32436.02)	(29474.54)
N	125	169	81	85	77	168	156	132
R-Squared	0.2762958	0.2942677	0.488074	0.4574219	0.3455468	0.3946719	0.3812154	0.1973043

Note: Department controls are included in the regression but excluded from the table. They include binary variables indicating whether or not each respondent is a resident of: Bilanga, Boala, Bogandé, Boulsa, Dargo, Liptougou, Piela, and Zeguedeguin (Manni excluded).

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AVI.5: Producer Impacts, Results for Association Members (Intent to Treat), Ordered Logit

	Sales Price	Profitability	Quality Knowledge	Improved Storage	Traction Asset	Small Asset
Age	0.0137871	0.011504	.0228366**	0.0113758	0.058265	-.0299858**
	(.023766)	(.0172142)	(.0074631)	(.0255361)	(.036089)	(.0108628)
Female	-0.0852425	-0.1777871	-0.3338464	0.8338473	1.615895*	-.8523172**
	(.4866507)	(.4397928)	(.6037477)	(.7967501)	(.8739804)	(.2857023)
Level of Education	-.3572376*	-0.1365835	-0.0904671	-0.5862897	-.6312453**	0.3637069
	(.2127856)	(.1321967)	(.1671011)	(.4059307)	(.2445576)	(.7208709)
Muslim	-0.2759402	0.1448025	0.3256128	1.318763	-0.5647724	-0.4800905
	(.6268782)	(.6124008)	(.4525695)	(.9881772)	(.8240751)	(.5086708)
Animist	-.8340603**	-0.7622901	-0.2154731	-0.0262133	-0.4573793	1.098623
	(.3124472)	(.5240824)	(.655894)	(.9502679)	(.978375)	(1.153009)
Protestant	.6179339**	-0.2032028	0.9478176	.9469242**	-34.25112***	-1.525923
	(.2939833)	(.7131202)	(.6970963)	(.4257238)	(.749269)	(2.402751)
HH Size	-0.007011	0.0235277	-.0533164**	0.0789406	0.091485	.0892781**
	(.0515114)	(.0890118)	(.0231836)	(.070361)	(.0689547)	(.0393748)
Land Cultivated (ha)	-0.2451628	-0.0293935	.2498061*	-.1944028*	0.0280866	-0.0062524
	(.1567881)	(.1881907)	(.1383054)	(.1025727)	(.104716)	(.1001474)
Allocated to Cowpeas (%)	.0333529*	0.0194091	-0.0009158	0.0122023	-0.0140358	-0.0067983
	(.0202366)	(.0120389)	(.0028694)	(.0111995)	(.0110913)	(.008877)
Cowpeas as Primary Revenue	0.3395602	.6259084**	0.0906616	-.8401387**	0.8471801	-0.6076925
	(.5797242)	(.2989078)	(.7563758)	(.3583881)	(.6810573)	(.8803901)
Types of Trainings	0.0245477	0.0617397	0.2156632	-0.4377094	-0.0510847	-0.263784
	(.3014143)	(.2388819)	(.2072675)	(.5046242)	(.2427215)	(.7883399)
Member of LEAP Association	**1.009539**	**-0.8375694**	**2.971017****	**-1.347241*****	**0.3616986**	**2.236721*****
	(.8333804)	**(.705331)**	**(.9386771)**	**(.2470002)**	**(.7027998)**	**(.5583906)**
Constant	1.231041***	1.50E-09	2.086394***	3.613244***		4.36805***
	(.3741011)	(.0000112)	(.4358721)	(.7961703)		(.5824631)
Number of Observations	115	122	169	169	169	169

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AVI.6: Producer Impacts, Results for Direct Participants (Treatment on Treated), Ordered Logit

