P4P Global Learning Series

P4P Impact Assessments

Synthesis of Preliminary Findings

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WFP World Food Programme
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P4P Purchase for Progress

Preliminary results of the P4P Impact Assessment

Foreword by P4P

As part of the learning and sharing pillar of P4P, an Impact Assessment of the project is being carried out in four countries: El Salvador, Ethiopia, Tanzania and Ghana. To date, preliminary analysis has been finalized for three of these countries, and the Ghana report is due in 2015 as the pilot is still ongoing in that country.

This document authored by Erin Lentz and Joanna Upton synthesizes the preliminary findings of the three Impact Assessment reports. It also puts some perspective on these results, highlighting challenges with the methodology, limitations of the findings and prospects for further analysis. The three full Impact Assessment reports authored by Douglas Krieger are provided in the Annex of this document for easy reference.

The Impact Assessment reports focus on verifying the P4P conceptual framework and intervention logic, which aims to increase smallholder farmers' productivity and welfare through supply and demand-side interventions, essentially at the level of the Farmer Organization. The logic of expected results for P4P is illustrated in Figures 1 and 2.

FIGURE 1: PROGRESSION OF FO RESULTS

	Staples Marketing	
	Results	**Facilitators**
Behavioral Change	• Acquiring a business orientation • Planning for production and marketing • Increased services/training offered to members	• Access to post-harvest facilities and equipment • WFP procurement (catalyst) • Supply-side support (capacity building, infrastructure)
Intermediate outcomes	• Increased quantities aggregated and sold • Increased range of markets (including quality-conscious buyers) • Able to facilitate financing for members • Obtaining higher prices	• Consistent and sizeable WFP procurement • Trust of membership, transparency • Improved access to credit
Impacts	• Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)	

FIGURE 2: PROGRESSION OF HOUSEHOLD RESULTS

	Staples Production		Staples Marketing	
	Results	**Facilitators**	**Results**	**Facilitators**
Behavioral Change	• Increased % of HH producing maize • Increased area allocated to maize • Increased use of productivity-enhancing technologies/practices (certified seed, fertilizer)	• Access to inputs/credit (perhaps through FO) • Training in agricultural technologies/practices	• Increased sales through FO (% of households and quantities) • Increased sales at least 4 weeks after harvest (% of households and quantity)	• FO access to markets (quantity sold) • Quality and marketing services offered by FO • FO and HH access to post-harvest services • Access to credit • HH characteristics (related to ability to wait for payment)
Intermediate outcomes	• Increased yields • Larger surpluses • Greater quantities sold	• An enabling environment that does not limit access to inputs or distort markets	• Higher prices • Increased likelihood of selling maize • Increase in quantity of maize sold	• FO access to markets (quantity sold) • FO engagement with quality-conscious buyers
Impacts	• Increased income from staples (absolute and as % of HH income) • Improvement in other welfare measures (total income, assets, food security, housing characteristics)			

Preliminary Perspectives on findings from evaluations of 3 P4P country programs
February 22, 2015
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1. Introduction

In this preliminary perspectives document, we discuss and synthesize the findings from three Purchase for Progress (P4P) countries, El Salvador, Ethiopia, and Tanzania, all of which had quasi-experimental evaluation designs. In each of these countries, P4P implemented supply-side support at the farmers' organization (FO) level, as well as demand-side support through local purchase of grain and beans from these FOs. Both participating and non-participating FOs, and member smallholder farmers were surveyed. P4P's external evaluation consultant analyzed the resulting data and produced impact assessment reports for each country, examining the impacts of aggregate P4P interventions on both participating FOs and on smallholder suppliers. We begin our preliminary synthesis of these three studies by briefly introducing P4P. We discuss some of the challenges with evaluating an intervention as multi-faceted as P4P. We then provide an overview of the similarities and differences between the country contexts. We then synthesize initial cross-country and country-specific findings from these reports. We identify a series of reasons why there are few significant findings at the smallholder level. We conclude by outlining possible next steps for analysis. We argue that establishing the robustness of these findings is an important next step toward informing future policy discussions about procuring locally from smallholders.

2. P4P rationale and overview

The rationale of P4P is that food assistance purchased locally can support smallholders. Increases in demand combined with supply-side interventions should lead to increases in income for participating farmers. P4P's strategy encompassed both supply side and demand side levers. WFP provided a source of demand for smallholder production, through procurement of commodities[2] from FOs, and WFP and its partners implemented supply side interventions, including (but not limited to) facilitating access to credit and input packages; providing training on production, post-harvest handling, aggregation and management; supporting access to equipment and infrastructure.

WFP's 20 P4P programs assessed drivers and constraints for smallholder producers across different scales of the food-system, including smallholders and farmer organizations, but also policymakers, marketing and agricultural institutions, and donors. Based on these findings, each country program developed its own set of interventions. The demand-side intervention was WFP's purchases, mainly from FOs; the mix of purchasing modalities—which including direct contracts, forward delivery contracts, and "soft" competitive tenders—varied by country.[3] Similarly, the particular combination of supply-side interventions was also tailored to the context

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[2] WFP procured commodities that are part of its food basket in the country. Under P4P, the two main commodities that were procured were maize and beans.

[3] Direct contracts are negotiated directly with FOs, for a given quantity and price based on open market prices for similar commodities. Forward delivery contracts involve negotiating a "floor price" for future purchases, in advance of planting or harvest, so as to provide a sure market for suppliers. "Soft" competitive tenders let FOs compete with each other as for typical competitive tenders, but with some of the requirements modified depending on available supply-side support.

of each country. Supply side interventions included efforts to increase productivity, capacity for aggregation, and quality assurance. WFP and its partners also aimed to assist with market development and the enabling environment by forging links between farmer organizations and credit providers, and by improving infrastructure, such as warehouses (among others). While WFP and its partners primarily targeted their interventions through farmer organizations (FOs), the key objective was to improve income of FO members with less than two hectares of land.

3. Evaluation challenges

There is a long and rich history of development programs seeking to engage smallholder farmers in higher value and / or higher productivity crops or farming practices. Literature exploring these interventions has recognized that linking farmers to higher-level value chains can, in many cases, improve farmers' wellbeing. Yet, findings also show that such structural transformations are not necessarily easily achievable (see, for example, Barrett et al. 2012; Timmer 2015).

Evaluating impacts on smallholder suppliers in the context of food assistance presents marked challenges. First, it is difficult to establish credible counterfactuals for causal assessment in non-experimental designs. At the same time in the case of local procurement random assignment is, by and large, not realistic. Second, several types of selection bias can then potentially affect the ability to evaluate impacts. In many programs, smallholders "opt-in" or choose to participate in particular activities; alternatively, programs may select organizations or farmers who appear able to meet the needs of the program. Whether findings from selection-based studies are also applicable to those who do not meet the selection criteria is difficult to establish. Third, programs often face tradeoffs between a good evaluation design and a good program design, such as selecting FOs likely to have the capacity to meet deliveries. Fourth, many interventions occur within complex supply chains; isolating the causal effect of the intervention from other factors is often statistically challenging. In short, the challenges of evaluating such interventions emerge in both the specificities of context and the imperatives of organizations seeking to achieve multiple goals.

P4P faced these same challenges. WFP's goals for P4P were not only to evaluate the effect of WFP's procurement from smallholders but also for WFP to procure for a recipient population. In other words, procurement needed to be successful.[4] As a result, WFP selected farmer organizations (FOs) that seemed best able to deliver the required amounts. WFP not only procured from these FOs but also targeted these FOs for capacity building. While the purposive selection of FOs increased the likelihood of successful procurement of food for its recipients, it also contributes to the complexity of the evaluation. Specifically, the non-random selection of FOs to participate in P4P means that selected FOs may have differed from the non-selected FOs *at the outset* in both observable and/or non-observable ways. Such differences would introduce bias into the impact estimations.

[4] An example drawn from local procurement in Guatemala highlights these challenges (Harou et al. 2013). In Guatemala, a program that procured food locally from farmer organizations was intended to support smallholder farmers and to meet the needs for food insecure recipients following an emergency. In other words, local procurement had two objectives: support smallholders and provide for food insecure recipients. Ultimately, the contracted supplier had sourced goods elsewhere to meet the requested quantities in time, in part due to unforeseen supply shortfalls among smallholder FO members. Other FOs had similarly supplied goods not sourced from their members, all of which rendered evaluation impossible. Yet, food procured locally was delivered to recipients in need, illustrating the tension between a successful program and a successful evaluation.

Further, in a pilot as large as P4P, WFP could not work directly with smallholder farmers. WFP and its partners instead sought to improve smallholder outcomes by working with FOs. In other words, the interventions at the FO level had to be transmitted to its members. The long supply chains, such as those found in Ethiopia, mean first that it is difficult to find credible comparison groups close by that would not themselves be in affected by the intervention. Second, impacts of the interventions were likely to be diffuse.[5] Relatedly, WFP's primary objective was to improve outcomes for smallholder farmers. As such, smallholder farmers with less than 2 hectares of land were purposively sampled for the evaluation. Yet, the impacts of P4P may have been felt more by other members, particularly if members with more land were more likely to engage in trainings, seek credit, or take advantage of the interventions than the sampled farmers. Without data on these other FO members, it is not possible to identify the impacts on slightly larger farmers.

4. P4P country contexts

WFP engaged in quasi-experimental design in four countries: El Salvador, Ethiopia, Tanzania, and Ghana. The Ghana pilot is ongoing and won't be discussed here. WFP and its partners offered two broad categories of interventions that composed the "P4P treatment": demand and supply side interventions targeted at FOs. Smallholders who were members of FOs participating in P4P are referred to as P4P smallholders.[6]

Samples

Farmer organizations and smallholders were periodically surveyed about their experiences. In each country, comparison farmer organizations and smallholders who did not have access to the "P4P treatment" were also surveyed. These non-P4P comparison FOs were geographically proximate to the P4P sites with members farming in similar agro-ecological conditions. To capture the experience of smallholder farmers, the surveys only collected information from FO members who had landholdings equivalent to less than two hectares. Attrition rates at the farmer level varied, with very high rates of attrition only in El Salvador (discussed further below).

Samples sizes of FOs and smallholders, years of surveys, and attrition rates are provided in Table 1. The precise definition of a farmer organization varies by country as follows:

- *El Salvador*: FOs were composed of smallholder farmers. The survey covered 13 P4P-FOs. Only 7 of 15 identified non-P4P FOs were willing to be interviewed. The relative willingness of some non-P4P FOs to be surveyed but not others could be a source of bias.
- *Tanzania*: Savings and Credit Cooperatives (SACCOs) were identified as the best candidates for intervention. These cooperatives could provide financial services but were not legally allowed to engage in marketing efforts. As a result, WFP targeted supply-side interventions toward SACCOs and encouraged SACCO members to aggregate and sell their commodities through private entities and Agricultural Marketing Cooperatives (AMCOs). Surveys covered 25 P4P and 25 non-P4P SACCOs.
- *Ethiopia*: two tiers of FOs were identified. 1st tier FOs are composed of smallholder farmers and are called Primary Cooperatives (PCs); 2nd tier FOs are collectives of smaller PCs and are called Cooperative Unions (CUs). P4P targeted interventions toward the 2nd

[5] In a study of local procurement in Burkina Faso, the authors chose not to evaluate the impact on smallholders for millet purchases from larger-scale, second tier, cooperatives; given the complexity of sourcing by FOs, it was not possible to identify an appropriate counterfactual. Further, the length of the supply chain between the second tier farmers cooperative and smallholder grower made impacts too diffuse (Harou et al. 2013; Upton et al. 2014).

[6] Note: P4P smallholders (i.e., members of P4P FOs) may not have sold any surplus to the FO. Further, they may not have received any direct supply side interventions.

tier, larger CUs, but surveyed a sample of both CUs and PCs. Surveys covered 13 P4P CUs and 4 non-P4P CUs, as well as 69 P4P PCs and 65 non-P4P PCs.

Differences between P4P FOs and non-P4P FOs

There is evidence of potentially selection-based differences between P4P and non-P4P organizations in El Salvador and Tanzania. There is no statistically significant evidence of selection-based differences in Ethiopia.[7]

- *El Salvador*: on average, participating FOs had statistically significantly more members and were established more recently than non-participating FOs. The mean number of members in P4P FOs was 150 versus 103 for non-P4P FOs. P4P FOs were statistically significantly more likely to have received external marketing assistance and, in turn, to provide marketing services to their members at the baseline (both significant at the ten percent level). Differences in other capacity and marketing measures were not statistically significant. However, the number of FOs involved was small, and there may have been some bias in which types of non-P4P FOs were willing to be surveyed.
- *Tanzania*: neither P4P FOs nor non-P4P FOs had previously engaged in any agricultural marketing efforts for their members. While similar across several dimensions, the P4P FOs were statistically more likely to have received some production and marketing assistance, to have provided financing to members and to have greater access to storage, all of which could contribute to the measured outcomes. Non-P4P FOs were more likely to have received credit.
- *Ethiopia*: CUs had prior history of providing services and marketing efforts to members and were relatively capable marketing organizations at the start of the project. P4P CUs had sold greater average volumes of maize in past years, and were on average of higher capacity than non-P4P CUs across most indicators. They had also received and provided more training and services. These differences were not statistically significant, but this could be in part due to the small sample size of only four non-P4P CUs. Most of these differences were much less pronounced, and/or non-existent, at the PC level.

Differences between P4P smallholders and non-P4P smallholders

We refer to any smallholder who was a member of a FO participating in P4P as a P4P smallholder. Across the three countries, P4P smallholders and non-P4P smallholders differed, although how they differ varies by country.

- *El Salvador*: P4P smallholders appear to have been more heavily engaged in farming prior to P4P than non-P4P smallholders. P4P smallholders earned statistically significantly more income, as well as earned a greater portion of their income from farming. They were also more likely to be members of female-headed households.
- *Tanzania:* Farmer members of P4P SACCOs were more likely than members of non-P4P SACCOs to have produced a surplus of maize, and to sell products through the FO or elsewhere prior to the interventions. While no more likely to have received a loan for agriculture, P4P smallholders were more likely to receive a loan for non-agricultural purposes. Moreover, among those P4P smallholders who did receive non-agricultural loans, the loan values were higher. P4P smallholders also reported higher average asset scores and higher expenditures on household items. They were less likely to be members of female-headed households.

[7] Krieger (2014a, 2014b, 2014c) includes tables comparing baseline P4P and non-P4P FO and smallholder differences and their p-values in Annex A. We do not reproduce them here but report statistically significant differences between participants and non-participants.

- *Ethiopia:* At baseline, P4P and non-P4P smallholders in Ethiopia differed across many indicators. P4P smallholders were more likely, for example, to use certified seeds and fertilizer. They also produced higher values of crops generally, and were significantly better off in terms of welfare indicators, including income and dietary diversity.

5. Interventions

Demand side interventions

WFP procured food from FOs, providing a demand-side "pull" into marketing. The procurement sizes across the three country studies were generally small relative to WFP's overall procurement levels and relative to estimates of national production levels from FAO (FAO Stat 2015), although the amount procured was sizable for many P4P-FOs. Table 2 shows procurement levels for the three countries, including the low level of procurement in Tanzania and Ethiopia. The slightly higher volume of P4P procurement relative to total WFP procurement in El Salvador reflect that WFP had not historically purchased much food in El Salvador prior to P4P's implementation in 2009. Further, between 2009 and 2013, only 3 FOs sold product to P4P in more than one year. 7 FOs supplied P4P in one year; 3 FOs did not sell to P4P at all, in part because WFP demand in El Salvador was not great. The amounts purchased, and numbers of FOs involved, were similarly irregular in the other country contexts. Purchases by P4P were likewise small relative to over-all WFP purchases within each country, with the greatest relative magnitude being for as yet projected purchases in Ethiopia in 2013, which will reach as much as 30% of total WFP purchases in country.

Supply side interventions

In El Salvador, while the demand side intervention was sporadic, the supply side interventions were more sustained. The P4P El Salvador program identifies three areas for improving smallholder outcome. First, WFP and its partners facilitated FO access to credit, including establishing revolving funds. Second, extension service capacity was improved, including making trainings available for P4P FO members. Third, crop and regional-specific input packages were developed.[8] The intervention, how it was implemented and whether it reached FOs and smallholders are described in Table 3. P4P smallholders heavily adopted the input-packages and trainings relative to non-P4P smallholders, although there was no statistically significant increase in access to credit for agricultural purposes.

In Tanzania, prior to the entry of P4P, farmer organizations with a marketing and training function were lacking. WFP and its partners' supply side efforts in Tanzania focused on strengthening FO marketing infrastructure and skills. 23 storage warehouses were rehabilitated, 10 to the level of licensing as part of Tanzania's Warehouse Receipt System. Several such warehouses were loaned diverse equipment, and trainings were provided on how to use it. Additional training was provided to FOs on a variety of topics, such as agribusiness management, post-harvest handling, gender sensitivity, and credit and finance, among others. No statistically significant difference in access to storage between P4P and non P4P FOs was found following the intervention. Unlike El Salvador, the supply stimulus did not include tailored input packages. See Table 4 for further details.

In Ethiopia, supply side interventions were similarly focused on provision and supplementation of warehousing equipment. Nine of the 13 surveyed P4P CUs received support for warehouse expansion. Seven were provided with temporary warehouse (rubhalls), four of which were later replaced with permanent warehouses (three with financial assistance from WFP). WFP and/or its partners additionally helped to finance warehouse equipment. This led to direct improvements in

[8] Information about interventions is from Krieger, 2014a (p. v) and communication with P4P M&E team.

available storage for FOs. The second core component in Ethiopia was training, which was provided at the CU level, and included training in agribusiness management, credit and finance, institutional capacity building, gender issues, monitoring and evaluation, quality control and post-harvest handling, production and productivity, and WFP procurement procedures. All 13 surveyed CUs received nearly all of these types of training. Similar to Tanzania, the intervention did not include tailored input-packages. See Table 5.

Interventions versus outcomes

WFP and its partners provided packages of supply-side interventions tailored to the needs of FOs in each country. WFP and its partners often aimed to support FO market engagement, infrastructure and credit needs and capacity expansion, among others, with the goal of providing facilitating conditions for improvements in smallholder productivity and welfare. To facilitate evaluation of impacts, we make distinctions between the adoption (or uptake) of these interventions and the impacts of interventions. What is considered an intervention and what is considered an outcome or impact depends on the specific package of interventions pursued in each country. See Tables 3-5 for greater details on the intervention packages.

The interventions and uptake of those interventions varied across countries. The interventions are, in the language of experiments, part of the "treatment." That FOs and smallholders receive or utilize the intervention is evidence of the intervention's adoption, rather than an *impact* of the intervention. For example, in Tanzania and Ethiopia, a component of the intervention was to improve storage.[9] Similarly, in El Salvador, one component of the intervention was to increase access to subsidized inputs. Smallholders reporting an increased use of inputs is consistent with the intervention. The adoption of the intervention is not the impact, but is a component of the facilitating conditions intended to improve smallholder welfare and productivity. In other cases, adoption of interventions may lead to an outcome that provides a facilitating condition for farmers. For example, P4P FOs in all three countries increased their provision of production services to farmers (and/or PC members), which could have been the result of trainings received or of other aspects of the P4P intervention. In the results section below, we limit our discussion to factors that are not part of the P4P package of interventions, but that represent (potentially causal) impacts of these interventions.

Estimation approach

Across countries, the P4P programs face the substantial challenge of assessing impacts resulting from a non-random treatment. The periodic surveys of P4P-FOs and their members and the non-P4P FOs and their members were intended to enable a "difference-in-differences" (DiD) approach to compare the differences between groups over time. The intent of DiD is to identify the causal effect of P4P by netting out other changes due to changing economic or agronomic conditions or differences in the initial conditions of each group. The left-hand graph in Figure 1 sketches the difference in differences concept. Group A and group B may start at different points, but are changing at the same rate. When group A receives an intervention, its slope changes. The difference between the new slope and what would have been its original slope (estimated using the change over time in the comparison slope of group B) is the effect of the intervention.

Yet, in practice, a DiD approach may not be able to net out heterogeneity due to non-random assignment (Imbens 2004). WFP selected higher functioning FOs to improve the likelihood of

[9] Krieger (2014) makes this point as well, arguing in the case of Ethiopia "For example, increased access to storage is an important anticipated outcome of participating in P4P and an indicator of P4P capacity in the P4P log-frame. In Ethiopia, however, WFP invested directly in increasing CU's storage capacity. Increased access to storage in Ethiopia is therefore part of the P4P treatment and not an outcome of P4P" (p. 3).

success of the P4P programs. Just as FOs were selected by WFP for participation, supply and demand side interventions often required engagement by FOs or smallholders. Some individuals and FOs who were participating in P4P may have been more actively engaged than others. For example, smallholders may have accessed credit made available through FOs by WFP and its partners or not.

An implication of bias introduced by non-random assignment is that unless we have prior knowledge about the groups, it is possible we will mistake already existing differences in motivation or learning as P4P impacts. For example, if two groups, group B and group C (on the right hand side of Figure 1) were already learning at different rates prior to an intervention, a DiD approach that does not have multiple periods of information prior to the intervention (necessary to estimate the pre-existing learning trajectory) would not be able to untangle independent learning from the intervention. The concern is that P4P programs may have selected higher functioning FOs that were already learning faster (e.g., about marketing practices) precisely because they were higher functioning. As a result, the findings from a DiD estimation cannot disentangle the amount of improvement due to the P4P intervention and the amount due to the difference in learning rates.

Thus, there is likely some selection bias both of those selected to participate and those who took advantage of the offered stimuli. Our concern about the inability of DiD to control for unobservable differences such as learning and motivation leads us to treat the findings as preliminary. Additional robustness checks and alternative estimations will help to establish the stability of these initial findings and potentially uncover other interesting impacts and/or mechanisms.

6. Cross-country findings from initial estimates

Impacts on P4P Farmer Organizations

Table 6 provides a summary of the difference-in-differences findings across countries. Across the three countries, the likelihood of PFP FOs providing services to P4P smallholders is statistically significantly higher relative to non-P4P FOs. Such services include production and quality improvement, although the specific nature of these services is not well defined in the surveys. In El Salvador, P4P FOs and in Ethiopia, P4P CUs were also more like to train members and to provide them with financing.[10] In all countries, P4P FOs, developed experience in selling products to WFP, which is not surprising given the intervention. However, more compelling is that in Ethiopia there is evidence that marketing capacity of P4P CUs improved over-all as measured by an increased likelihood of sales to non-WFP buyers.

Impacts on Smallholder Farmers: Production, productivity, and marketing

Evidence of marketing and productivity impacts on smallholder farmers is quite mixed across countries. P4P farmers in Tanzania and El Salvador were more likely to sell products via their FO, which is not surprising in part due to the prior limited marketing capacity of the FOs. Only in Ethiopia did farmer participants receive statistically significantly higher prices per metric ton (MT) as a result of the intervention.

Otherwise, there were a number of impacts on farmer production and marketing specific to El Salvador. In El Salvador, relative to non-P4P smallholders, for P4P smallholders:

[10] As noted above and in Tables 3 and 5, as part of the supply intervention packages, El Salvadoran and Ethiopian P4P FOs received training and increased access to credit. The lack of specific details on these interventions makes it difficult to identify whether the FO training and credit "passed-through" directly to the smallholders, and thus reflects "uptake" of the intervention rather than an impact.

- The use of inputs was statistically significantly higher.
- Yields were statistically significantly higher; initial estimates put the increase in yields compared to non-P4P smallholders at 0.87 metric tons per hectare.
- The percent of maize surplus sold 4 weeks or more after harvest was higher.
- The likelihood of selling through the FO was higher.
- The area allocated to maize was higher.

The increase in yields is particularly promising, suggesting that, although WFP procurement was limited to a few FOs in each year, the combination of the procurement with the supply-side interventions supported increases in smallholder productivity.[11]

Impacts on Smallholder Farmers: Welfare Outcomes

Initial estimates of the effect of P4P in El Salvador, Tanzania, and Ethiopia do not find statistically significant differences in household welfare measures between P4P and non-P4P smallholder farmers. Welfare measures include real income, asset scores, livestock holdings, and food consumption scores.

Limited Significant Findings

There are several factors that may contribute to the small number of significant results, especially with respect to farmer welfare.

1. P4P directed its interventions at one level of the supply chain (the farmer organization) while intending to impact another level of the supply chain (smallholders). The gap between the treatment level and outcome level suggests that purchases and supply-side interventions had to "trickle" down the supply chain from the FO to smallholders to have an impact.[12] In addition, common across the three countries, only some smallholders chose to sell to the FO or chose to take advantage of the interventions, further limiting possible impacts to a sub-set of P4P-FO members.[13]

2. WFP's demand stimulus for all three countries was irregular and, relative to the larger food economy, small (see Table 1). However, for many FOs, the magnitude of purchases was quite sizable. In theory, such purchases could result in improved incomes for smallholders, particularly those who are isolated from well-integrated markets. Yet, in any given year, some P4P FOs did not supply WFP, because they were not as competitive for bids as other P4P FOs, because WFP had limited need, or because they sold to other purchasers. As a result, these P4P FOs received supply side interventions but the

[11] Without further data, it is difficult to know why some P4P-FOs in El Salvador did not sell to WFP. In some cases, it is likely due to WFP's limited procurement. In other cases, capable P4P-FOs may have chosen to sell to other customers (e.g., those who could pay more quickly than WFP). Thus, with currently available estimates, it is difficult to determine the relative importance of the supply side and demand side interventions in improving yields.

[12] In Burkina Faso, an evaluation examined the effects of procuring cowpeas and millets for a local school-feeding program (Upton 2014). Ultimately, the evaluation could not assess the effect of local millet sourced from large farmers' cooperatives on smallholders for two reasons. First, the geographically wide and complex supply chains dissipated any effects of relatively small procurement across many smallholders. Second, Burkina Faso's large farmer organizations regularly procure from non-members or from members of other FOs, making identifying a credible counterfactual within the millet-producing region impossible.

[13] The gap between the intervention and the outcome levels is widest in Ethiopia, where P4P interventions occurred at the "second-tier" of farmer organizations, the cooperative unions (CUs). An intervention at the cooperative union level had to be substantial enough to influence the behaviors and outcomes for smallholders, who primarily engaged with cooperative unions through their membership in primary cooperatives (PCs), which were sub-units of the larger CUs.

accompanying demand stimulus was occasional or indirect. Thus, it would be interesting to examine outcomes for smallholders whose FOs who regularly sold to P4P.[14]

3. P4P selected the FOs it chose to work with and members chose whether and how to engage in P4P-related activities. Comparing initial differences between participating and non-participating FOs and their members, we find that in El Salvador and Tanzania, the participating FOs and their members differed by observable factors from the comparison groups. This is not surprising – P4P needed to procure food, and it chose FOs that seemed most likely to be able to deliver. In El Salvador, for example, members of P4P-FOs were more likely to engage in market activities (e.g., higher rates of selling, seeking price information from FOs, etc.). In Tanzania, the P4P SACCOs had more experience with providing credit, which may also be a source of bias. Utilizing household matching techniques with DiD could help attenuate this selection bias (Imbens 2004).

4. Relatedly, within each country, the supply and demand interventions varied among the "treated" P4P FOs and smallholders, potentially resulting in heterogeneity of outcomes among the treated for each P4P program (Angrist 2004). For example, among P4P smallholders, some may have actively participated in trainings and utilizing newly available services, while others did not; the subset of more active smallholders may have had a boost in welfare. Indeed, the variability of the treatment within the treated group could be greater than the differences between P4P and non-P4P FOs. Employing instrumental variables may help account for the different experiences smallholders had with P4P (Angrist 2004). Such an approach might yield new insights.

5. Data were not collected from farmers owning more than two hectares of land who were members of P4P and non-P4P FOs. Based on analysis of sales records, larger farmers may have been more likely to benefit from the new P4P opportunities (Damien Fontaine, personal communication).[15] Thus, collecting results from only farmers with less than two hectares likely under-reports the impacts.[16]

6. Lastly, the pilot ran for a relatively short period of time. Some supply side interventions occurred relatively late in the pilot timeline. As a result, the full impacts of these interventions might not be fully felt yet. For example, in El Salvador, while revolving credit was made available in 2010, facilitating links between FOs and credit agencies and the number of FOs seeking a loan picked up substantially in 2012 and 2013. It may be early to assess the long-term behavioral changes associated with these new sources of credit.

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[14] For example, lacking the pull of a large, regular demand stimulus, some FOs and their members may not have fully participated in the supply side interventions. Further, in Tanzania, the National Agricultural Input Voucher Scheme (NAIVS) coincided with the P4P pilot (World Bank. 2014. "Tanzania Public Expenditure Review: National Agricultural Input Voucher Scheme." Washington, DC: World Bank). On average, both P4P and non-P4P farmers' engagement with their SACCOs improved over the period. NAIVS may have been a more significant policy lever for both P4P and non-P4P farmers than the P4P interventions.

[15] Other studies have found that larger farmers tend to be "first adopters." For example, larger farmers, on average, adopted Green Revolution technologies earlier than smaller farmers, although smaller farmers' use caught up over time (Hazell 2003). If P4P followed the same pattern, smaller farmers may have been slower to "adopt" P4P activities, reducing the impact of the 5-year program.

[16] As Conway (2012) notes, what constitutes a small farm is relative, and depends on agronomic conditions. He argues that in parts of Latin America, farms with less than 10 hectares could be considered small.

7. Future directions

P4P is a multi-faceted, complex, and relatively diffuse, intervention. As a result, it is perhaps not surprising that the initial DiD estimates discussed here did not reveal many major statistically significant differences in welfare outcomes between P4P and non-P4P smallholders. However, initial results do indicate that El Salvador resulted in increased productivity and related measures, and that farmer organization capacity generally improved. Given the substantial selection bias, we would recommend employing alternative estimation techniques to mitigate the bias. We discuss a few possible refinements to future analyses below.

1. The attrition rate in the El Salvador P4P smallholder sample was 67 percent. In other words, 115 of 349 respondents in the 2009 baseline were resurveyed in 2012. The attrition rate for non-P4P households was 59 percent. Such high attrition rates, if non-random, (e.g., less capable farmers drop out of farming), can bias results. Robustness checks, such as propensity score matching or imputation based on observables, could help to validate the weighted survey technique used in the estimations by Krieger to adjust for possible bias.
2. More complex techniques such as combining DiD estimates with smallholder matching strategies could help to reduce bias (Imbens 2004). Based on the differences between P4P smallholders and non-P4P smallholders, it seems likely that at least some observables (e.g., larger farm sizes) were factors that led to some FOs being selected but not others. Estimating a probability of selection into P4P, based on such observables, could generate regression weights.
3. A series of estimations that examine differences among P4P-smallholders (and to the extent possible, given small samples, P4P-FOs) could improve our understanding of how impacts varied within those who were selected and what smallholder characteristics are associated with these impacts (Angrist 2004). For example, which characteristics are related to the increase in yield observed among P4P smallholders? Such insights could assist in the better targeting interventions and or in the identification of which sorts of combination of interventions are more effective.

Undertaking such estimations would help to address selection bias and to confirm the above results. Such additional analyses can then productively support the formulation of policy interventions and practitioner recommendations.

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Table 1: P4P Sample Summary^

	El Salvador		Tanzania		Ethiopia	
Farmers' Organizations	Panel	Sampled; Attrition	Panel	Sampled; Attrition	Panel	Sampled; Attrition
FOs - 2nd Tier - P4P Participants	NA		NA		13	14; 7%
FOs - 2nd Tier - non-P4P Participants	NA		NA		4	5; 20%
FOs - 1st Tier - P4P Participants	13	13; 0%	25	25; 0%	69	70; 1.4%
FOs - 1st Tier - non-P4P Participants	7	15 identified	25	25; 0%	65	68; 4.4%
Years Surveyed	2009-10, 2012-14		2009, 2012, 2013		2009, 2012, 2013	
Households	Panel	Sampled; Attrition	Panel	Sampled; Attrition	Panel	Sampled; Attrition
Members of P4P FOs	112	349; 68%	321	402; 20%	321	390; 18%
Members of non-P4P FOs	125	308; 59%	343	410; 16%	278	387; 28%
Years Surveyed	2009, 2012		2009, 2011, 2013		2009, 2011, 2013	

^ Sample sizes taken from the Impact Assessment Reports (Krieger 2014)

Table 2: P4P and WFP Procurement (Metric Tons)

	2009	2010	2011	2012	2013	TOTAL/CUM
El Salvador						
P4P*	555	2,454	77	1,818	854	5,758
Number of FOs delivering product, each year then cumulative	3	4	2	6	2	10
WFP (other procurement)*	4,489	4,855	3,204	1,598	343	14,489
P4P as % of WFP procurement	0%	0%	0%	0%	0%	0%
WFP as % of Maize & Beans Production^	0.52%	0.58%	0.39%	0.15%	0.03%	0.32%
Ethiopia						
P4P*	-	16,074	2,220	26,625	34,386	79,305
Number of FOs delivering product, each year then cumulative^^	-	7	3	17	22	33
WFP (other procurement)*	77,127	232,714	82,773	76,374	110,368	579,356
P4P as % of WFP procurement	0%	6%	3%	26%	24%	12%
WFP as % of Maize & Beans Production^	1.81%	4.37%	1.28%	1.15%	1.62%	1.96%
Tanzania						
P4P*	2,080	3,364	4,551	1,738	14,449	26,182
Number of FOs delivering product, each year then cumulative	4	8	17	15	7	23
WFP (other procurement)*	15,476	29,947	60,560	74,604	36,836	217,423
P4P as % of WFP procurement	12%	10%	7%	2%	28%	11%
WFP as % of Maize&Beans Production^	0.38%	0.53%	1.21%	1.18%	0.57%	0.79%

*WFP LRP and P4P Procurement numbers received from communication with the P4P M&E Team (February 21, 2015). Number of FOs delivering product drawn from the Impact Assessment Reports (Kreiger 2014a-c).

^Note that this is the rough percentage that WFP procurement represents of total annual domestic maize and beans (dry) production (the dominant commodities procured), using the sum of these two figures taken from FAO Stat (2015), in order to illustrate the approximate relative magnitudes of procurement in each country in each year.

^^2013 number of FOs reflects the number of contracts. We do not have final figures on the numbers of FOs who met deliveries. At least 7 met their delivery obligations. Some FOs may not have met their delivery obligations. As a result, this number and the total number may be inflated. Prior contracted quantities were met by 84%, 55%, and 77% in 2010, 2011, and 2012, respectively.

Table 3: P4P Interventions and Adoption of Interventions for El Salvador

	Intervention	Adoption at FO level	Adoption by smallholders
Demand stimulus			
Direct contracts and competitive tenders to purchase food from FOS	See Table 2: WFP Procurement	WFP purchased from: 3 FOs multiple years; 7 FOs one year; 3 FOs not at all	30% more likely than non-P4P smallholders to sell through FOs; no change in prices received
Supply stimulus			
		Increase is for percentage of P4P FOs	*Increase is for percentage of P4P smallholders*
Improve capacity of extension services to train P4P-FO members	14,860 person-trainings on topics including gender, agribusiness management, post-harvest handling, credit and finance, and others.	54 percentage point increase in provision of productivity trainings	23 percentage point increase in likelihood of receiving productivity training
Crop and regional-specific input packages	Input packages included seed, fertilizer, pesticides, and technical assistance	54 percentage point increase in FOs facilitating access to inputs for members	47 percentage point increase in likelihood or accessing subsidized inputs through the FO
Facilitate access to credit	Established revolving credit fund (2010). Links made between Fos and financial institutions (1 link in 2009; 8 in 2010; 8 in 2011; 16 in 2012; 18 in 2013).	Access to revolving credit for all FOs; 31 percentage point increase in likelihood of utilizing credit; several P4P FOs received loans (2 in 2009; 3 in 2010; 6 in 2011; 5 in 2012; 10 in 2013).	No evidence of increase in utilization of credit by smallholders

Table 4: P4P Interventions and Adoption of Interventions for Tanzania

	Intervention	Adoption at FO level	Adoption by smallholders
Demand stimulus			
Direct contracts and competitive tenders to purchase food from FOS	See Table 2: WFP Procurement	WFP purchased from: 27 FOs (7 for 1 yr, 7 for 2 yrs, 10 for 3 yrs, 3 for 4 yrs)	11% more likely than non-P4P smallholders to sell through FOs; no change in prices received
Supply stimulus			
		Increase is for percentage of P4P FOs	*Increase is for percentage of P4P smallholders*
Improved storage and other infrastructure and equipment investments	23 Warehouses rehabilitated; purchases of rubhalls, tarpaulins, etc. at a value of $470, 082	Reported improved quality and capacity of storage available, but no data on impacts relative to non-P4P FOs	No data on access to or use of storage facilities by smallholders
Credit, including supporting emerging Warehouse Receipt Systems	Equipment loans including loans for 8 grain storage facilities; 10 rehabilitated warehouses were rehabilitated to the level of licensing Tanzania's Warehouse Receipt System (a form of credit); supported emerging WRS	Higher likelihood of utilizing credit (not significant), and of providing financing to members (significant, 24 percentage points), relative to non-P4P FOs	No increase in utilization of agricultural credit
Training	25 Fos received training; 30,986 person-trainings on 8 different topics, including agribusiness management, credit and finance, and gender, among others	52 percentage points more FOs providing productivity training by end of pilot, but difference not significant relative to non-P4P FOs	No data on trainings received by smallholders

Table 5: P4P Interventions and Adoption of Interventions for Ethiopia

	Intervention	Adoption at FO (CU) level	Adoption by smallholders
Demand stimulus			
Direct contracts and competitive tenders to purchase food from FOS	See Table 2: WFP Procurement	WFP purchased from: 3 FOs in only one year, 6 in two years, 6 in three years, and 1 in all four years	No difference in change in likelihood of selling through FOs; higher price received by farmers (of on average 32 Birr (3 USD) per MT)
Supply stimulus			
		Increase is for percentage of P4P CUs	*Increase is for percentage of P4P smallholders*
Improved storage and other infrastructure and equipment investments	Supported warehouse expansion for 9 of 13 CUs; provided temporary warehouses for 7 CUs, then helped to finance permanent warehouses for 3	The 13 surveyed CUs reported increases in storage space from 36,650 MT to 65,000 MT (105%), with owned capacity increasing by 52% from 23,050 MT to 47,200MT	No data on access to or use of storage facilities by smallholders
	Financed warehouse material or equipment for all 13 CUs	No data on direct improvements in warehouse equipment	
Credit	Helped link CUs to credit providers to access fertilizer	No increase in likelihood of using credit	No impact on use of agricultural or other credit by farmers
Training	Partners ran 219 training events, and an additional 98 with direct WFP involvement, across 8 subjects for all 13 CUs	No data on up-take of trainings	No data on trainings received by smallholders

Table 6: Summary of Difference in Difference Results (2009-2013/2014) Across Countries[1, 6]

	El Salvador[2]	Tanzania[3]	Ethiopia[4]	
			CUs	PCs
Impacts on Farmers' Organizations				
Organizational Capacity				
Providing services to members (likelihoods):				
Production services	0.34***	0.14*	0.29***	-
Marketing services	0.29***	0.54***	-	0.10**
Quality enhancement services	0.49***	0.63***	0.23***	-
Planning for production & marketing	-	-	0.23*	
Facilitating access to inputs	*54%****[7]	0.40*	-	-
Providing production training	0.40*	-	0.85***	-
Marketing Outcomes				
Providing financing to members (likelihood)	-	0.24*	0.09**	-
Sales to any buyer (likelihood)	*0.40****[7]	N/A	-	-
Quantity of maize sold to any buyer (MT)	63*	N/A	-	-132**
Sales to buyers other than WFP (likelihood)	-	-	0.23*	N/A
Impacts on Smallholder Suppliers				
Marketing				
Sales through the FO (likelihood)	0.29***	0.11***		-
Percentage of surpluses sold through the FO	0.14**	-		-
Average price received by farmers (USD/MT)	N/A	-		32*
Production (inputs and outputs)				
Utilized any credit (likelihood)	-	-0.08*		-
Utilized certified seeds (likelihood)	*0.18***[7]	-		-
Certified seeds used (%), among users	*0.27****[7]	-		-
Utilization of fertilizer (likelihood, cultivating HHs)	-	-		-0.06***
Yield (average, MT/ha, cultivating HHs)	0.87***	-		-
Cultivated maize (likelihood)	0.19***	-		0.08**
Land area allocated to maize (ha, cultivating HHs)	0.29**	-		-

	Maize produced (avg MT, cultivating HHs)	1.08***	-	-
	Produced a marketable surplus (likelihood)	0.48***	N/A	N/A
	Marketable surplus (avg MT, cultivating HHs)	1.05***	N/A	N/A
Well-being[5]				
	Incomes	-	-	-1,854***
	Livestock	-	-	-2,256***

Notes:

1 We report only estimates of differences between P4P and non-P4P FOs and farmers associated with statistically significant p-values, and that were not the direct result of up-take of an intervention. "Likelihoods" are presented as proportions, rounded to two decimal places. N/A indicates outcomes not relevant and/or not examined for that country and group. For a summary of evidence of treatment uptake, see Tables 3-5. Differences at baseline are available in Annex B Comparison Tables in each country assessment report.