	Sales Price	Profitability	Quality Knowledge	Improved Storage	Traction Asset	Small Asset
Age	0.0136311	0.005533	.0250656***	0.0072054	0.0575785	-.0253862*
	(.0265468)	(.0190033)	(.0075969)	(.0293137)	(.0365867)	(.014824)
Female	-0.6467668	-0.40697	-0.3551492	-0.223759	1.539601*	-0.0522937
	(.6293206)	(.2671711)	(.6188407)	(.8050489)	(.829636)	(.4929823)
Level of Education	-0.3070471	-0.1089893	-0.036567	-0.4746719	-.6308559**	0.6184949
	(.2097469)	(.1429489)	(.17444)	(.3460268)	(.2416955)	(.6548936)
Muslim	-0.5470393	-0.2295654	0.3472266	1.42144	-0.5866591	-0.22493
	(.3600577)	(.569145)	(.4772519)	(.9721818)	(.8281468)	(.6843017)
Animist	-0.0099489	-0.3682151	-0.2088705	0.4655778	-0.3798844	0.3810009
	(.3753685)	(.3803668)	(.6785054)	(.8283176)	(1.024561)	(1.222691)
Protestant	1.084112***	0.1559315	1.0156	1.333606**	-35.20366***	-2.170479
	(.2641332)	(.8879522)	(.7278193)	(.5265547)	(.7424753)	(2.866813)
HH Size	0.0039887	0.0256122	-.0501219**	0.0861236	0.0917374	.0936475*
	(.0551122)	(.0947494)	(.0232044)	(.0780132)	(.068466)	(.0520906)
Land Cultivated (ha)	-.2948948*	-0.1088296	.2411133*	-.3304066*	0.0247261	0.1596594
	(.1675781)	(.2054395)	(.127031)	(.1790017)	(.1060552)	(.0984688)
Allocated to Cowpeas (%)	.036854**	0.0169935	-0.0019653	0.00962	-0.0137307	0.0036249
	(.0168895)	(.013923)	(.0030389)	(.0121507)	(.0112575)	(.0127387)
Cowpeas as Primary Revenue	-0.1151145	0.1640397	0.0543635	-0.7729974	0.8200624	-0.0883446
	(.6628845)	(.2079477)	(.7480941)	(.6220165)	(.6905952)	(.953829)
Types of Trainings	0.0221872	0.1799639	0.2412309	-0.0315869	-0.0544002	-0.5711005
	(.2172311)	(.21444)	(.2038023)	(.4024758)	(.2435239)	(1.017408)
Member, & sold to CRS	**1.855529*** **	**1.467658*** **	**0.3254854**	**1.410813** **	**0.4240824**	**-0.4567229**
	(.4462454)	**(.4018239)**	**(.5080222)**	**(.5073817)**	**(.6391103)**	**(.9005385)**
Constant	1.378401***	1.964926***	2.096244***	1.167145***		3.28487**
	(.39538)	(.5450559)	(.3960347)	(.254415)		(1.224164)
Number of Observations	115	122	169	169	169	169

Standard Errors in parentheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AVII: Sampling Weights, LEAP and MYAP Schools

Province	Department	LEAP			MYAP		
		Sample	Of	Weights*	Sample	Of	Weights*
Gnagna	Piela	15	44	2.93	---		
	Bilanga	15	77	5.13			
	Bogande	15	74	4.93			
	Liptougou	15	39	2.60			
	Thion	---			22	22	1
	Manni				34	60	1.76
Namentenga	Boulsa	15	67	4.47	---		
	Boalla	15	15	1			
	Zeguedeguin	15	20	1.33			
	Dargo	15	28	1.87			
	Yalgo	---			30	30	1
	Tougouri				34	44	1.29
TOTALS		120	364	24.27	120	156	5.06

* The probability weight, integrated into the multivariate logit, is calculated as the inverse of the probability that each school was chosen.