2 Panel sample sizes in El Salvador were 13/7 (P4P/non-P4P) at the FO level, and 112/125 (P4P/non-P4P) at the farmer level.

3 Sample sizes in Tanzania were 25/25 (P4P/non-P4P) at the FO level, and 321/343 (P4P/non-P4P) at the farmer level.

4 Sample sizes in Ethiopia were 13/4 (P4P/non-P4P) at the CU level, 69/65 (P4P/non-P4P) at the PC level, and 321/278 (P4P/non-P4P) at the farmer level.

5 Incomes and livestock values are reported in 2009 Ethiopian Birr for Ethiopia (roughly 11 Birr = 1 USD, Jan 2009 per Oanda.com)

6 Other results that were not statistically significant for any country were excluded. These include changes in FOs providing value addition services; FOs selling to buyers other than WPF; changes in smallholders selling 4 weeks or more after harvest (likelihood); smallholders utilizing credit (likelihood); smallholders utilizing (subsidized) inputs; smallholders percentage of surpluses sold 4 weeks or more after harvest; smallholder utilizing productivity training; smallholder assets; dietary diversity

7 These results are statistically significant but may primarily reflect adoption or uptake of the P4P intervention. Thus, these may not necessarily reflect "impacts." More detailed information about the composition of the P4P intervention packages would help to clarify whether these reflect uptake of services provided or reflect impacts.

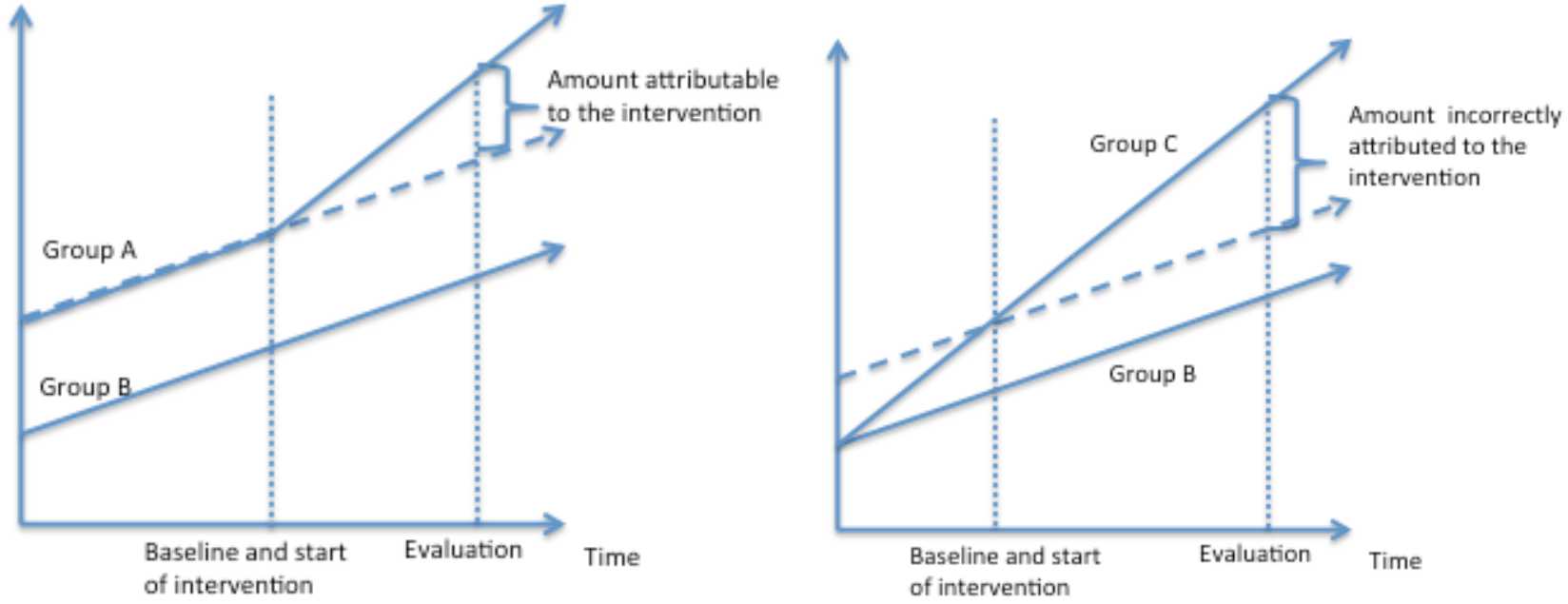

Figure 1: Difference-in-Differences estimators

ANNEX

Impact Assessment Reports:

Ethiopia

Tanzania

El Salvador

P4P Global Learning Series

Impact Assessment Report: Ethiopia

March 2014

WFP World Food Programme wfp.org

P4P Purchase for Progress

The Impact of P4P on FOs and Smallholder Farmers in Ethiopia

March 2014

Author: Douglas Krieger

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ACRONYMS

CU	Cooperative Union
DiD	Difference in Differences
FO	Farmers' Organization
ha	hectares
LRP	Local and Regional Procurement
mt	metric tonnes
NFRA	National Food Reserve Agency
P4P	Purchase for Progress
PC	Primary Cooperative
USD	United States Dollars
WFP	World Food Programme

EXECUTIVE SUMMARY

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[1] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[2]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to be active market participants lies at the center of all the strategies and WFP buys directly from FOs in almost all the countries. When the opportunities existed, some countries overlaid supporting structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors onto the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to engage their members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

P4P in Ethiopia

Ethiopia buys from relatively high capacity Cooperative Unions (CUs), second tier FOs with Primary Cooperatives (PCs) as members. WFP directs its capacity building support to the CUs with the expectation that the stimulus provided at the CU level will indirectly build the capacities of member PCs and the smallholder farmer members of the PCs. WFP also buys from small-scale traders in Addis Ababa who provide a critical market outlet for smallholder farmers and strengthened the management and marketing capacities of traders' associations.

[1] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.
[2] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

Assessing the Impact of P4P

The analysis in this report concludes that, by almost any objective measure, P4P-supported FOs and farmers are substantially better off at the end of the P4P pilot than at the beginning. For example, among the 13 P4P CUs, 70 P4P PCs, and a random sample of 321 of their member farmers from which the country office collected data. For example P4P-supported CUs and PCs are able to offer their members a wider range of value addition, marketing, quality, and production services; received more external assistance to build capacities in post-harvest management, production, and marketing; and substantially increase the quantities of maize they sold (CUs). P4P-supported households are using more productivity-enhancing inputs (certified seed); participating in more productivity training; and have increased their yields of maize and the quantities they produce and sell. Consequently, a range of household welfare indicators including income, assets, livestock value, and the food consumption score have improved substantially.

Trends in FO capacity and household production and welfare, however, do not constitute evidence that the observed changes are caused by participating in P4P. To credibly attribute changes to P4P it is necessary to compare these outcomes to those that *would have occurred had these same FOs and households not participated in P4P*. This report applies appropriate analytical techniques to the data to estimate the causal effects of P4P on key indicators of FO capacity and smallholder farmers' production and marketing of staple commodities and on their household income.

Data and Methods

The impact assessment analysis for CUs draws largely on the survey data collected from a panel of 13 P4P-supported CUs and 4 non-P4P CUs. The Ethiopia country office collected data from these CUs in 2009, 2012, and 2013. The country office followed the same schedule for collecting data on PCs and followed a panel of 70 P4P and 68 non-P4P PCs. The household analysis draws on surveys of random samples of farmer members of both P4P and non-PCs conducted at the baseline, midpoint, and final periods of the pilot (2009, 2011, and 2013). Accounting for attrition, the panel dataset contains observations for 321 P4P and 278 non-P4P households.

The very small number of observations on CUs precludes involved statistical analysis. The analysis of the causal effect of P4P on CUs therefore uses a simple non-parametric difference-in-differences (DiD) approach that does not control for differences between P4P and non-P4P CUs. The larger number of observations on PCs facilitates a more complex DiD model estimated in a regression framework that does allow for controlling for differences between the two groups. The household impact assessment analysis also uses a DiD approach to estimate the causal effects of participating in P4P on household production, marketing, and welfare indicators. Both analyses rely on comparing outcomes for P4P groups with those of non-P4P groups which represent the counterfactual of not having participated in P4P. All three sets of analysis bolster the analytical results with visual inspection of the data to build a convincing case for causal effects.

Findings and Conclusions

Ethiopia elected to buy primarily from Cooperative Unions (CUs), second tier FOs with Primary Cooperatives (PCs) as members. WFP and its partners directed all of the P4P-facilitated support to the CUs. Even though partners were assisting the PCs, WFP did not direct capacity building activities at the PC or household level. The results framework thus includes an additional layer to capture the indirect capacity building of PCs that are members of P4P-supported CUs. Results at the PC level may be very different than

at the CU level because the WFP stimulus is diluted (i.e., spread out in an unpredictable way among all the PCs that are members of a CU) and not linked to direct capacity building support from WFP and its partners.

At least on paper, Ethiopia's CUs and PCs appear to be relatively high capacity organizations. Fifty-four percent of P4P CUs and 50 percent of non-P4P CUs reported having sold maize in the two years prior to P4P. Similarly, 62 percent and 75 percent of P4P and non-P4P PCs, respectively, reported previous experience selling maize. P4P-supported CUs reported selling an average of 1,261 mt of maize in 2009, the baseline year for P4P and P4P-supported PCs reported selling an average of 187 mt. Sixty-nine percent of P4P CUs and 90 percent of P4P PCs reported having access to storage suitable for maintaining quality for the long-term.

All 13 of the P4P-supported CUs reported having access to storage at the time of the 2009 baseline and 8 owned their facilities. Average storage capacity accessible at baseline was 2,819 mt and average capacity of owned storage (for CUs that owned their warehouses) was 2,561 mt. The story is similar among PCs; 90 percent reported having access to warehouses in 2009 with an average capacity of 551 mt.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 1 and Figure 2. The remainder of this section frames the conclusions in the context of the results framework. It presents results in the sequence in which they are likely to occur; CU capacity, PC capacity, household marketing, household production, and household welfare.

Impact of P4P on CU Capacity

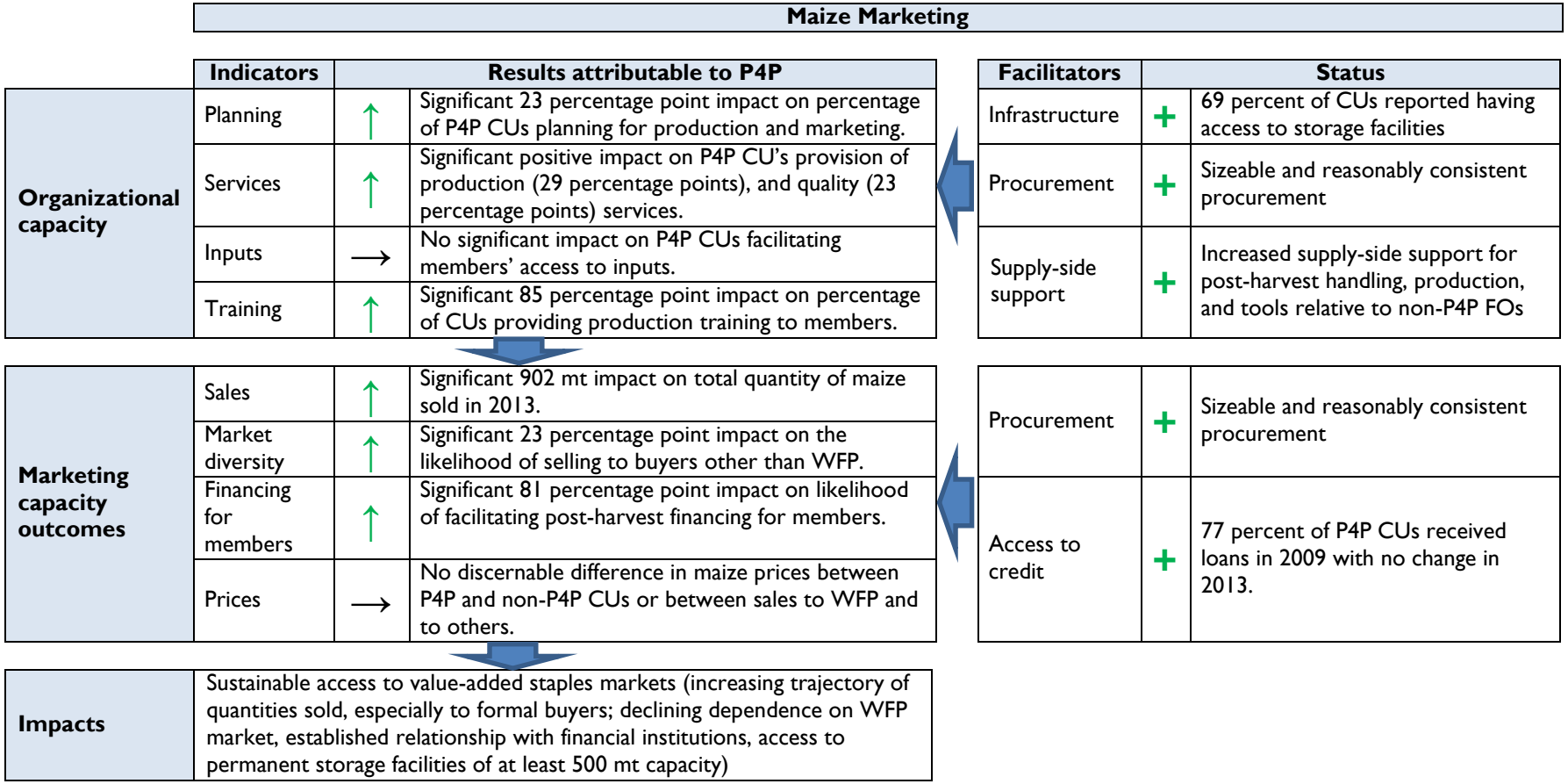
Figure 1 summarizes anticipated results and facilitators of FO (CU or PC) capacity and serves to frame the conclusions presented in this section.

The baseline capacities of CUs suggest that they were relatively capable marketing organizations. Eighty-five percent reported selling some crops in the two years prior to the baseline and average quantities sold ranged from 61 to over 1,000 mt, depending on the crop. As a group, the 13 P4P CUs surveyed reported providing an average of 49 percent of 8 quality-oriented services and 69 percent of 3 marketing services. Over 75 percent reported having access to credit and more than 50 percent reported being able to provide financing to their PC members.

Prior (to P4P) external assistance had focused largely on organizational management (e.g., record keeping, financial management, group management, and business planning). More than 80 percent of CUs reported having received such assistance. Few, (no more than 30 percent) reported receiving other types of assistance (e.g., post-harvest management, production, marketing, inputs, tools, or infrastructure). Some of these results are not surprising perhaps since CUs' members are PCs, not farmers.

These baseline conditions established many of the facilitating factors necessary to support organizational capacity building. The other crucial facilitator is WFP's procurement stimulus. By the end of the pilot, WFP had registered 31 CUs as WFP suppliers. Of the 21 CUs WFP registered as vendors at the start of the pilot, it purchased from 4 (19 percent) in only one year, 6 (28 percent) in two separate years, 8 (38 percent) in three years, and 1 (5 percent) in four years. The size of individual contracts ranged from 50 mt to 6,500 mt with an overall mean of 1,093 mt. The total quantity contracted per CU (throughout the five-year pilot) ranged from 200 to 14,920 mt with an average of 2,682 mt. WFP appears to have provided a sizeable but andr relatively consistent procurement stimulus in Ethiopia.

FIGURE 1: SUMMARY OF IMPACT OF P4P ON CU CAPACITY



Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

The generally positive facilitating conditions for supporting organizational capacity building contributed to many significant positive changes in organizational capacity indicators that can be attributed to participating in P4P. These include:

- A 15 percentage point increase in the average percentage of 2 value addition services provided to members;
- A 23 percentage point increase in the average percentage of 8 quality services provided to members;
- A 29 percentage point increase in the average percentage of 5 production services provided to members;
- An 85 percentage point increase in the percentage of CUs providing production training to members; and
- A 23 percentage point increase in the percentage of CUs planning for production and marketing.

The facilitating environment for marketing outcomes was generally positive for P4P CUs. WFP's procurement stimulus was sizeable and relatively consistent but the percentage of P4P CUs selling to other buyers increased relative to non-P4P CUs, even though quantities sold were very small relative to quantities sold to WFP. And, although they experienced no significant increase in utilizing credit, most reported utilizing credit so there may have been little room for improvement.

Consequently, marketing capacity outcomes were positive. Those that could be attributed to participating in P4P included:

- An average 902 mt increase in the total quantity of maize sold between 2012 and 2013 relative to what would have happened without P4P;
- A 23 percentage point increase in the percentage of P4P CUs selling to buyers other than WFP relative to what would have happened without P4P; and
- A significant 81 percentage point increase in the percentage of CUs offering post-harvest financing to members relative to what would have happened without P4P.

The P4P CUs already seem to be sustainable marketing organizations and all reported selling to other buyers throughout the P4P pilot.