Table AVIII: Variable Definitions, Recipient Control Variables

Outcome	Variable Description	Variable Label	Variable Definition
Program	Program, LEAP or MYAP	*LEAP*	= 1 if LEAP, 0 otherwise
School-level	Distance to market	*Market Distance*	In kilometers
	Enrollment	*Enrollment*	Total number enrolled, all grades
	Ethnic composition of students	*Gourmantche*	Gourmantche students (%) ; (remainder dominantly Mossi, some Peulh)
	Religious composition of students	*Muslim* *Animist*	Muslim students (%) Animist students (%) (remainder Christian)
	Informal School	*Informal School*	= 1 if a CEBNF, a non-formal school for older students who missed the age for primary school
Respondent-level	Age	*Respondent age*	In years
	Ethnicity	*R_Gourmantche* *R_Peulh*	= 1 if Gourmantche, 0 otherwise = 1 if Peulh, 0 otherwise (remainder Mossi)
	Religion	*R_Muslim* *R_Animist*	= 1 if Muslim, 0 otherwise = 1 if Animist, 0 otherwise (remainder Christian)

AIX: Mean Characteristics, Recipients

Control Variable	MYAP	LEAP	
	Mean	Mean	LEAP-MYAP
School-level characteristics:			
Distance to Market (km)	8.03	5.77	-2.26***
Enrollment	137.8	165.3	27.5**
Religious Composition:			
Muslim	31%	25%	-6%
Animist	36%	28%	-8%*
Protestant	15%	23%	8%**
Catholic	18%	22%	4%
Ethnic Composition:			
Gourmantché	52%	41%	-11%
Mossi	43%	54%	11%*
Peulh	5%	4%	-1%*
Informal School	3%	3%	1%
Respondent-level characteristics:			
Age	38.36	37.71	-0.65
Gender (Female=1)	1	1	0
Literate	47%	47%	0%
Religion:			
Muslim	39%	28%	-11%*
Animist	12%	11%	-1%
Protestant	16%	25%	9%*
Catholic	33%	36%	3%
Ethnicity:			
Gourmantché	48%	40%	-8%
Mossi	47%	56%	9%
Peulh	3%	3%	0%

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AX.1: *Millet* Multivariate Results, General Preferences

	Taste	Ration Size	Texture	Appearance	Cleanliness	Storability	Nutrition	General Satisfaction
Respondent Age	-0.0028361	-0.0124221	-0.0008481	0.0024125	0.0103045	-0.0269362	-0.0177912	-0.0120624
	(.0197914)	(.0176435)	(.0165874)	(.0180361)	(.0163605)	(.021741)	(.0157523)	(.0141726)
R_Gourmantche	0.0512518	0.3516454	0.9006536	0.2010934	0.1212262	0.0472655	-0.7597157	-0.6227396
	(.4517435)	(.3906509)	(.6150205)	(.3333871)	(.657347)	(.3793246)	(.7474562)	(.7555336)
R_Peulh	1.701821	1.128869**	0.6300025	1.245653	-0.5745726	-1.267504	-1.369691	-0.9944764
	(1.219102)	(.5571197)	(.6057987)	(.8469758)	(.7770944)	(.94518)	(.9106032)	(.7023566)
R_Muslim	0.1014695	0.0710416	-0.6058143	-.7119014*	-.9705844***	-1.458612***	-.8928435**	-.9299822*
	(.468246)	(.4305716)	(.4922301)	(.3666244)	(.2523398)	(.3458335)	(.2769054)	(.4971023)
R_Animist	0.1457414	-1.362273	-0.1233589	-0.7208196	-0.9027753	-1.536467*	-0.5938412	-0.9224856
	(.4984547)	(.9063473)	(.6751533)	(.6761243)	(.7198913)	(.9115583)	(.9918359)	(1.091629)
Enrollment	0.0001874	0.0008673	0.0011184	.0026373**	0.0018414	.0043088***	0.0017271	0.0011673
	(.0013484)	(.0025522)	(.001088)	(.0012591)	(.0011874)	(.0008679)	(.0020476)	(.0024743)
Gourmantche (%)	-0.0014678	-.0202058*	-0.0107569	-.0123045*	-.02328**	-.0188097**	-.0127458**	-0.0064982
	(.0047534)	(.0109848)	(.0079183)	(.0067468)	(.0097461)	(.0095366)	(.0057189)	(.0068742)
Muslim (%)	-0.0009963	-0.0151986	0.0019873	-0.0071182	0.0056859	-0.0038878	-0.0030889	0.0124115
	(.0078697)	(.0139502)	(.0095619)	(.0092005)	(.0106775)	(.0118196)	(.006111)	(.0118383)
Animist (%)	0.0012567	-.0159154*	0.0027932	0.0024771	0.0121397	-0.003571	-.0131032**	0.0015707
	(.0070132)	(.0086696)	(.008584)	(.0073906)	(.0097159)	(.0106071)	(.0060897)	(.0086931)
Informal School	0.8105555	0.6278463	1.070443**	.7938741*	0.6311483	-0.0009014	1.69512	0.0785934
	(.9344094)	(.7542144)	(.4492564)	(.4781412)	(.7902624)	(1.660418)	(1.153138)	(.6568757)
Market Distance	-.0563626**	.0497398**	0.0396924	0.0377029	0.0229849	.0362513**	-0.0309993	.0471588**
	(.0256207)	(.0219236)	(.026057)	(.0296246)	(.022988)	(.0150791)	(.0260944)	(.0215454)
LEAP	**0.2119954**	**0.305518**	**.9858361***	**1.045996****	**-1.784446****	**2.5318*****	**-1.96153*****	**0.1113409**
	(.3001155)	**(.4095173)**	**(.5561807)**	**(.4190309)**	**(.72289)**	**(.358233)**	**(.2468805)**	**(.1440406)**
Constant	.7216324***	.8982378***	.7606425**	.7671321**	1.022211***	1.435664***	1.5717***	.9279578***
	(.0682177)	(.1532432)	(.3230434)	(.252999)	(.247151)	(.2058745)	(.1581215)	(.1525707)
No. of Schools	217	219	220	218	215	203	215	220

Standard errors in paretheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AX.2: *Cowpea* Multivariate Results, General Preferences

	Taste	Ration Size	Texture	Appearance	Cleanliness	Storability	Nutrition	General Satisfaction
Respondent Age	-0.0064316	-0.0012185	-0.0112976	.03155**	.0423709**	0.0137959	.0242212**	.0366535***
	(.012243)	(.0131741)	(.0159114)	(.0101168)	(.0209422)	(.0230917)	(.0098888)	(.0092596)
R_Gourmantche	0.4216077	-0.1914871	-0.0198742	-0.2451306	-0.4558273	0.3326762	-0.7021782	-0.6654604
	(.505389)	(.4552481)	(.4897208)	(.3262176)	(.3667913)	(.6882065)	(.6940789)	(.4486297)
R_Peulh	1.250691	0.9119841	1.973737**	1.425203**	2.970673	0.1794678	0.505776	1.813791*
	(1.210899)	(1.011024)	(.7714203)	(.6919134)	(2.289327)	(2.259216)	(.561009)	(1.025267)
R_Muslim	-0.3905002	-1.085788**	-1.117344**	-0.3600474	-0.443171	-.8422774**	-1.059691**	-0.5190229
	(.3531538)	(.371664)	(.4698553)	(.4814668)	(.4715843)	(.4051686)	(.3633023)	(.4428417)
R_Animist	-0.0246312	-1.573174**	-0.492128	-0.5902364	-0.4333153	0.4777588	-1.342096**	-0.8294879
	(.6607585)	(.7125711)	(.4442068)	(.6528774)	(.8615458)	(.7069697)	(.5320739)	(.6755178)
Enrollment	-0.0015027	-0.0005015	0.0004667	0.0015724	0.0019634	0.0002343	0.0033177	0.0009677
	(.0027141)	(.0024983)	(.0016862)	(.0022574)	(.0021043)	(.0027215)	(.002127)	(.0016161)
Gourmantche (%)	-0.0008465	-0.0080207	-0.0061779	-0.003666	-0.0091023	-.0285431***	-0.0111539	-0.0024058
	(.0090134)	(.0080916)	(.004489)	(.0057824)	(.0071144)	(.0058449)	(.0071648)	(.0053132)
Muslim (%)	0.0062599	-0.0016747	-0.0068102	-0.0081426	-0.0050202	-.0258806**	-0.0068306	-0.0079792
	(.0137068)	(.0115305)	(.0073542)	(.0101892)	(.0103315)	(.0086762)	(.0079768)	(.0099224)
Animist (%)	-0.0001797	-0.0018624	0.0040202	0.0005743	-0.0028899	0.0011349	-0.0077084	-0.0111322
	(.0118019)	(.0063589)	(.0103526)	(.0084585)	(.0115706)	(.0054936)	(.008839)	(.0083299)
Informal School	-0.8741691	0.1207086	-.7351441*	-1.034611	-0.0781381	0.1253655	-0.8663495	-0.8173445
	(.8214418)	(.9445354)	(.4198116)	(.6357053)	(.7992882)	(.8479397)	(.8028166)	(.7531198)
Market Distance	0.028891	0.0120972	0.0205353	0.0218688	-0.0084002	-0.0023053	0.0028941	-0.0257045
	(.0282118)	(.0421993)	(.0309098)	(.0370767)	(.0283361)	(.0270476)	(.025196)	(.0203367)
LEAP	**.7079728***	**.6194192****	**3.096398*****	**1.79019*****	**0.7193283**	**0.1094342**	**-2.772664*****	**1.98914*****