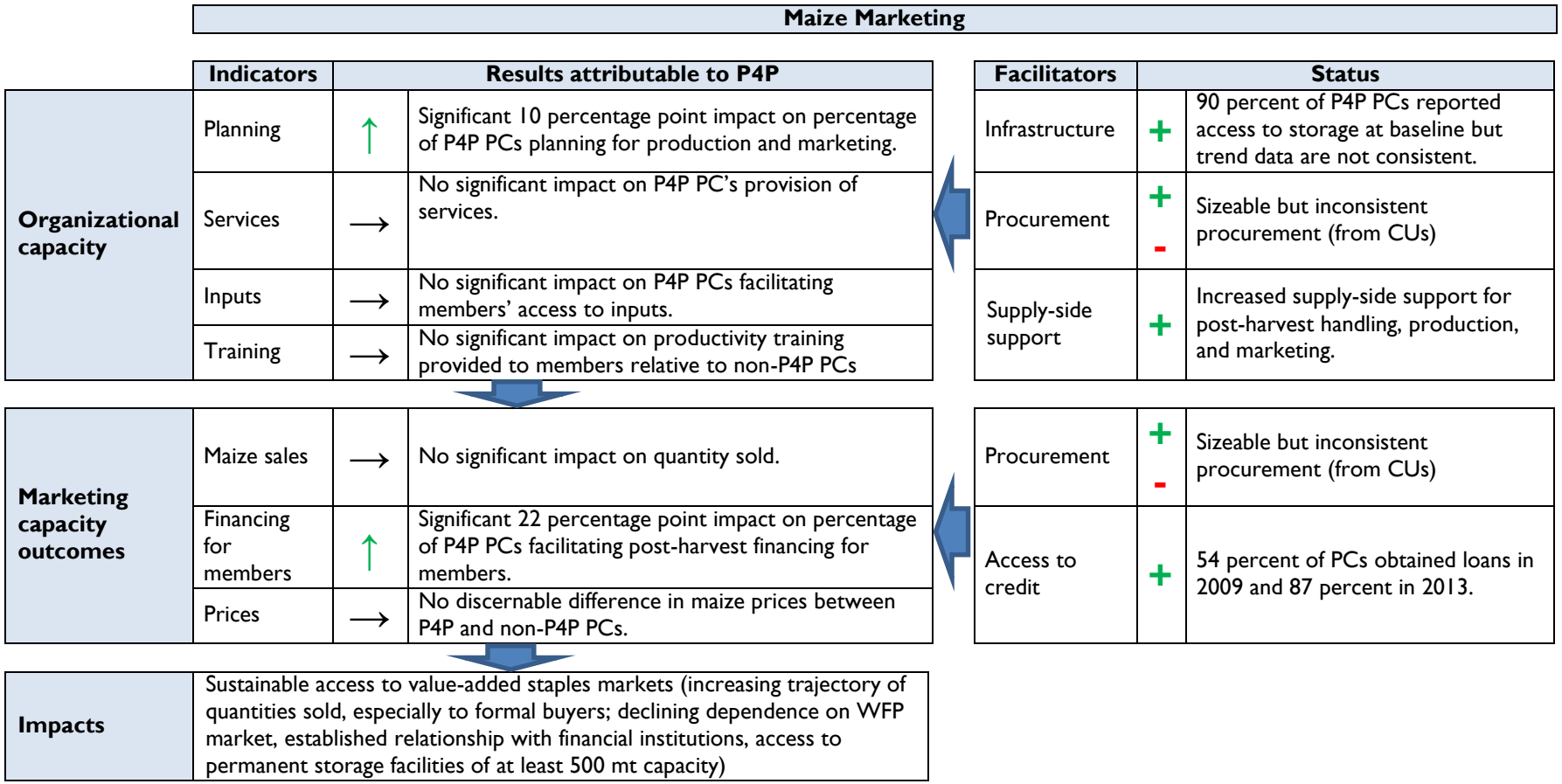
Impact of P4P on PC Capacity

Impacts at the PC level are indirect. PCs benefit from the WFP procurement stimulus only to the extent that CUs aggregate from a PC to supply WFP. Furthermore, since the surveys represent only a sample of the PCs that are members of P4P CUs, the magnitude and consistency of the stimulus are both diluted.

Figure 2 illustrates that, like the CUs, PCs appear to be relatively capable FOs with many of the facilitating conditions in place to support organizational capacity building. In particular, most (90 percent) reported having access to storage. Eighty-five percent had received external assistance in organizational management and the percentage reporting assistance with post-harvest management, production, and marketing increased markedly during the pilot.

Positive change in facilitating conditions was associated with increased organizational capacity as measured by the selected indicators. Only one, however, was attributable to P4P. In particular:

FIGURE 2: SUMMARY OF IMPACT OF P4P ON PC CAPACITY



Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
\+ Favorable conditions/change.
\- Unfavorable conditions/change.

- The percentage of P4P PCs planning for production and marketing increased by 10 percentage points relative to what would have happened without P4P – the only change statistically attributable to P4P;
- The average percentage of services offered by PCs increased – value addition services by 7 percentage points, quality services by 11 percentage points, production services by 8 percentage points, and marketing services by 17 percentage points. However, non-P4P PCs registered similar changes so the results are not attributable to P4P.
- Most (78 percent) of P4P PCs reported facilitating members' access to inputs at the time of the baseline and this percentage increased to 90 percent by 2013.
- P4P PCs registered a 59 percentage point increase in the percentage of PCs providing production training to members but non-P4P PCs experienced similar increases.

Similarly, the facilitating conditions for increased marketing capacity at the PC level were also mostly positive. More than half of P4P PCs (54 percent) reported utilizing credit prior to P4P but the percentage increased to by 23 percentage points to 87 percent by the end of the P4P pilot. This result is not statistically attributable to P4P but did improve the facilitating conditions for improved marketing capacity.

In spite of somewhat improved facilitating conditions, PCs reported few changes in marketing capacity indicators. Consistent with an increase in credit utilization, the percentage of P4P PCs that reported providing post-harvest financing to member farmers increased slightly but significantly during the pilot (from 10 percent to 13 percent). However, P4P PCs reported no significant increase in quantities sold or in prices received for maize.

Impact of P4P on Household Maize Marketing

In the Ethiopia context, capacity building results at the PC level are the most likely to affect households' marketing and production. Member households experienced little change in the factors facilitating marketing (Figure 3). A slightly larger percentage of P4P PCs (three percent) began offering post-harvest financing. P4P PCs also expanded the percentage of value addition, production, quality, and marketing services they offered (but not significantly relative to non-P4P PCs).

Predictably, these minor improvements in facilitating conditions did not stimulate significant changes in households' marketing behavior. Specifically:

- The percentage of P4P households that reported selling through the PC at some point during the pilot increased from 18 percent in 2009 to 33 percent in 2013. This result suggests a growing engagement with the PC. However, non-P4P households reported similar growth rates so the result is not statistically attributable to P4P.
- The percentage of P4P households that reported holding some maize for sale more than four weeks after harvest increased from 29 percent to 40 percent. However, the result is not significantly different from changes in behavior among non-P4P households.

Since P4P PCs do not appear to have altered their marketing behavior much in response to P4P, it is no surprise to find no significant marketing outcomes among member households. Household members of P4P PCs reported receiving no higher prices for maize than P4P households, nor did they report selling larger quantities.

FIGURE 3: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Maize Marketing							
	Indicators	**Results attributable to P4P**			**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Selling through the PC	→	No significant impact of P4P on percentage of households selling through the PC		Quantity sold by PC	→	No significant increase in quantities sold by PCs
					Quality and marketing services available from PC	+	Small increase in access to services through the PC but not attributable to P4P.
	Selling more than 4 weeks after harvest	→	No significant impact of P4P on percentage of households selling four weeks or more after harvest		Access to credit	→ ↑	P4P households were no more likely than non-P4P households to utilize credit for agricultural purposes. Significant increase in percentage of PCs providing post-harvest financing to members.
Household marketing outcomes	Prices	→	No significant difference between P4P and non-P4P households in terms of prices received for maize. In fact, non-P4P households reported receiving USD 32/mt more than P4P households in 2013.		Quantity sold by PC	→	No significant increase in quantities sold by PCs

Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

Impact of P4P on Household Maize Production

The P4P development hypothesis suggests that outcomes in household maize marketing lead to production outcomes. For example, higher prices obtained from selling maize through the PCs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. Specific changes in production facilitating conditions (documented in Figure 4) include:

- The percentage of P4P households reporting that they had received training in agricultural production practices increased from 78 percent to 98 percent.
- P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members. Although the change was significant, however, the percentage of PCs offering financing to their members was very small, 13 percent in 2013.
- The percentage of P4P PCs that reported facilitating access to inputs was high throughout the five-year period of the pilot, never dropping below 70 percent.
- The percentage of P4P households reporting access to subsidized inputs increased from 29 percent to 38 percent.

Given the apparent focus on production technologies and practices, it is not surprising that the only notable change in household production practices was increased use of certified seed. The percentage of P4P households reporting using certified seed increased from 64 percent to 75 percent and the average percentage of all maize seed used that was certified increased from 63 percent to 90 percent. Non-P4P households reported similar changes, however, so these changes in production behavior are not attributable to P4P.

Consistent with the increased use of certified seed, P4P households reported a significant increase in average maize yields – from 1.88 mt/ha to 2.37 mt/ha. This increase was significantly greater than that reported by non-P4P households and is directly attributable to P4P. Given that P4P and non-P4P households' access to and use of productivity-enhancing inputs and training were similar, the difference in growth in yields may be due to the quality of training.

FIGURE 4: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Maize Production						
	Anticipated Results	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Planting maize	→	P4P households were no more likely than non-P4P households to change their maize planting behavior.	Access to inputs/credit	→	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members.
	Area allocated to maize	→	P4P households were no more likely than non-P4P households to change the area they allocated to maize production.			
	Use of inputs	→	P4P households were no more likely than non-P4P households to change their use of certified seed (either to begin using it or to change the percentage they used) of to change their use of fertilizer.	Production training	→	P4P households were no more likely than non-P4P households to report receiving production training.
Intermediate outcomes	Yields	↑	P4P households reported significantly greater growth in yields than non-P4P households between 2011 and 2013.	Access to inputs/credit	→	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members.
	Quantity produced	→	P4P households were no more likely than non-P4P households to increase the quantity of maize they produced.			
	Quantity sold	→	P4P households were no more likely than non-P4P households to sell larger quantities of maize.			

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
\+ Favorable conditions/change.
\- Unfavorable conditions/change.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2013 than in 2009 by almost any measure of welfare.

- Real incomes increased by 46 percent;
- The average household asset score increased by 5 percent;
- The real value of household livestock increased by 42 percent;
- The food consumption score increased by 9 percent; and

However, non-P4P households experienced similar improvements and none of the changes observed with P4P households were significantly different from those experienced by non-P4P households.

INTRODUCTION

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[3] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[4]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to be active market participants lies at the center of all the strategies and WFP buys directly from FOs in almost all the countries. When the opportunities existed, some countries overlaid supporting structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors onto the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to engage their members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

Ethiopia's FOs are organized around a three-tier cooperative system comprised of village-level Primary Cooperatives (PCs) as the lowest tier, district-level Cooperative Unions (CUs) that aggregate from PCs and top-tier regional Federations that support the cooperative system but do not typically aggregate or sell commodities. On the recommendation of the Government of Ethiopia, WFP elected to work with CUs with the belief that they had the capacity to aggregate and deliver commodities to WFP standards. WFP' assessment of PCs suggested that most lacked the human, financial, and transportation resources to be able to aggregate and deliver food to WFP.

The assessment mission prior to the start of P4P in Ethiopia identified 14 candidate CUs for inclusion in P4P. WFP and partners visited each candidate CU to determine eligibility and elected to work with all of them. It also included two additional CUs bringing the number of CUs engaged with P4P at the beginning of

[3] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.
[4] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

the pilot to 16. Criteria for selecting CUs included having legal status (in order to enter into contracts), existing or potential access to surplus commodities, proximity to WFP programs, availability of supply-side partners, represent largely smallholder farmers, proximity to food processing facilities (as potential buyers), and participation of women. The selection criteria also considered CUs' access to storage facilities and the CU's commitment to engage with WFP. Selected CUs were in three regions (Amhara, Oromiya, and SNNPR). WFP added 13 additional CUs in 2013 when it signed forward delivery contracts for 38,000 mt of maize.

On paper, CUs appear to be relatively high-capacity FOs. All 13 CUs surveyed in 2009 had access to substantial warehouse capacity (600 mt to 12,000 mt with an average of,819 mt) and 7 owned their storage facilities.[5] Eighty-five percent reported selling commodities (mostly wheat) in the two years prior to the baseline survey and average annual quantities were substantial (1,762 mt). Seventy-seven percent reported having access to credit and they reported providing, on average, 49 percent of 8 quality-oriented services and 69 percent of 3 marketing services included in the baseline survey.

Ethiopia's P4P Story, however, documents several capacity limitations. In particular:

- "Many union managers lacked the ability to carefully observe market trends and make informed decisions about buying and selling maize at the start of the P4P initiative."
- CUs had a limited ability to meet WFP's quality criteria. WFP's procurement records, however, document problems aggregating (caused by limited access to credit or side selling), rather than quality as the reasons for default in 2010. This points to limited organizational capacity.
- Moreover, insufficient equipment, especially cleaning machines and fumigation sheets in most of the FOs, contributed to the delayed delivery of food.

The analysis in this report concludes that, by almost any objective measure, P4P-supported FOs and farmers are substantially better off at the end of the P4P pilot than at the beginning. For example, among the 13 P4P CUs, 70 P4P PCs, and a random sample of 321 of their member farmers from which the country office collected data:[6]

- Between 2009 and 2013, P4P-supported CUs are able to provide their members a much greater range of value addition, production, marketing, and quality services. P4P-supported PCs also increased the range of the four services they were able to provide but the magnitude of change was not as great.
- The percentage of P4P-supported CUs able to facilitate access to inputs for their members increased from 69 percent in 2009 to 92 percent in 2013. The growth among P4P-supported PCs was from 78 percent to 90 percent.
- P4P CUs reported receiving substantially more external assistance in post-harvest management, production, and marketing. P4P PCs reported similar results.
- The total quantity of maize sold by the 13 P4P CUs increased from 1,261 mt in 2009 to 26,549 mt in 2012. The average quantity of maize sold by P4P PCs, however, delined from 187 mt in 2009 to 26 mt in 2012 before rebounding to 41 mt in 2013.
- The percentage of P4P households using post-harvest services increased from 31 percent in 2009 to 84 percent in 2013 and the percentage using marketing services increased from 23 percent to 54 percent. The percentage that participated in productivity training increased from 78 percent to 98 percent.

[5] Ethiopia intervention mapping daa.
[6] The results reported below are all statistically significant with p-values≤0.10.

- The likelihood of using certified maize seed increased from 64 percent to 75 percent and the average percentage of all seed used that was certified increased from 63 percent to 90 percent.
- Average maize yields increased from 1.88 mt/ha to 2.37 mt/ha.
- The average quantity of maize produced increased from 0.78 mt to 0.92 mt and the average quantity sold increased from 0.24 mt to 0.41 mt.
- Real household income increased by 46 percent, the average household asset score increased by 5 percent, the value of livestock increased by 42 percent, and the average food consumption score increased by 9 percent.

Trends in FO capacity and household production and welfare, however, do not constitute evidence that the observed changes are caused by participating in P4P. To credibly attribute changes to P4P it is necessary to compare these outcomes to those that *would have occurred had these same CUs, PCs, and households not participated in P4P*. This is the major challenge of assessing impact; that analysts cannot simultaneously observe outcomes under P4P and those under the counterfactual of not participating in P4P. This report applies appropriate analytical techniques to the data to estimate the causal effects of P4P on key indicators of FO capacity and smallholder farmers' production and marketing of staple commodities and on their household income.

To make a credible case for impact, it is first necessary to understand the details of what WFP did in Ethiopia so anticipated outcomes are not confused with the P4P "treatment." For example, increased access to storage is an important anticipated outcome of participating in P4P and an indicator of FO capacity in the P4P logframe. In Ethiopia, however, WFP invested directly in increasing CU's storage capacity. Increased access to storage in Ethiopia is therefore part of the P4P treatment and not an outcome of P4P. After a brief description of data and methods used in the impact assessment, this report describes in detail the elements of the P4P treatment in Ethiopia.

Separate sections of the report then examine the evidence of causal effects of P4P participation on selected indicators of FO capacity and household production, marketing, and welfare theoretically linked to participating in P4P. The final section of the report summarizes conclusions with respect to the impacts of P4P in Ethiopia.

RESULTS FRAMEWORK

The results framework articulated in this section illustrates the interdependent, and often sequential, nature of anticipated P4P results and provides a context within which to interpret the findings and frame the conclusions. It is relevant at this juncture as a framework for understanding the relevance of the findings and analysis presented in the remainder of the report.

P4P is a capacity building program set within a market development framework. WFP's primary entry point in most countries, including Ethiopia, is farmers' organizations (FOs). The overarching rationale for WFP's involvement is the hypothesis that channeling a portion of the organization's local and regional procurement to a point in the supply chain that is closer to smallholder producers (usually FOs) can provide the market necessary to catalyze other development partner's efforts to build FOs' organizational and marketing capacities. FOs more capable of identifying markets, adding value, and reliably meeting market demands will improve households' marketing opportunities and outcomes. Improved access to markets for households will increase returns to agriculture, provide an incentive for investing in production, and ultimately, lead to improvements in household welfare.

This is an obviously simplistic summary of a much more complex and nuanced development hypothesis. For instance, it makes no mention of the myriad barriers FOs and smallholder farmers face pursuing these outcomes. It does, however, illustrate the sequential and interdependent aspects of the pathway through which P4P expects to produce results.

Figure 5 and Figure 6 illustrate the results framework for FOs and households, respectively. The vertical dimension of the figures illustrates the hypothesized progression of FO and household results, respectively. The second column of each figure (the second column of both the marketing and production components of Figure 6) lists the primary indicators at each level of result. For FOs, improved organizational capacity supports enhanced marketing capacity which ultimately leads to sustainable market access. For households, changing marketing behavior produces favorable market outcomes which then provide the incentive to change production behavior which increases production and, coupled with improved market access, improves the welfare of the household. On the horizontal dimension, moving right to left, the "facilitators" acknowledge some of the fundamental conditions necessary to support achievement of the results.

FIGURE 5: P4P RESULTS FRAMEWORK: FO CAPACITY

	Staples Marketing	
	Results	**Facilitators**
Organizational capacity	• Acquiring a business orientation • Planning for production and marketing • Increased services/training offered to members	• Access to post-harvest facilities and equipment • WFP procurement (catalyst) • Supply-side support (capacity building, infrastructure)
Marketing capacity outcomes	• Increased quantities aggregated and sold • Increased range of markets (including quality-conscious buyers) • Able to facilitate financing for members • Obtaining higher prices	• Consistent and sizeable WFP procurement • Trust of membership, transparency • Improved access to credit • FO engagement with quality-conscious buyers
Impacts	• Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)	

There are several other important things to note about the results frameworks outlined in Figure 5 and Figure 6.

1. Household marketing and production results are not necessarily independent. For example, the development hypothesis posits that higher prices associated with selling through the FO (a household marketing outcome) will provide an incentive to invest in productivity-enhancing technologies and practices (a behavioral change in the production column). The interdependence of results therefore works horizontally and vertically in the household figure.
2. Results often depend on "facilitators", some of which fall within the remit of development partners' or governments.
3. Many FO results appear as facilitators in the household results framework. This implies that household results depend, in many cases, on FO results. The FO and household frameworks are therefore interdependent and household results may lag FO results. It is also possible that FO results may lag household results. For example, an FO may find it difficult to aggregate large quantities before achieving a level of trust with its members that will encourage them to sell through the FO.

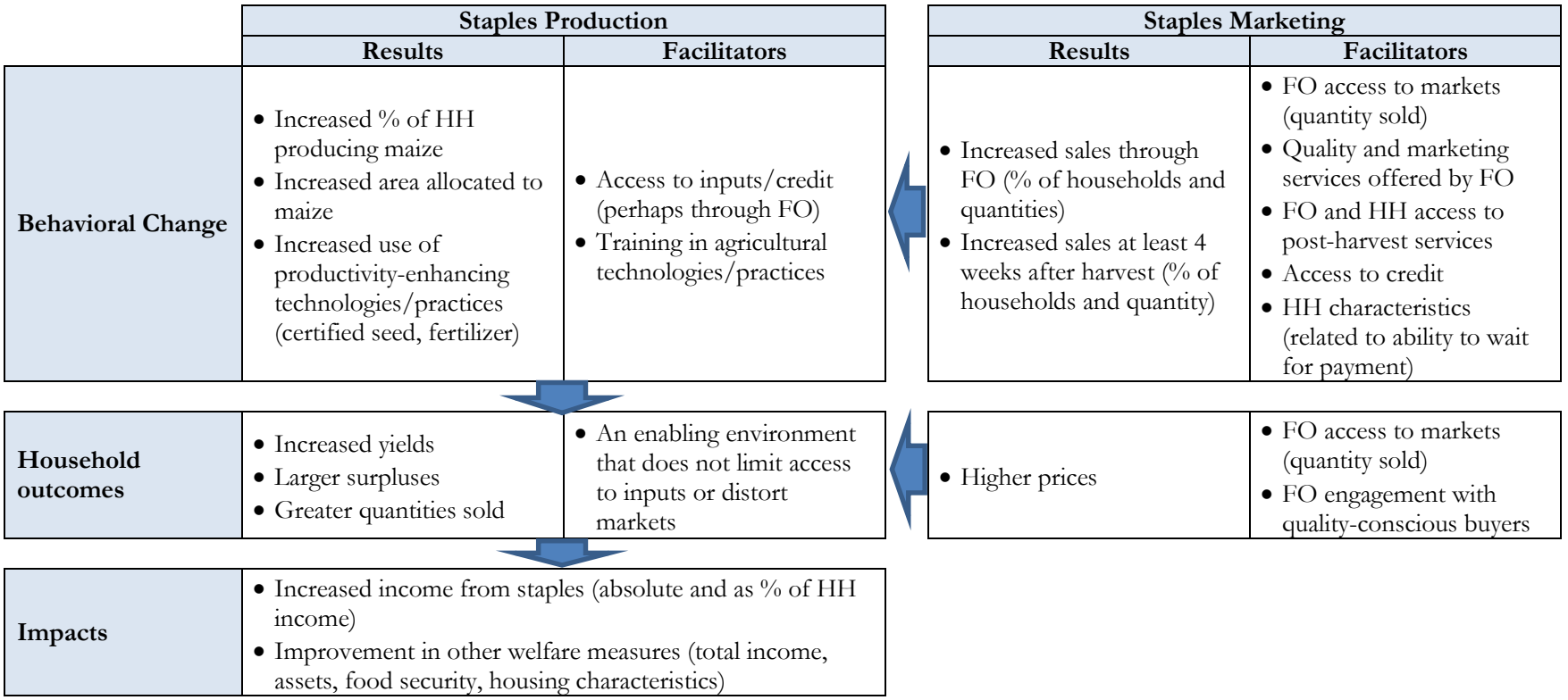
The remainder of this section more fully articulates this framework, describes its components, and illustrates the interdependencies between anticipated results. It is organized around the four basic elements of FO capacity, household marketing, household production, and household welfare. Following a detailed description of the quantitative results, the conclusions section returns to the results framework articulated in this section to draw the quantitative and qualitative evidence together into a coherent story of the impact of P4P in Ethiopia.

FO Capacity

Organizational capacity refers to the capacity of the FO to operate effectively to support its farmer members' agricultural endeavors, particularly in production and marketing. It encompasses the human and physical capacity required to aggregate, add value, and market staple commodities. Initial FO capacities, as documented in country assessments, varied substantially across the P4P pilot countries. Some countries (e.g., Tanzania, DRC) found few viable FOs with which to engage. Others (e.g., Ethiopia, Mali, Mozambique) found well established FOs, some of which had substantial marketing capacity. The rate at which countries are able to progress through the results framework will depend to some extent on the baseline situation with respect to FO and farmer capacity and facilitating factors at both the FO and household levels. When the capacity of P4P-supported FOs was particularly low, which it was in many countries, WFP and its partners often had to start organizational capacity building by establishing basic facilitating conditions. Important among these are:

- **Management capacity:** Building the organizations' internal management capacity. Capable management promotes financial viability, efficiency, and sustainability. It also contributes to operational and financial transparency which may foster members' trust in the FO, an important factor supporting participation and reliable aggregation. To support building management capacity WFP and its partners often train FO leaders and members in topics such as bookkeeping, financial management, group dynamics, and other topics.
- **External assistance:** Marshalling the technical, financial, and material assistance necessary to improve FOs' commodity management and marketing skills and farmers' knowledge of, and access to, productivity-enhancing technologies and practices. Training, in topics such as warehouse management, procurement procedures, negotiation, and production contribute to building these skills. In some countries, WFP and its partners help FOs build relationships with service providers such as financial institutions and input suppliers to help resolve barriers to aggregation and production.

FIGURE 6: P4P RESULTS FRAMEWORK: HOUSEHOLD MARKETING, PRODUCTION, AND WELFARE



- **Post-harvest infrastructure and equipment:** Establishing the storage infrastructure necessary to support aggregation and quality management. Equipment to clean, dry, grade, weigh, and bag commodities and storage facilities capable of maintaining quality are essential material capacities for marketing. Many countries found it necessary to enhance the quality and size of FOs' storage facilities and provide the equipment required to properly store and market commodities.
- **WFP's procurement:** Finally, access to a market will help provide the incentives for FOs and farmers to invest the time and resources to build these capacities. The basic tenet of P4P is that WFP's commitment to buy from FOs for a period of time will provide this market. Thus, the consistency and size of WFP's procurement is important; it must be large and regular enough to stimulate the necessary investments.

Establishing these facilitating conditions should contribute to improving organizational capacity. Relevant indicators of improved FO organizational capacity include:

- **Planning for production and marketing**: Planning is an important discipline that encompasses developing marketing strategies and predicting quantities that will be available from members. It may also provide farmers with some expectation that a market exists and thus ease aggregation.
- **Providing services to members**: FOs exist to provide services to their members and the greater the range and number of beneficial services they can offer, the more relevant they will be to the needs of their members. In the context of P4P, services associated with production and marketing are particularly germane. The ability to provide some services is contingent on facilitating conditions. For example, to provide storage and quality management services, an FO must have access to a warehouse and equipment and training in commodity management.
- **Facilitating members' access to inputs**: Smallholder farmers' access to productivity-enhancing inputs may be constrained by limited access to input markets or by financial considerations. FOs have facilitated members' access to inputs in a number of ways including providing inputs on credit, serving as a conduit for subsidized inputs provided by government programs, or by buying inputs in bulk at lower prices than farmers could obtain on their own.
- **Providing production training to members**: Access to inputs is not sufficient in itself to increase production. Farmers must also know how to use inputs correctly. Facilitating access to training on the appropriate use of a full range of other productivity-enhancing technologies and practices is another important role for FOs and one that reflects their overall capacity to serve members' needs.

As FOs become better managed and gain access to the infrastructure, equipment, and knowledge necessary to support production and marketing, they should become more capable marketing organizations. As with organizational capacity, a number of factors will facilitate improvements in marketing capacity. These include:

- **WFP's procurement**: WFP's procurement plays a central role in the P4P development hypothesis. By providing an assured and forgiving market for quality, WFP expects to create a window for capacity building – especially the capacity to reach quality-conscious buyers. Access to an assured market will also create the incentive for FOs to make the investments of time, energy, and money to build their capacities.
- **Access to marketing credit**: Limited access to credit is a major barrier to FOs' ability to aggregate and become reliable market participants. Many smallholder farmers do not have the financial capacity to wait for payment when they sell their crops. They need immediate cash to meet household expenses and to invest in inputs for the next season. In this environment, FOs without the ability to pay members prior to receiving payment from a buyer have trouble competing with traders who usually pay cash at the farm gate. This situation often leads to side-selling, when a farmer who has committed to sell through the FO sells instead to a different buyer. Volatile prices can exacerbate the problem of side selling. In 2010, volatile commodity prices in many east African countries contributed to side-selling when farmers (and FOs and even large traders) that had committed to

selling to WFP sold to other buyers as prices rose above the WFP contract price in the interval between signing a contract and delivering the commodity. Widespread side-selling can cause an FO to default on contracts. For FOs without sufficient internal capital, access to marketing credit can give them the ability to buy from farmers at the time they deposit commodities, eliminating the problem of side selling, and make them more reliable sellers. Many P4P countries have focused on building relationships between FOs and financial institutions to address this issue. And in many instances, financial institutions have agreed to accept a contract with WFP as collateral for a marketing loan.

Organizational capacity building coupled with establishing the facilitating conditions for more effective marketing should contribute to improved marketing capacity outcomes. Relevant indicators of marketing capacity in the P4P context include:

- **Quantity sold**: The total quantity an FO is able to aggregate and sell is an obvious indicator of marketing capacity. It reflects not only the FO's ability to find markets but also its ability to aggregate members' surpluses which, in turn, reflects the organizational capacity of the FO.
- **Quantity sold to buyers other than WFP**: WFP will not commit to buying from an FO indefinitely in a capacity building role. For results to be sustainable, FOs must develop the capacity to identify and sell to buyers other than WFP, and preferably to buyers who are willing to pay a premium for value addition (quantity, quality, or other commodity characteristics).
- **Facilitating post-harvest financing to members**: Access to credit, a facilitating factor, may give an FO the ability to provide post-harvest financing to members thus extending members' feasible marketing options and improving the reliability of aggregation. Using credit or other sources of capital to buy from members prior to a sale is only one technique for facilitating post-harvest financing. Some countries have supported warehouse receipt systems which can give farmers access to a loan secured by deposited commodities. In other countries, e.g., Burkina Faso, FOs may provide inputs on credit and then compel members to sell a sufficient quantity of commodities through the FO to cover the loan.
- **Prices**: An FO's ability to offer competitive prices will be an important consideration in farmers' decisions to sell through the FO. The prices an FO is able to obtain reflect its ability to identify markets where it has a competitive advantage, negotiate effectively, and deliver reliably. Prices are not the only consideration however. Others include the timeliness of payment and valuable services farmers receive from FO membership (e.g., credit, inputs, and training). Nevertheless, prices are a relevant indicator of FO marketing capacity.

The ultimate objective of FO capacity building under P4P is to leave in place an FO that can add value to members' commodities (through aggregation, quality, or transformation/processing) and sustainably access markets that appropriately compensate the FO for commodity characteristics. It is too early to assess the sustainability of P4P results but positive change in organizational and marketing capacity indicators may point to the sustainability of results.

Household Marketing

To fully benefit from improved FO marketing capacity, farmers must elect to sell through the FO. A small handful of farmers (18 percent of P4P farmers in Ethiopia) reported selling through the FO at the time of the 2009 baseline. To extend results to a wider range of members, farmers must change their marketing behavior and begin selling their surpluses through the FO. Farmers collectively channeling larger quantities through the FO will further build the organization's capacity, further enhancing overall results.

As in the FO marketing capacity results framework, several factors are likely to facilitate behavioral change. Many of these are FO marketing capacity outcomes reflecting the P4P development hypothesis that stronger FOs will support better marketing and production outcomes for farmers. Facilitators of household marketing include:

- **Services provided by the FO**: Services provided to members through the FO serve several purposes. From the perspective of household marketing behavior, FO's that provide services relevant to improving their member's production and marketing outcomes are likely to earn members' trust and loyalty and capture a larger share of their marketed surplus. From the FO perspective, members' trust and loyalty can further strengthen the FO and its ability to aggregate effectively and reliably.
- **Household access to credit**: Few smallholder farmers have access to credit. Ethiopia appears to be an exception with just over half of surveyed farmers reporting that they had received credit at the time of the 2009 baseline. Access to credit enhances a household's flexibility in marketing choices. With access to credit, a household may be able to choose to sell to a buyer that does not pay cash on the spot or to hold commodities into the lean season when prices are typically higher. As mentioned among the FO marketing outcomes, FOs may play a role in facilitating households' access to credit. The efforts of WFP and its partners to build relationships with financial institutions and establish warehouse receipt systems may also contribute to improved access to credit.
- **Quantities sold by the FO**: For farmers to choose to sell through the FO, the FO must be able to offer a market. The quantity the FO is able to sell is thus a critical facilitating factor in households' decisions to sell through the FO.

Choosing to sell more through an FO that earns its members' support by providing valuable services and a reliable market should ultimately lead to improved marketing outcomes for farmers. In the P4P context these outcomes may include higher prices or lower marketing cost (and thus higher net returns to the farmer). The P4P monitoring and evaluation system did not collect detailed data on marketing costs. The relevant indicator of improved marketing outcomes at the household level is thus higher prices.

Household Production

Better marketing outcomes should provide farmers the incentive and the means to invest in increasing productivity. The path to higher productivity begins with behavioral change (i.e., choosing to produce maize, allocating more area to maize production, investing in productivity-enhancing inputs and technologies) supported by favorable facilitating conditions, many of which are outcomes of FO capacity building. Relevant facilitators include:

- **Access to inputs**: Farmers' access to productivity-enhancing inputs may be constrained by access to input dealers, high prices, limited availability, or lack of knowledge of their use or benefits. FOs, governments, the private sector, and agricultural development organizations may all play a role in improving access to inputs and P4P countries have worked with each of these actors.
- **Access to credit**: In the context of production, access to credit is important as a facilitator of investment in productivity. Without access to credit, capital-poor households may not be able to purchase inputs, increase the area of land they cultivate, or invest in other practices that improve productivity (e.g., hired labor, mechanization). Credit need not be in the form of cash; it may also encompass in-kind schemes that advance inputs, machinery, or tools against future payment in crops.
- **Access to training in agricultural production practices**: As important as access to productivity-enhancing technologies and practices is the knowledge of how to use them appropriately. For example, farmers in El Salvador reported that the knowledge of when to plant and how and when to apply fertilizers and pesticides was perhaps more important to increasing productivity than access to

the inputs themselves. WFP and its P4P partners have often supported access to inputs and the training required to use them correctly.

With these facilitating factors in place, anticipated behavioral changes include:

- **Households choosing to produce maize:** Maize is a primary staple in many P4P countries and, consequently, most households produce maize. In Ethiopia, for example, 70 percent of surveyed P4P households reported producing maize in 2009. There may, therefore, be little scope for increasing the percentage of households that cultivate maize in some countries.
- **Area allocated to maize production**: Allocating more land to maize production, either by changing cropping patterns or increasing the overall area of land a household cultivates, may also affect the quantity of maize produced.
- **Use of productivity-enhancing technologies and practices**: Improved access to inputs, recognition of their value in increasing productivity, access to credit, and market-driven incentives should lead to increasing investment in productivity-enhancing inputs and practices.

All other things being equal, these behavioral changes should increase yields, quantities produced, and quantities sold, the key household production indicators.

Household Welfare

Producing and selling larger quantities at higher prices will ultimately affect household welfare. Welfare is a broad concept with dimensions including income, wealth, nutrition, food security, and physical security to name a few. The P4P proposal identified income as the primary household welfare measure. Because of the anticipated difficulty measuring relatively small changes in income, however, the P4P logframe identified several alternate welfare indicators. These include the household asset score (a simple summary of household assets), the value of household livestock (an important store of wealth in many cultures), and the food consumption score (an indicator of food security).

DATA AND METHODS

The impact assessment is based on a quasi-experimental design that compares outcomes for two groups of CUs, PCs, and households; one group that is participating in P4P and a similar group that is not. Survey data collected from these two groups at various points in time track changes in anticipated outcomes during the implementation of P4P. The Ethiopia country office commissioned surveys of samples of P4P CUs and PCs in every year of the five-year pilot and surveyed samples of non-P4P CUs and PCs in year 1, the baseline, year 4, and year 5. It also collected data from randomly selected members of the surveyed PCs in year 1, the baseline, year 3, and year 5. The surveys tracked a panel of FOs and households, i.e., the same set of FOs and households in each survey.[7] Table 1 summarizes the samples of CUs and PCs. Table 2 summarizes the household samples.

The surveys collected data on a variety of FO capacity and household production, marketing, and welfare indicators. For FOs these included data on services provided to members, storage capacity, marketing activity, and credit utilization, among others. The household surveys collected data on household characteristics; production; production practices; marketing activity; credit utilization; and income from crops, livestock, and off-farm sources, among others. The data collection instruments are available from WFP.

[7] Due to attrition, the size of the household panel (households interviewed in all three surveys) is smaller than the overall sample.

TABLE 1: FARMERS' ORGANIZATION SAMPLE

	2009 (baseline)	2010	2011	2012	2013
Cooperative Unions (full sample)					
P4P	14	13	13	14	15
Non-P4P	5			5	4
Cooperative Unions (panel)					
P4P	13	13	13	13	13
Non-P4P	4			4	4
Primary Cooperatives (full sample)					
P4P	70	70	71	71	71
Non-P4P	68			65	65
Primary Cooperatives (panel)					
P4P	69	69	69	69	69
Non-P4P	65			65	65

TABLE 2: HOUSEHOLD SAMPLE

	2009 (baseline)	2011	2013
Entire sample			
P4P households	390	390	375
Non-P4P households	387	380	366
Panel			
P4P households	312	312	312
Non-P4P households	278	278	278

In the comparison group design, the outcomes for the non-P4P groups represent the counterfactual, i.e., outcomes for the P4P groups had they not participated in P4P. Obviously, many factors other than P4P may affect outcomes of the two groups over time. The more similar the two groups, the less potential exists for other factors to differentially influence outcomes. It was not feasible, however, to randomly assign FOs to P4P and non-P4P groups (the best way to obtain comparable groups) and the Ethiopia country office matched them loosely on similarity of size, marketing experience, location, and organizational capacity.

Analysis of Impacts on FO Capacity Indicators

The very small sample of CUs makes it difficult to attribute differences between P4P and non-P4P CUs to participation in P4P. Even if differences do exist the analysis is unlikely to find them statistically significant unless they are relatively large. Given these constraints, the analysis relies on simple comparisons of average outcomes between P4P and non-P4P CUs – essentially a non-parametric difference-in-differences (DiD) approach, recognizing that many observed differences will not be statistically significant. The non-parametric approach implicitly assumes that P4P is the only difference between the two groups that affects outcomes. However, the small samples make regression approaches that attempt to control for other factors infeasible.

In contrast, the samples of PCs are relatively large. Consequently, the analysis uses a regression-based DiD approach to estimate the impacts of P4P on PC capacity indicators. The approach includes covariates to control for differences between P4P and non-P4P PCs. The selected covariates were factors on which P4P

and non-P4P PCs differed, were likely to affect outcomes, and were not correlated with participating in P4P. The following section describes the DiD approach.