	(.3803533)	**(.2463071)**	**(.3280681)**	**(.26851)**	**(.4392981)**	**(.4930897)**	**(.4744437)**	**(.4113884)**
Constant	1.181846***	1.068873***	1.457327***	1.063374***	1.813863***	1.601508***	1.265049***	1.676287***
	(.196422)	(.1035945)	(.2182161)	(.1424469)	(.341477)	(.1972488)	(.1801931)	(.3568884)
No. of Schools	217	217	216	216	170	172	205	199

Standard errors in paretheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AX.3: *Millet/Bulgur Wheat* Multivariate Results, Preparation Preferences

	Time	Effort	Cost	Fuel Use	Water Use	Oil Use
Respondent Age	0.0017851	0.0046889	.0464577**	-.0174431*	0.003818	0.0153855
	(.0182895)	(.0109193)	(.0191534)	(.0100874)	(.0167646)	(.02288)
R_Gourmantche	0.1411059	-0.2209363	-0.1639457	-1.085622	-0.8083449	-1.159477
	(.7943648)	(.4049082)	(.632628)	(.8342458)	(.5493278)	(.9019096)
R_Peulh	-0.8074533	-2.783682**	-0.9859613	-0.7350837	1.724531**	0.0771161
	(.9962932)	(.9895243)	(1.956812)	(.5560615)	(.5859545)	(.9369132)
R_Muslim	-1.222855	-0.6123487	0.7909959	0.2675291	-.6147156***	-1.280908***
	(.7645186)	(.3935622)	(.8376463)	(.6049865)	(.1549477)	(.3687025)
R_Animist	-0.9155961	-0.0153235	-0.2782362	0.0048658	-0.3852839	-0.3215748
	(.6094972)	(.3931702)	(.5761636)	(.3538743)	(.3797073)	(.7855503)
Enrollment	-.0051265*	-.0040751*	-0.0054532	-.0027277*	0.0027955	-0.0022164
	(.002901)	(.0023972)	(.0034143)	(.0016091)	(.0021113)	(.0016477)
Gourmantche (%)	0.0007401	-0.000324	.008428**	.0112197*	.0178502***	0.0119706
	(.0070429)	(.0087945)	(.0031353)	(.0066748)	(.0038608)	(.0087342)
Muslim (%)	-0.0047214	-.0217695**	-0.0064396	-0.0060502	0.0086553	-0.0030422
	(.0106003)	(.0105514)	(.0101344)	(.0128474)	(.0080015)	(.0134359)
Animist (%)	0.005784	0.0010849	0.0095699	0.0006973	.0205589**	-0.0045083
	(.0048713)	(.0035024)	(.0180606)	(.0050441)	(.0085315)	(.010511)
Informal School	-0.18997	-2.525106**	-1.582075	-2.520465**	-0.2003417	-2.025197
	(.3416725)	(.9949611)	(1.181799)	(1.136078)	(1.555089)	(1.912627)
Market Distance	0.0078253	-0.0281792	-0.0126001	0.0068926	0.0760126	-0.0211401
	(.0466204)	(.0453305)	(.1021588)	(.0491441)	(.0466289)	(.0173511)
LEAP	-3.768873***	-8.468864***	-1.209423*	-5.695169***	-1.810942***	.6446737*
	(.9218137)	(2.363024)	(.6813437)	(1.189138)	(.3679507)	(.342687)
Constant	2.56537***	2.113491***	2.12035***	1.889676***	1.683692***	1.383631***
	(.5906763)	(.5431853)	(.4989489)	(.4219124)	(.1981516)	(.1726311)
No. of Schools	204	203	191	203	204	198