Analysis of Impacts on Households

Analysis of the PC and household data employs a DiD approach to estimate the causal effects of P4P on selected PC and household outcomes. The DiD estimator defines the impact of a program on an anticipated outcome as the relative change in the average outcome measure over time between a "treatment" group affected by the program and a "control" group that is not affected, or:

$$Impact = \left(\bar{Y}_{1t_1} - \bar{Y}_{1t_0}\right) - \left(\bar{Y}_{0t_1} - \bar{Y}_{0t_0}\right) \quad (1)$$

where $\bar{Y}$ indicates the group mean of outcome measure Y; the subscripts *0* and *1* refer to control and treatment groups, respectively, and the subscript *t* refers to time with the subscripts 0 and 1 on *t* referring to pre- and post- program time periods respectively.

The non-parametric DiD estimator in equation (1) is appropriate only if the treatment and control groups are statistically equivalent, that is, that differences are due only to chance. Statistical equivalence implies that the DiD impact estimate derived from equation (1) is due only to the treatment and not to other factors. Random assignment of experimental units (e.g., FOs or households) to treatment and control groups is the best way to ensure statistical equivalence. Except for Ghana, however, it was not possible to randomly assign FOs, or by implication, households, to P4P and non-P4P groups. Therefore, the simple estimator of equation (1) is not appropriate for Ethiopia.

A generalization of the DiD estimator in a regression framework is more appropriate for cases where treatment and control groups are not equivalent. When the two groups are not statistically equivalent, the analysis needs to control for the differences to obtain reliable estimates of causal effects. One useful feature of the DiD estimator is that it completely controls for time-invariant differences between the two groups leaving only time-variant differences as possible confounders. The regression equivalent of the DiD estimator is:

$$Y_{it} = \alpha + \beta D_{it_0} + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (2)$$

where Y_{it} is the observed outcome for household *i* at time (survey) *t*, D_{it_0} is a vector of indicators of whether household *i* is in the treatment group at time *t=0*, τ is a vector of indicators for each time period except *t=0*, D_{it} is an indicator of household *i* being in the treatment group for all $t \neq 0$, X_{it} is a set of control variables which may include interactions, and ε_{it} is the error term. The elements of the coefficient vector γ are the average impacts of the treatment on *Y* at time *t*.

With panel data the regression equation becomes:

$$Y_{it} - Y_{it-1} = \alpha + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (3)$$

where parameters are the same as those defined for equation (2).

Because WFP in Ethiopia purchased much more maize than beans, the technical review panel that WFP convenes annually to guide P4P recommended in 2013 that the quantitative analysis of impacts focus on maize. Consequently, the impact assessment analysis considers only maize.

Data Limitations

The fact that the first and second follow-up surveys (2010 and 2011) did not cover non-P4P FOs severely restricts the scope of the analysis and probably biases some results. The missing observations for non-P4P FOs limits the comparison of temporal trends in outcome variables between the two groups. The limitation is particularly acute for variables formulated in cumulative terms, e.g., total quantity sold to date. In fact, in these instances, even a comparison of P4P and non-P4P FOs in the final year must ignore the 2010 and 2011 data for P4P FOs or values will not be comparable. Consequently, when necessary, the analyses of FO data compare data from the baseline and final years of the pilot without considering the intervening years.

The very small number of observations on non-P4P CUs also limits the power of tests for impacts on CU capacity. Low power means that the chance of identifying an effect that does in fact exist is relatively small.

Comparability of P4P and Non-P4P Groups

The reliability of the DiD estimates of impact in the case of non-equivalent groups depends in part on the extent of their similarities and differences. Therefore, prior to assessing the impacts of P4P on FO capacity and farmers' productivity and welfare, the analysis examines the differences between the two groups and the significance of observed differences.

Comparability of FOs

Side-by-side tests of differences in means and proportions of FO characteristics (27 characteristics for CUs and 29 for PCs) served to assess the baseline comparability of P4P and non-P4P FOs. Statistically significant differences (i.e., independent group tests with $p<0.10$) between the two groups were:

For CUs:

- P4P CUs reported significantly **fewer** full-time employees than non-P4P CUs: an average of 9.23 versus 12.25.

For PCs:

- In terms of PC characteristics:
    - P4P PCs reported significantly **fewer** farmer members than non-P4P PCs: an average of 1,034 compared to 1,368.
    - P4P PCs reported significantly **more** full-time employees than non-P4P PCs: an average of 13 versus 10 for non-P4P PCs.
    - P4P PCs reported being significantly **closer** to their primary markets than non-P4P PCs: an average of 72 kilometers (km) compared to 122 km for non-P4P PCs.
- On measures of PC capacity:
    - P4P PCs were significantly **less likely** than non-P4P PCs to report planning for production and marketing: 86 percent versus 99 percent.
    - P4P PCs were significantly **less likely** than non-P4P PCs to have sold through a contract: 17 percent versus 52 percent.
- In terms of receiving external assistance:

    - P4P PCs were significantly **more likely** than non-P4P PCs to report having received assistance on agricultural production: 36 percent relative to 19 percent.
    - P4P PCs were slightly, but significantly, **less likely** than non-P4P PCs to report having received assistance for inputs and tools: 0 percent versus 6 percent and 1 percent versus 12 percent, respectively.
- On the basis of services provided to their farmer members:
    - P4P PCs were significantly **more likely** than non-P4P PCs to report providing any services, quality services, and marketing services: 99 percent versus 89 percent, 29 percent compared to 16 percent, and 52 percent versus 30 percent, respectively.
- P4P PCs were also significantly **less likely** than non-P4P PCs to report having sold maize in the two years prior to the baseline survey: 39 percent versus 55 percent.

Table 16 and Table 17 in Annex A provide the full details of the tests for similarity between P4P and non-P4P CUs and PCs, respectively.

Comparability of Households

Side-by-side tests of differences in means and proportions of 76 baseline household characteristics found a number of statistically significant differences. Differences between the two groups were:

- The only statistically significant difference on the basis of household characteristics was that P4P households had slightly, but significantly, fewer members than non-P4P households – average household size of 6.21 versus 6.64.
- In terms of agricultural production:
    - P4P households were significantly **more** likely than non-P4P households to cultivate maize – 72 percent versus 66 percent.
    - P4P households were significantly **more** likely than non-P4P households to use fertilizer – 100 percent versus 92 percent.
    - P4P households were significantly **more** likely than non-P4P households to use certified maize seed – 54 percent versus 41 percent.
    - P4P households were significantly **more** likely than non-P4P households to use certified seed for crops other than maize – 64 percent versus 50 percent.
    - P4P households harvested significantly **larger** quantities than non-P4P households of crops other than maize – 1.86 mt compared to 1.44 mt.
    - P4P households spent significantly **more** than non-P4P producing crops – 2,438 Birr versus 1,734 Birr per year.
    - P4P households reported a significantly larger value of crops than non-P4P households – 6,212 Birr versus 4,962 Birr.
- In terms of marketing activity:
    - P4P households reported selling significantly **larger** quantities of crops other than maize than non-P4P households – an average of 0.52 mt per year compared to 0.33 mt.
    - P4P households were significantly **more** likely than non-P4P households to report selling maize through the FO – 8 percent versus 4 percent.
    - P4P households reported selling significantly **larger** quantities of maize through the FO and at the farm gate than non-P4P households – an average of 0.03 mt through the FO and 0.01 mt at the farm gate compared to 0.01 mt and 0.00 mt, respectively.
- P4P households were significantly **more** likely than non-P4P households to report obtaining price information through the FO – 43 percent compared to 34 percent.
- P4P households also reported **larger** values of many household welfare indicators. In particular they reported:
    - Average annual household income from all sources of 7,979 Birr compared to 6,760 Birr;

    - Average income from farming of 6,386 Birr compared to 5,228 Birr;
    - Average annual value of crops consumed in the household of 5,045 Birr compared to 4,074 Birr;
    - Average annual expenditure on household items of 1,495 Birr compared to 1,183 Birr; and
    - Average food consumption score of 45 compared to 42.
- P4P household reported significantly **lower** income than non-P4P households from selling livestock – 63 Birr compared to 143 Birr.

The comparison of P4P and non-P4P households suggests that P4P households may have been somewhat more involved in agricultural production and marketing, particularly of crops other than maize. They also seemed somewhat better off although the difference did not show up in quality of housing, value of livestock, or assets.

Table 18 in Annex A shows the comparisons of all 76 baseline characteristics used to assess the comparability of P4P and non-P4P households.

THE P4P "TREATMENT"

An impact assessment determines the causal effect of a *treatment* on anticipated outcomes. For P4P this is the impact on FO organizational and marketing capacity and household agricultural marketing, productivity, and welfare associated with participating in P4P. The P4P logframe defines a number of indicators of FO capacity and household productivity and welfare outcomes.[8]

The P4P development hypothesis expects that WFP's commitment to buy from FOs during the pilot phase will catalyze the support of development partners to help build the capacities of participating FOs to capitalize on the opportunity to sell to WFP and provide individual farmers the financial incentive to invest in increasing agricultural productivity. In this context, the P4P *treatment* is merely WFP's procurement and the capacity building activities of partners are outcomes of the treatment.

However, many P4P programs purposely selected FOs based in part on the presence of development partners working to build the capacities of the FOs. Furthermore, country programs often directly supported capacity building activities, e.g., conducted training, financed training conducted by partners, and provided infrastructure and equipment. In Ethiopia the country office participated in and financed training and invested in providing and equipping warehouses. In this context, participating in P4P implies a multi-faceted treatment that may vary across participating FOs.

Impact assessments often carefully design treatments/interventions to vary the treatment elements and/or their intensity across subjects (e.g., FOs). With P4P, however, country offices had a great deal of latitude to design and implement their own programs. The P4P Rome-based coordination unit, which designed and managed the monitoring and evaluation system and the impact assessment framework, had little direct control over specific implementation decisions at the country level. The impact assessment therefore has to take the types and intensities of treatments as given.

The remainder of this section documents characteristics of the P4P treatment for individual FOs in Ethiopia. These data will define the dimensions and intensity of the P4P *treatment* applied to individual FOs and help identify the characteristics of the treatment that influence particular outcomes. In the Ethiopia context, the

[8] P4P Global Logframe, Internal WFP document.

broad dimensions of the treatment are WFP procurement, investments (largely in infrastructure and equipment), and training. Because, in most cases, WFP's development partners were already working with participating FOs, coordinated their activities closely with WFP, and were often funded by WFP, the impact assessment considers their activities to be part of the P4P treatment rather than an outcome of the treatment.

The remainder of this section describes, in detail, the various components of the P4P treatment in Ethiopia grouped broadly into categories of WFP procurement, investments in infrastructure and equipment, and training.

WFP Procurement

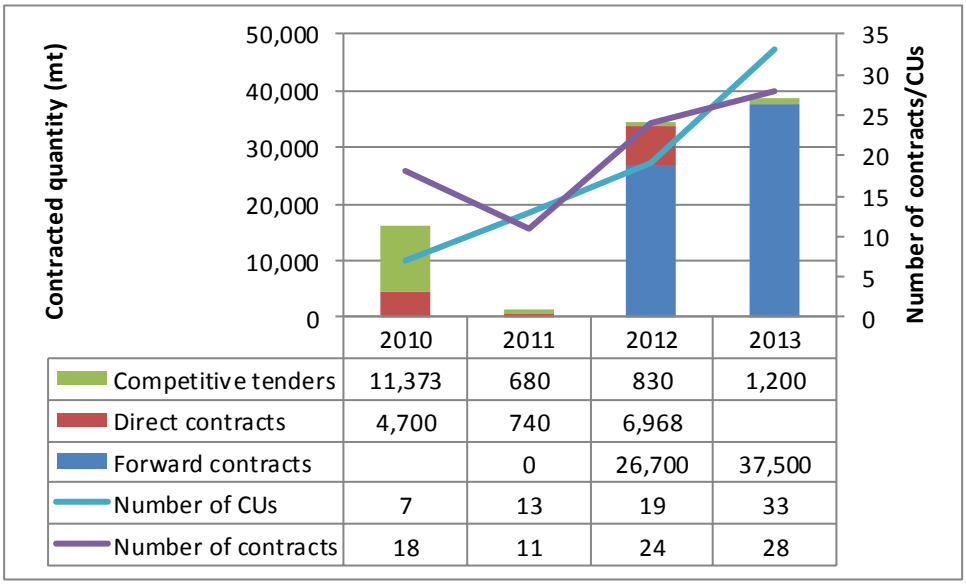
Between P4P's inception in 2009 and May 2014, WFP took delivery of 44,511 mt of maize (42,470 mt) and beans (2,041 mt) from CUs in Ethiopia (see Table 21 in Annex B for a summary of WFP's procurement in Ethiopia). This figure does not include quantities purchased from other entities (i.e., 3,430 mt of maize purchased from traders and 5,050 mt of maize purchased across the commodity exchange) or forward delivery contracts with CUs for 30,628 mt of maize contracted in 2013 and not yet delivered. WFP purchased maize and beans in Ethiopia but maize accounted for the lion's share (96 percent) of quantities delivered to date. Ethiopia has registered 34 CUs as WFP suppliers under P4P, signed contracts with 33 of them, and taken delivery of commodities from 21. Twelve of those that have not yet delivered, signed their first (forward) contracts in 2013 and delivery is not yet due.

While the quantities WFP procured generally increased, they fluctuated somewhat due to programmatic requirements external to the P4P program (Figure 7). Aspects of the treatment as they relate to procurement that the country office could control were the procurement modality; the number of CUs from which it purchased; the number of contracts (excluding competitive tenders where WFP could not control the outcome) awarded to each CU; and by implication, the quantities contracted from each CU.[9] Figure 7 illustrates that Ethiopia has steadily expanded the number of CUs with which it has engaged. It has also shifted from direct contracts and competitive tenders to rely much more heavily on forward delivery contracts.

The P4P development hypothesis implies that the size and consistency of procurement matters. WFP's commitment to purchase from a CU is expected to provide the CU the space to build capacity with a patient buyer. The stimulus should also be large enough to provide member farmers with the incentive to invest in increasing production (although the stimulus at the farm level may be substantially diluted in the Ethiopia model which buys from CUs.) This implies a consistent level of procurement large enough to represent a meaningful sale volume for individual farmers.

[9] With competitive tenders, the CO could control only the number of tenders it issued, and their size, but could not directly control the individual FOs that won tenders.

FIGURE 7: WFP PROCUREMENT FROM P4P CUS BY YEAR AND MODALITY



	2010	2011	2012	2013
Competitive tenders	11,373	680	830	1,200
Direct contracts	4,700	740	6,968	
Forward contracts		0	26,700	37,500
Number of CUs	7	13	19	33
Number of contracts	18	11	24	28

Source: WFP procurement records.

Over the course of the five-year pilot, Ethiopia contracted with 33 of the 34 CUs registered as P4P vendors. Of the 16 CUs WFP registered as vendors involved since the beginning of the pilot, it purchased from 3 (19 percent) in only one year, 6 (38 percent) in two separate years, 6 (38 percent) in three years, and 1 (6 percent) in four years. The remained 13 CUs were registered only in 2013 and received one contract each in that year (Table 3). The size of individual contracts ranged from 50 mt to 6,500 mt with an overall mean of 1,093 mt. The total quantity contracted per CU (throughout the five-year pilot) ranged from 200 to 14,920 mt with an average of 2,682 mt (Table 4). Total quantities delivered per contract (which excludes contracts not yet closed) ranged from 0 to 10,118 mt with an overall average of 1,349 mt. Actual deliveries were somewhat smaller as a result of defaults. These are relatively large quantities in the context of the 1,261 mt average quantity CUs reported selling in 2009, prior to selling starting to sell to WFP.

TABLE 3: FREQUENCY OF WFP PROCUREMENT (FROM 21 CUS)

Number of years with sales to WFP	Number of CUs	Percentage of CUs	Cumulative percentage
Four years	1	6%	6%
Three years	6	38%	44%
Two years	6	38%	82%
One year	3	19%	101%

Source: WFP procurement records.
Note: The table does not report results for the 18 CUs registered after 2009.
Note: Sum of 101% is a result of rounding.

TABLE 4: DISTRIBUTION OF QUANTITIES CONTRACTED AND DELIVERED

	Number of observations	Mean	Median	Minimum	Maximum	Standard deviation
Quantity contracted (mt)	33	2,682	1,500	200	14,920	3,031
Quantity delivered (mt)	33	1,349	612	0	10,118	2,184

Source: WFP procurement records.

One concern in Ethiopia is that the procurement stimulus at the CU level will be too diluted at the PC and farmer levels to provide a meaningful stimulus. Using data provided by the country office on the number of PCs that are members of each surveyed CU and the number of farmer members of those PCs, the average annual stimulus to member PCs in years when WFP purchased from a CU ranged from 14 mt to 172 mt. Calculating the average stimulus to farmers was a little more complicated. When spread across the percentage of farmers who reported selling through the PC (26 percent on average), the average annual stimulus to farmers when the CU with which they were associated sold to WFP ranged from 0.095 to 0.209 mt. While these numbers seem small, they are meaningful in the context of the average quantities PCs and households reported selling. Surveyed PCs reported selling between 26 mt and 187 mt and households between 0.23 mt and 0.41 mt.

In conclusion, P4P appears to have provided a reasonably consistent procurement stimulus with contract sizes representing meaningful quantities at the CU, PC, and household levels.

Investments in Infrastructure and Equipment

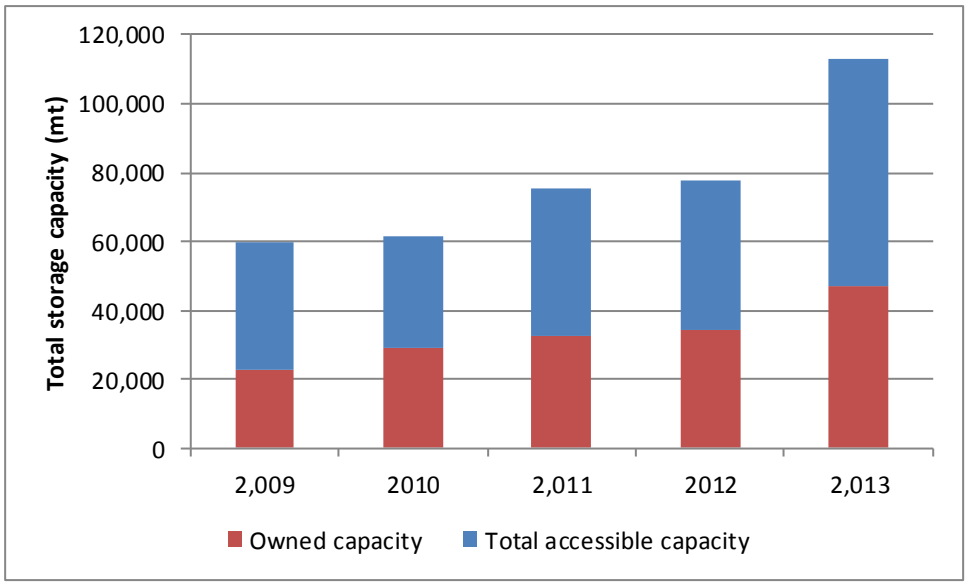
The Ethiopia P4P program directly invested in improving CUs' infrastructure by providing some or all of the financing to establish, expand, and equip warehouses. In particular, WFP supported warehouse expansion for 9 of the 13 surveyed CUs. During the 2009-2013 period, WFP provided temporary warehouses (rubhalls) to 7 P4P-supported CUs, 4 of which then received permanent warehouses (3 with WFP financial assistance). Table 20 in Annex B documents changes in P4P-supported CUs' warehousing capacity and the role of WFP and its partners in building the capacity. WFP and partners played a financial role in building the warehousing capacity of 10 of the 13 P4P-supported CUs included in the survey.