Standard errors in paretheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AX.4: *Cowpeas/Lentils* Multivariate Results, Preparation Preferences

	Time	Effort	Cost	Fuel Use	Water Use	Oil Use
Respondent Age	0.0040192	-0.0246571	-0.0107572	-.0277139*	0.0006267	-0.0011732
	(.0411573)	(.0256097)	(.0247082)	(.0163606)	(.0198001)	(.0205563)
R_Gourmantche	-0.4987732	1.063457*	0.3006016	-0.9321974	-0.4239074	1.757577**
	(.5430617)	(.6380687)	(.4175614)	(.6184744)	(1.135817)	(.6370509)
R_Peulh	-3.012016***	-0.6808962	-1.752793	-3.1996**	-0.7729769	0.4198839
	(.8998038)	(.6983573)	(1.46816)	(1.056017)	(.6861573)	(.9525804)
R_Muslim	0.3573451	-0.2611591	0.9623165	0.889003	0.4275826	-2.460268***
	(.9993906)	(.5583845)	(.7532343)	(1.127688)	(.7912673)	(.6529626)
R_Animist	-0.1217122	-0.2673811	-0.3517384	0.5740774	0.4144712	-0.4562867
	(.7503884)	(.6839115)	(1.057561)	(.7791298)	(.6614555)	(.6361606)
Enrollment	-.0028789*	-0.0017533	-.0039517*	-.0047821*	-0.0040457	-0.0015992
	(.0015737)	(.0015049)	(.0022927)	(.0027864)	(.0035484)	(.0022455)
Gourmantche (%)	-0.0027944	-0.0171678	-.0129947***	-0.0048217	-0.0054905	-0.0160803
	(.0125679)	(.0114478)	(.002716)	(.0129311)	(.0163519)	(.0129706)
Muslim (%)	.0281398**	0.0023774	-0.0015392	0.0020597	0.0049796	0.0134945
	(.0089567)	(.0133065)	(.0119408)	(.0118602)	(.008779)	(.0125747)
Animist (%)	.0211252**	.0070328*	0.0039417	-0.0035711	0.006963	.0187515**
	(.0070449)	(.0041719)	(.012604)	(.012808)	(.0096562)	(.0065706)
Informal School	-2.540977***	2.105013	-1.292127	-4.335575**	-1.162034	1.357084
	(.4361358)	(1.825247)	(.9225591)	(1.561485)	(1.360871)	(1.440498)
Market Distance	0.0083861	-0.0169214	0.0487991	0.0126832	0.0057936	0.0130126
	(.0413931)	(.0283263)	(.0593679)	(.0514582)	(.0561751)	(.0259574)
LEAP	**-4.06015*** **	**-2.165259*** **	**-0.9234582**	**-3.397211*** **	**-0.7189774**	**-0.3422257**
	(.980129)	**(.4964405)**	**(.6311665)**	**(.9584961)**	**(.4378293)**	**(.368466)**
Constant	2.366434***	1.646992***	1.994484***	1.954103***	1.466707***	1.801402***
	(.3323697)	(.1637148)	(.3586868)	(.3149943)	(.2734025)	(.2193825)
No. of Schools	201	201	190	201	200	199

Standard errors in paretheses

*, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively

Table AXI: Comparative Nutritional Content

	LEAP		MYAP		BOTH*	LEAP-MYAP
	Millet *180 grams*	Cowpeas *45grams*	Bulgur *180 grams*	Lentils *45 grams*	Vegetable Oil *25 grams*	
Calories	214.14	52.63	149.34	52.27	212.50	65.16
from Carbohydrates	174.83	37.37	125.60	36.59	0	50.00
from Fat	15.10	2.68	3.66	1.43	212.50	12.70
from Protein	24.41	12.68	19.88	14.09	0	3.13
Carbohydrate (g)	42.62	9.13	33.43	9.07	0	9.26
Fiber (g)	2.38	1.63	8.11	3.55	0	-7.64
Sugar (g)	0.21	0	0.20	0.82	0	-0.81
Protein (g)	6.31	3.66	5.54	4.07	0	0.36
Vitamin A (IU)	5.38	4.50	3.56	3.59	1500.00	2.73**
Vitamin C (mg)	0	0.18	0	0.68	0	-0.50
Vitamin E (mg)	0	0	0	0.05	1.96	-0.05
Vitamin K (mcg)	0.52	0	0.89	0.77	5.89	-1.15
Thiamin (mg)	0.21	0.08	0.10	0.07	0	0.12
Riboflavin (mg)	0.10	0.03	0.10	0.02	0	0.01
Niacin (mg)	2.38	0.32	1.78	0.48	0	0.44
B6 (mg)	0.21	0.05	0.20	0.09	0	-0.03
Folate (mcg)	34.24	63.95	32.44	79.09	0	-13.34
Pantothenic Acid (mg)	0.31	0.18	0.59	0.30	0	-0.39
Choline (mg)	20.17	0.00	12.46	14.70	0	-6.99
Calcium (mg)	5.38	11.71	18.00	8.55	0	-9.46
Iron (mg)	1.14	1.37	1.68	1.50	0	-0.67
Magnesium (mg)	79.24	43.16	57.56	16.20	0	48.63
Phosphorus (mg)	180.00	63.95	72.00	80.91	0	91.04
Potassium (mg)	111.72	168.68	122.64	166.14	0	-8.37
Sodium (mg)	3.62	8.55	9.00	0.91	0	2.26
Zinc (mg)	1.66	0.84	0.99	0.57	0	0.94
Copper (mg)	0.31	0.13	0.10	0.11	0	0.23
Manganese (mg)	0.52	0.21	1.09	0.23	0	-0.59
Selenium (mcg)	1.66	1.13	1.09	1.25	0	0.45
Fat (g)	1.76	0.32	0.40	0.18	24.11	1.50
Saturated	0.31	0.08	0.10	0.02	5.89	0.27
Monounsaturated	0.31	0.03	0.10	0.02	14.82	0.22
Polyunsaturated	0.93	0.13	0.20	0.07	2.32	0.80
Omega 3 (mg)	50.38	50.00	7.22	16.66	50.36	76.50
Omega 6 (mg)	863.79	86.32	169.12	61.59	2071.43	719.40

Source: USDA SR-21; available on line at http://nutritiondata.self.com

* While specific information on the variety of vegetable oil used is not available, these data assume fortified, refined (partially hydrogenated) soy-based oil, as typically purchased under USAID programs.

** The vegetable oil distributed under the MYAP program may not have been Vitamin-A fortified, in which case this difference is 1502.73 (IU).