As a group, prior to any investment by WFP or P4P partners, the 13 P4P-supported CUs surveyed reported having access to 36,650 mt of storage space, 23,050 mt of it owned. By 2013, these CUs reported access to 65,000 mt of storage of which they owned 47,200 mt. Owned storage capacity increased by 105 percent, with 12,500 mt (52 percent) due to direct investments by WFP and its partners.

Figure 8 summarizes the evolution of storage capacity among surveyed P4P-supported CUs.

WFP and/or its P4P partners also fully or partially financed warehouse materials and equipment (e.g., weighing scales, moisture analyzers, sieves, and cleaning, drying, and grading machinery), office equipment, and shellers for all 13 of the P4P-supported CUs surveyed. Furthermore, WFP helped link all of the surveyed CUs to credit providers to facilitate access to fertilizer.

FIGURE 8: STORAGE AVAILABLE TO P4P-SUPPORTED CUS



Source: Ethiopia intervention mapping data.

Training

Training is also an important element of capacity building for FOs. In Ethiopia, WFP directly supported training for CUs. While some of its partners worked with PCs and farmers, WFP did not deliberately direct the types of training provided at these levels or support the training financially.

At the CU level, WFP and its partners provided training in agribusiness management, credit, institutional capacity building, gender, monitoring and evaluation, post-harvest handling, production, and WFP procurement. WFP participated substantially in training on post-harvest handling, M&E, and WFP procurement. Partners provided most of the training in the other topics with WFP providing it for some CUs in some years. WFP financially supported all types of training, either fully or partially, and provided financing to a large majority of the individual training events conducted by partners (Table 5).

IMPACT OF P4P ON FO CAPACITY

This section estimates changes in FO capacity that can be attributed to participating in P4P. The presentation is organized around the results framework of Figure 5, looking first at organizational capacity and then at intermediate outcomes. Each section presents evidence of changes in facilitating factors and links them to changes in anticipated results. Two sub-sections present results for CUs and then for PCs.

Each section first compares trends in indicators between P4P and non-P4P FOs in a visual format that intuitively illustrates differential trends in outcomes and then presents non-parametric DiD estimates of impact.

TABLE 5: SUMMARY OF TRAINING ACTIVITIES

Training topic	Number of FOs trained	Trainer (number of events)	Funding (number of events)
Agribusiness management	13	Partners (48) WFP & partner (4)	WFP & partner (51)
Credit and finance	13	Partners (28) WFP & partner (1)	Partners (29) WFP & partner (22)
Institutional capacity building	13	Partners (34) WFP & partner (1)	Partners (3) WFP (11) WFP & partner (30)
Gender	13	Partners (30) WFP & partner (1)	Partners (5) WFP (26) WFP & partner (4)
Monitoring and evaluation	12	WFP (15) WFP & partner (7)	Partners (9) WFP (24)
Post harvest handling, storage, quality control	13	Partners (23) WFP & partner (29)	WFP (1) WFP & partner (51)
Production and productivity	13	Partners (48) WFP & partner (4)	Partners (29) WFP & partner (23)
WFP procurement and payment procedures	13	Partners (1) WFP & partner (51)	WFP (52)

Source: Ethiopia intervention mapping data.

Impact of P4P on Organizational Capacity

Organizational capacity refers to the human and physical capacity of an organization to effectively manage commodity aggregation, value addition, and marketing. WFP's procurement, its direct investments in providing and equipping warehouses, and the external assistance it brought to bear on the FOs significantly improved the facilitating conditions necessary to support improvements in organizational capacity. Indicators of organizational capacity relevant in the Ethiopia context include services FOs are able to provide to members, including production training and access to inputs, and planning for production and marketing.

Visual Inspection - CUs

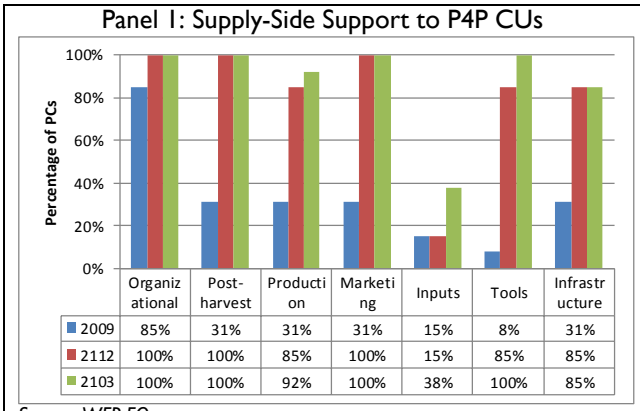
The results framework of Figure 5 postulates that access to post-harvest infrastructure, WFP's procurement, and other supply-side support are important factors facilitating improvements in organizational capacity. At the time of the baseline, all of the 13 P4P-supported CUs had access to substantial storage capacity. WFP and its partners invested directly in enhancing warehouse capacity in 11 of the 13 surveyed P4P-supported CUs. Furthermore, they provided warehouse equipment and machinery to all 13 CUs and bolstered the investments with training (to all CUs) in post-harvest handling and storage and quality control. Supply-side support proved by WFP and partners also included training in agribusiness management; credit and finance; institutional capacity building; gender; production and productivity; and WFP procurement and payment procedures (Table 5).

WFP's commitment to provide a market for high quality commodities should have catalyzed this supply-side support. For these particular areas of support, however, WFP played a key role in directing and financing the activities. The growth in the percentage of CUs that reported receiving supply-side support illustrated in Panel 1 of Figure 9 is, therefore, an element of the P4P treatment and not necessarily catalyzed by WFP's

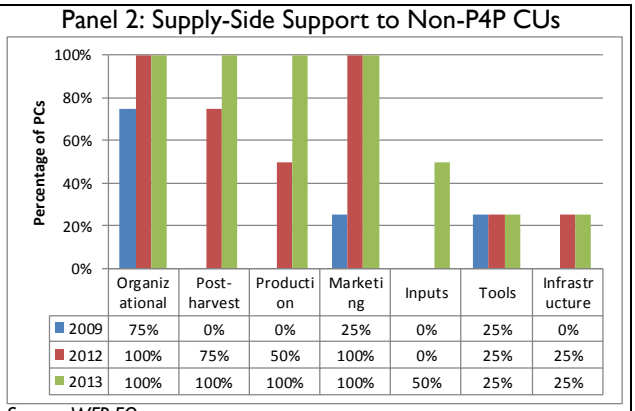
procurement. Interestingly, the percentage of non-P4P CUs that reported receiving supply-side support also increased during the time of the P4P pilot. Differences between the percentage of P4P and non-P4P CUs receiving supply side support were statistically significant only for post-harvest assistance in 2012 and tools and infrastructure in 2012 and 2013. The latter two almost certainly reflect the investments WFP and partners made in providing and equipping warehouses.

Finally, the consistency and size of WFP's procurement is also an important facilitating factor contributing to building organizational capacity. The "WFP Procurement" section on page 16 summarizes WFP's procurement from P4P CUs and concludes that WFP provided a reasonably consistent and sizable procurement stimulus.

FIGURE 9: ORGANIZATIONAL CAPACITY FACILITATORS - CUS



Source: WFP FO surveys.



Source: WFP FO surveys.

The improved facilitating environment should have contributed to improved organizational capacity as measured by a greater range of services offered to members, the ability to facilitate members' access to production inputs and provide production training to members, and greater use of planning for production and marketing.

The FO survey asked whether FOs provided a range of 18 different services; too many to examine individually. The services fall into four categories; value addition, quality, production, and marketing.[10] The analysis aggregates the services into these four categories and defines four service capacity indicators as the percentage of the services within a category the FO provides. Panels 1 and 2 of Figure 10 illustrate trends in the average percentage of services offered by P4P and non-P4P CUs, respectively.

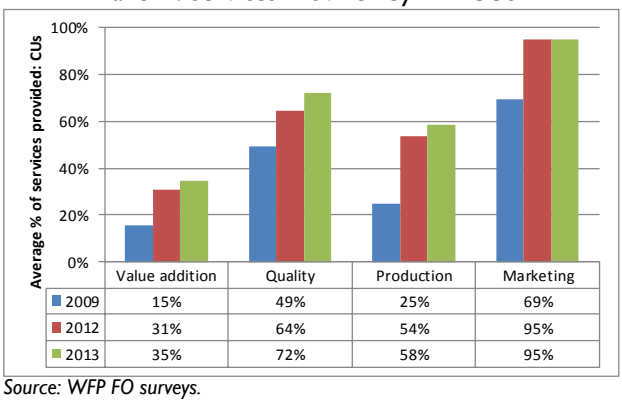
At the time of the 2009 baseline, P4P CUs offered a significantly larger percentage of quality and marketing services than did non-P4P CUs. Figure 10 shows steady growth in the average percentage of all four services offered by P4P CUs while nonP4P CUs exhibited much lower growth rates (Panel 2 of Figure 10). In fact, the growth in the percentage of services offered by P4P CUs exceeded that for non-P4P CUs for every service.

[10] The value addition category includes two services; small-scale food processing and milling. The quality category includes eight services; drying commodities, cleaning commodities, removing small/broken grains, removing discolored grains, use of storage facilities, use of cleaning facilities, use of drying equipment, and fumigation. Production includes five services; technical assistance in agricultural technologies and practices, supplying agricultural inputs, facilitating access to inputs, maize threshing/shelling, and draft power. Marketing includes the three services of transporting good to buyers/markets, weighing and bagging, and aggregating commodities for sale.

Panel 3 of Figure 10 shows a greater growth in the percentage of P4P CUs than non-P4P CUs facilitating access to inputs for members. Recall that WFP and its partners established links between P4P CUs and credit providers specifically to facilitate access to fertilizer. Panel 4 of Figure 10 shows much greater growth in the percentage of P4P CUs than non-P4P CUs offering production training to their members, a result that tracks the fact that WFP and partners specifically trained all 13 P4P-supported CUs in production. Finally, almost all P4P and non-P4P CUs reported planning for production and marketing (Panel 5 of Figure 10) and there was little room for improvement. The few P4P CUs that were not planning in 2009, however, were by 2012.

FIGURE 10: ORGANIZATIONAL CAPACITY INDICATORS - CUS

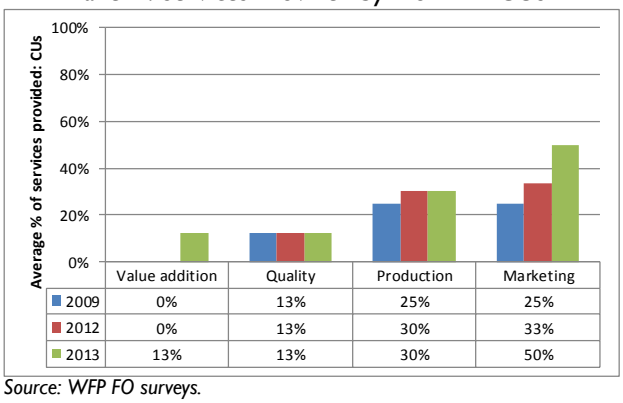
Panel 1: Services Provided by P4P CUs



	Value addition	Quality	Production	Marketing
2009	15%	49%	25%	69%
2012	31%	64%	54%	95%
2013	35%	72%	58%	95%

Source: WFP FO surveys.

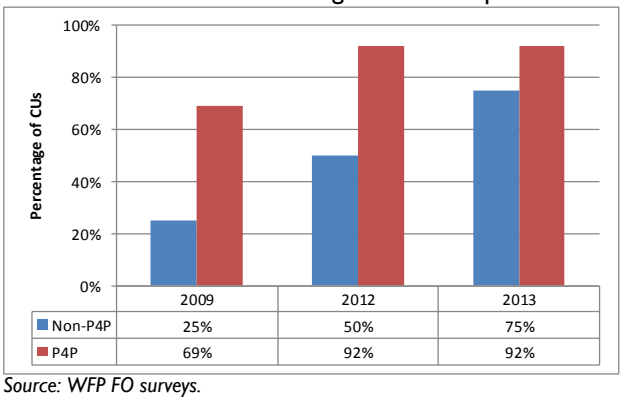
Panel 2: Services Provided by Non-P4P CUs



	Value addition	Quality	Production	Marketing
2009	0%	13%	25%	25%
2012	0%	13%	30%	33%
2013	13%	13%	30%	50%

Source: WFP FO surveys.

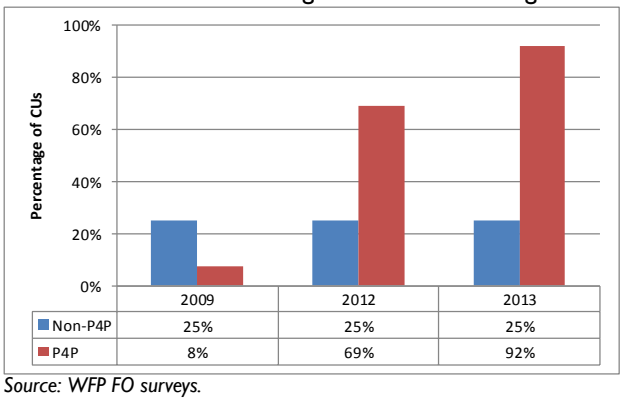
Panel 3: CUs Facilitating Access to Inputs



	2009	2012	2013
Non-P4P	25%	50%	75%
P4P	69%	92%	92%

Source: WFP FO surveys.

Panel 4: CUs Offering Production Training



	2009	2012	2013
Non-P4P	25%	25%	25%
P4P	8%	69%	92%

Source: WFP FO surveys.

Panel 5: CUs Planning for Production and Marketing

	2009	2012	2013
Non-P4P	100%	100%	100%
P4P	77%	100%	100%

Source: WFP FO surveys.

DiD Estimates of the Impact of P4P on Organizational Capacity - CUs

Table 6 reports DiD estimates of the impact of participating in P4P on key organizational capacity indicators for CUs. The underlying data are from the panel of 13 P4P and 4 non-P4P CUs collected in 2009, 2012, and 2013. Estimated coefficients reflect the marginal impact of participating in P4P on the outcome of interest. For example, the 0.2308 coefficient for the change in the percentage of quality services provided between 2009 and 2013 means that the average percentage of quality services provided by P4P CUs increased by 23 percent relative to the change among non-P4P CUs. If non-P4P CUs represent a suitable counterfactual, then the change can be interpreted as the change relative to the outcome that would have occurred had the CU not participated in P4P. The "*" associated with some coefficients in Table 1 indicate the level of statistical significance. Coefficients without "*" are not statistically different from zero, i.e., no impact.

A negative value does not necessarily mean that the value of the outcome declined, *it means it declined for P4P CUs relative to non-P4P CUs.*

TABLE 6: DID ESTIMATES OF THE IMPACT OF P4P ON CUS' ORGANIZATIONAL CAPACITY

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Percentage of value addition services provided (cumulative %)	.01538* (0.0690)	-0.0865 (0.4830)	0.0673 (0.6550)	34	.0.719
Percentage of quality services provided (cumulative %)	0.1538** (0.0250)	0.0769 (0.1280)	0.2308*** (0.0060)	34	0.1080
Percentage of production services provided (cumulative %)	0.2423*** (0.0060)	0.0462 (0.1850)	0.2885*** (0.0020)	34	0.3711
Percentage of marketing services provided (cumulative %)	0.1731* (0.1030)	-0.1667* (0.0700)	0.0064 (0.9510)	34	0.3302
Likelihood of facilitating access to inputs (cumulative %)	-0.0192 (0.9420)	-0.2500 (0.2870)	-0.2692 (0.3740)	34	0.1072
Likelihood of providing production training (cumulative %)	0.6154*** (0.0000)	0.2308* (0.0730)	0.8462**** (0.0000)	34	0.2764
Likelihood of planning for production and marketing (%)	0.2308* (0.0730)	-0.0000 (0.2660)	0.2308* (0.0830)	34	0.1563

Numbers in parentheses are p-values.
* *significant at p< 0.10*
** *significant at p< 0.05*
*** *significant at p< 0.01*

The results reported in Table 6 support the following conclusions regarding the impact of P4P on CU organizational capacity.

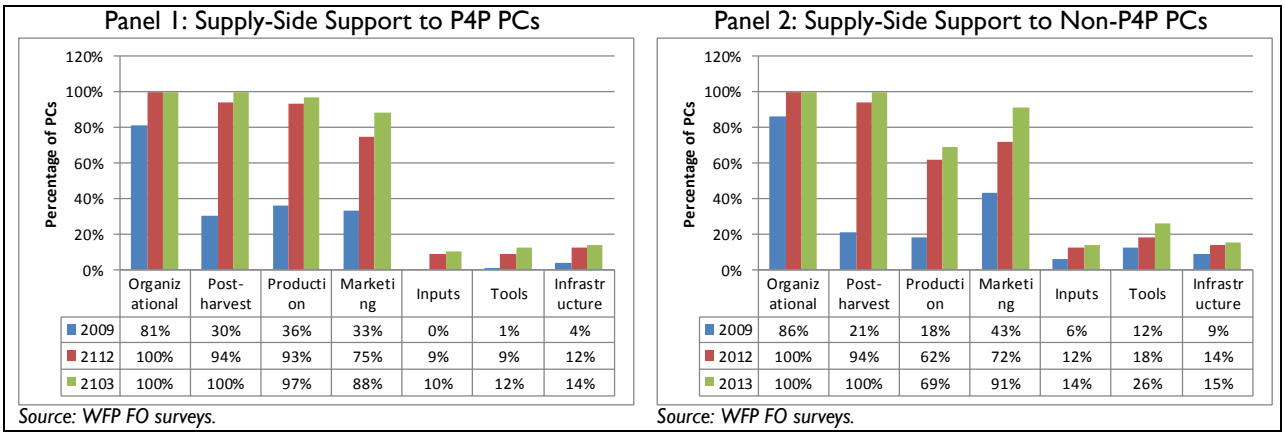
- Participating in P4P significantly increased (by 23 percentage points) the percentage of quality and production services P4P CUs offered relative to what would have occurred had the CU not participated in P4P.
- Participating in P4P significantly increased (by 29 percentage points) the percentage of P4P CUs that offered production training to members. This result corresponds to WFP's focus on production training in Ethiopia.
- Participating in P4P led to a significant 85 percentage point increase in the percentage of P4P CUs planning for production and marketing relative to what they would have done without P4P.

Visual Inspection - PCs

Except for WFP's procurement stimulus, which will have a less direct effect, the factors facilitating organizational capacity building among PCs are the same as those associated with CUs; supply-side support and post-harvest infrastructure. P4P and non-P4P PCs reported receiving similar levels of supply-side support in 2009, prior to the start of P4P. In fact, the only statistically significant baseline differences between P4P and non-P4P PCs were that P4P PCs were significantly more likely than non-P4P CUs to have received assistance with production, input, and tools. By 2013, the only significant differences were in production and tools and in both cases P4P PCs gained relative to non-P4P PCs (Panels 1 and 2 of Figure 11).

Survey data on PCs' access to storage and storage capacity are not consistent[11] so it was not possible to examine this facilitating factor.

FIGURE 11: ORGANIZATIONAL CAPACITY FACILITATORS - PCS



Organizational capacity indicators for PCs are also the same as for CUs; services provided, facilitating access to inputs, offering production training, and planning for production and marketing. Figure 12 presents trends in each of these indicators.

On average, P4P PCs offered a significantly greater percentage of quality, production, and marketing services to their members in 2009 than did non-P4P PCs. Trends in the services indicators between 2009 and 2013 appear similar (Panels 1 and 2 of Figure 12). Both groups of PCs seemed more focused on marketing than on the other services.

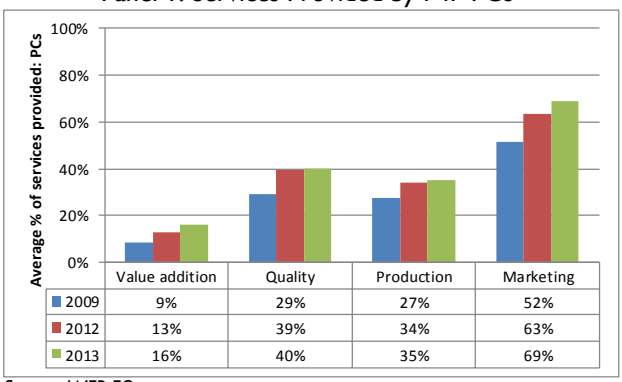
Non-P4P PCs appear to have experienced more improvement than P4P PCs in terms of facilitating members' access to inputs (Panel 3 of Figure 12). This is a somewhat surprising result in light of the fact that WFP helped link 100 percent of P4P-supported CUs to credit providers specifically to improve access to fertilizer.

P4P PCs' abilities to provide production training to members increased relative to non-P4P PCs (Panel 4 of Figure 12). As with CUs, a large percentage of PCs, both P4P and non-P4P reported planning for production and marketing so there was little room for improvement in either group (Panel 5 of Figure 12).

[11] Many PCs reported having access to storage in 2009 but not in subsequent years. This result might be understandable in a few cases but not in many cases which included storage the PCs claimed to own.

FIGURE 12: ORGANIZATIONAL CAPACITY INDICATORS - PCS

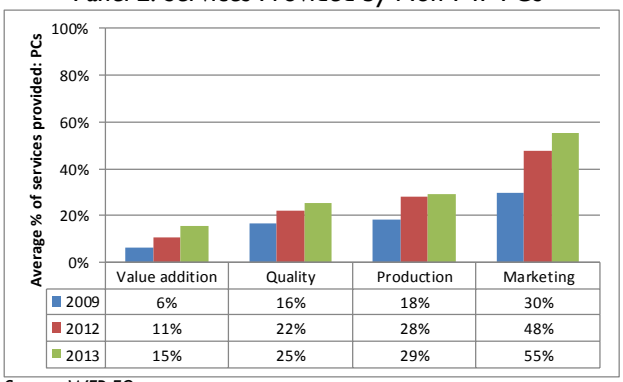
Panel 1: Services Provided by P4P PCs



	Value addition	Quality	Production	Marketing
2009	9%	29%	27%	52%
2012	13%	39%	34%	63%
2013	16%	40%	35%	69%

Source: WFP FO surveys.

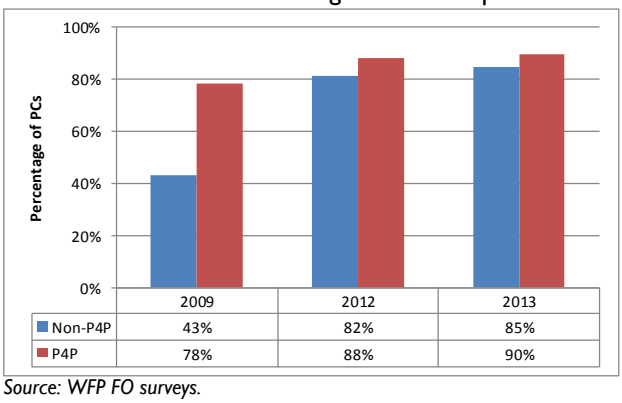
Panel 2: Services Provided by Non-P4P PCs



	Value addition	Quality	Production	Marketing
2009	6%	16%	18%	30%
2012	11%	22%	28%	48%
2013	15%	25%	29%	55%

Source: WFP FO surveys.

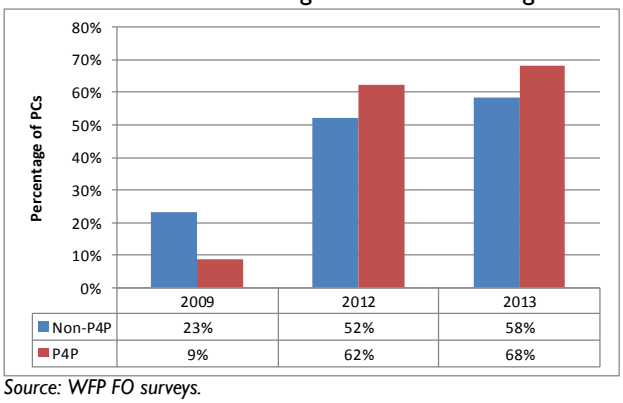
Panel 3: PCs Facilitating Access to Inputs



	2009	2012	2013
Non-P4P	43%	82%	85%
P4P	78%	88%	90%

Source: WFP FO surveys.

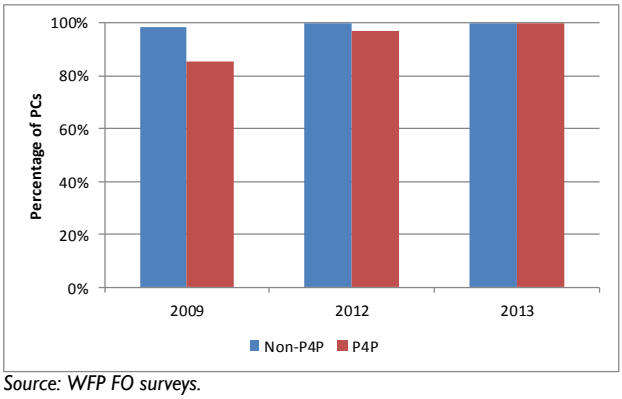
Panel 4: PCs Offering Production Training



	2009	2012	2013
Non-P4P	23%	52%	58%
P4P	9%	62%	68%

Source: WFP FO surveys.

Panel 5: PCs Planning for Production and Marketing



Source: WFP FO surveys.

DiD Estimates of the Impact of P4P on Organizational Capacity - PCs

The much larger sample of PCs facilitates a more rigorous approach to causal analysis. The DiD estimates in this section are derived from a regression model that controls for factors other than P4P that could affect observed results. The covariates selected are those on which P4P and non-P4P PCs differed significantly at the time of the baseline, might be expected to affect outcomes, and are uncorrelated with the treatment. To

ensure exogeneity all covariates are measured at their baseline values. Covariates are omitted from the analysis when they are also the outcome of interest. For example, the estimates of the impact of P4P on the percentage of quality services provided does not include the percentage of quality services provided as an explanatory variable.

Table 7 summarizes the covariates used in the PC analysis.

TABLE 7: COVARIATES IN PC ANALYSIS

Variable description	Baseline values				
	P4P status	N	Mean	Median	Standard deviation
Years since CU was established	Non-P4P	68	23.87	31.00	10.78
	P4P	70	15.73	10.00	11.17
Indicator marketing activity prior to baseline	Non-P4P	68	0.51	1.00	0.50
	P4P	70	0.44	0.00	0.50
Number of members	Non-P4P	68	1,324	1,069	923
	P4P	70	1,022	839	862
Number of full-time employees	Non-P4P	68	10.13	11.00	4.04
	P4P	70	13.03	13.00	8.12
Distance to usual market	Non-P4P	68	33.26	5.00	74.17
	P4P	70	28.87	13.00	51.34
Indicator of planning for production and marketing	Non-P4P	68	0.98	1.00	0.12
	P4P	70	0.86	1.00	0.35
Indicator of experience with contract sales	Non-P4P	68	0.50	0.50	0.50
	P4P	70	0.17	0.00	.038
Indicator of receiving production assistance	Non-P4P	68	0.22	0.00	0.42
	P4P	70	0.36	0.00	0.48
Indicator of receiving assistance with tools	Non-P4P	68	0.12	0.00	0.32
	P4P	70	0.01	0.00	0.12
Indicator of receiving assistance with Inputs	Non-P4P	68	0.06	0.00	0.24
	P4P	70	0.00	0.00	0.00
Percentage of quality services provided	Non-P4P	68	0.16	0.12	0.19
	P4P	70	0.29	0.25	0.23
Percentage of marketing services provided	Non-P4P	68	0.32	0.33	0.34
	P4P	70	0.52	0.67	0.24
Percentage of production services provided	Non-P4P	68	0.18	0.20	0.17
	P4P	70	0.27	0.30	0.15

The visual inspection suggested that participating in P4P may be associated with a reduced (relative to non-P4P PCs) likelihood of facilitating members' access to inputs and increased abilities to provide production training to members. The results presented in Table 8, however, find few changes that can be attributed to PCs participating in P4P. In fact, the only statistically significant positive effect is a 10 percentage point increase in the percentage of P4P PCs planning for production and marketing relative to what would have occurred without P4P. The small negative results between 2012 and 2013 in the percentage of quality and production services offered by P4P PCs relative to non-P4P PCs and the percentage providing production training to members are not particularly worrisome because the indicator value increased and there is no reason to expect that participating in P4P would have depressed these indicators for P4P PCs relative to non-P4P PCs.

TABLE 8: DID ESTIMATES OF THE IMPACT OF P4P ON PCS' ORGANIZATIONAL CAPACITY

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Percentage of value addition services provided (cumulative %)	0.0327 (0.2100)	-0.0181 (0.4130)	0.0146 (0.6690)	268	0.0980
Percentage of quality services provided (cumulative %)	-0.0026 (0.9370)	-0.0414** (0.0180)	-0.0439 (0.1990)	268	0.3418
Percentage of production services provided (cumulative %)	0.0159 (0.4660)	-0.0067 (0.6080)	0.0092 (0.7020)	268	0.5748
Percentage of marketing services provided (cumulative %)	0.0219 (0.4300)	-0.0603** (0.0520)	-0.0384 (0.2160)	268	0.4738
Likelihood of facilitating access to inputs (cumulative %)	0.0715 (0.2800)	-0.0150 (0.6930)	0.0565 (0.4600)	268	.6050
Likelihood of providing production training (cumulative %)	0.0881 (0.3630)	-0.1317** (0.0270)	-0.0435 (0.6500)	268	0.3610
Likelihood of planning for production and marketing (%)	0.0963*** (0.0130)	0.0042 (0.7820)	0.1005** (0.0170)	268	0.1922

Numbers in parentheses are p-values.
* *significant at p< 0.10*
** *significant at p< 0.05*
*** *significant at p< 0.01*

In summary, with the exception of a small increase in the percentage of P4P PCs planning for production and marketing, participating (indirectly) in P4P appears to have had little effect on PCs' organizational capacity as measured by the selected indicators.

Impact of P4P on FOs' Marketing Capacity

The results framework of Figure 5 identifies four factors that should facilitate improvements in CUs' marketing capacity. These include consistent and sizeable WFP procurement, trust of membership/transparency, improved access to credit, and the extent of CUs' engagement with quality-conscious buyers. Anticipated marketing capacity outcomes include increased quantities aggregated and sold, accessing a larger range of markets (including quality-conscious buyers), the ability to facilitate financing for members, and obtaining higher prices. This section investigates, visually and then analytically, changes in these facilitating factors and outcomes for CUs and then for PCs.

Visual Inspection - CUs

Previous sections have already documented trends in WFP's procurement from P4P CUs and concluded that it provided a meaningful and relatively consistent procurement stimulus. Panel 1 of Figure 13 compares trends in utilizing credit between P4P and non-P4P CUs. P4P CUs experienced a slight bump in utilizing credit in 2012 relative to non-P4P CUs but otherwise the two groups appear very similar. The data provide no direct indicators of trust or transparency. However, the fact that all P4P CUs were trained in agribusiness management, credit and finance, and institutional capacity building should have increased leaders' capacity for transparent operation.

In terms of marketing outcome indicators, Panel 2 of Figure 13 shows little difference between P4P and non-P4P CUs in terms of their ability to provide financing to members. In 2013 however, none of the non-P4P CUs reported providing financing while the percentage of P4P CUs providing financing jumped to 85

percent. The increase in the percentage of P4P CUs offering financing to members coincides with the Commercial Bank of Ethiopia endorsing WFP's forward delivery contracts as a criterion for qualifying for loans. This represents a change from the bank's pre-P4P policy. However, delays submitting documents and lengthy internal procedures at the bank prevented many CUs with forward delivery contracts from accessing the loans.[12]

Panels 3 and 4 of Figure 13 review data on overall sales and sales to buyers other than WFP. Panel 3 shows that P4P CUs were quite involved with other buyers before P4P (2009). In 2009, 62 percent of P4P CUs reported selling maize to buyers other than WFP and the cumulative percentage increased to 85 percent by 2013. The percentage selling to WFP followed a similar trajectory for 2012 and 2013. In terms of quantities sold, however, CUs sold much more maize to WFP than to other buyers. Collectively, the 13 surveyed P4P CUs reported selling 99 percent of their maize to WFP in 2012 and 95 percent in 2013.

Although quantities sold fluctuate widely from year to year, the dramatic increase in 2012 and 2013 relative to 2009 suggests that P4P stimulated a substantial increase in quantities of maize sold. Survey data on CU's marketing activity in the two years prior to the 2009 baseline supports this conclusion. P4P CUs were very engaged in marketing with 85 percent reporting selling crops. They reported selling a wide variety of crops however, with relatively large percentages reporting sales of wheat and teff. In terms of quantity, P4P CUs reported selling much more wheat on average (1,142 mt) than maize (467 mt). The quantities sold to WFP in 2012 and 2013 therefore represent significant increases in the quantities of maize P4P CUs were able to aggregate and sell.

Non-P4P CUs were also active in marketing with 100 percent reporting selling crops in 2009 (Panel 4 of Figure 13). Non-P4P CUs, however, sold primarily soy beans (1,300 mt on average) and wheat (667 mt on average) and reported selling very little maize (91 mt on average). Unlike P4P CUs, non-P4P CUs reported no increase in maize marketing. Seventy-five percent (3 CUs) reported selling maize in 2009 and none of the CUs reported selling maize in 2012 or 2013. Furthermore, the average quantity sold in 2009 (75 mt) was very small relative to P4P CUs. At least on the basis of visual inspection, P4P seems to have stimulated a substantial increase in maize marketing activity as measured by quantities sold overall but it has had little effect on market diversity since WFP appears to be mopping up most of what the CUs sell.

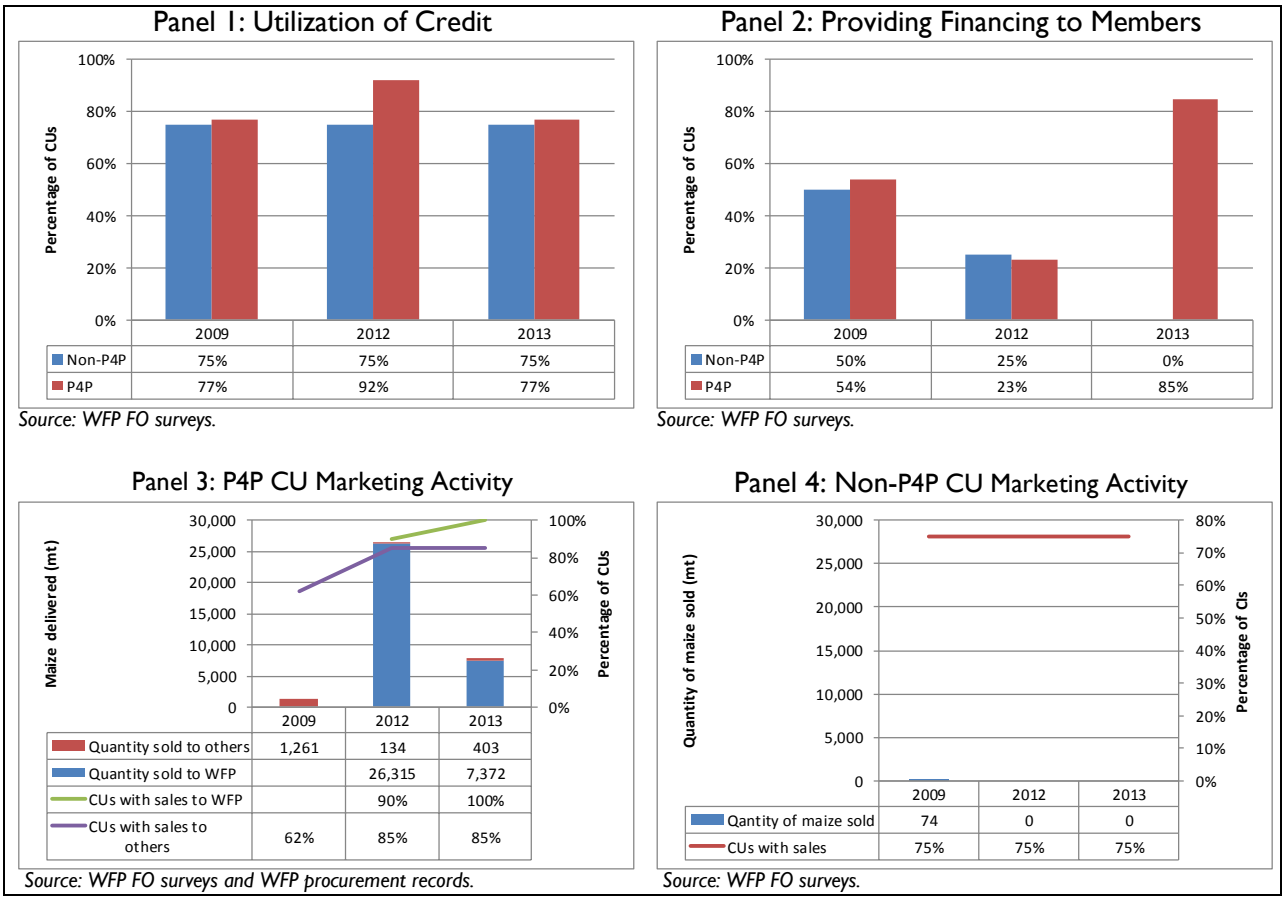
The data on prices CUs received for maize were too thin to reach any conclusions about whether P4P-supported CUs received higher prices than non-P4P CUs or whether WFP paid more than other buyers.

DiD Estimates of the Impact of P4P on Marketing Capacity - CUs

Table 9 presents DiD estimates of the impact of P4P on CUs' marketing capacity. Because the number of observations on CUs was so small, the estimates are from a non-parametric DiD model that does not control for differences between P4P and non-P4P CUs that may have differentially affected outcomes. Their validity as accurate estimates of causal effects depends, therefore, on their being statistically equivalent, an assumption that is almost certainly not strictly supported. However, the few baseline differences between P4P and non-P4P CUs suggests that they may not be too dissimilar.

[12] Ethiopia P4P Story.

FIGURE 13: EVOLUTION OF CU MARKETING CAPACITY



Source: WFP FO surveys.

Source: WFP FO surveys.

Source: WFP FO surveys and WFP procurement records.

Source: WFP FO surveys.

TABLE 9: DID ESTIMATES OF THE IMPACT OF P4P ON CUS' MARKETING CAPACITY

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Likelihood of utilizing credit (%)	0.1538 (0.7090)	-0.1538 (0.1590)	0.0000 (1.0000)	34	0.0769
Total quantity of maize sold to any buyer	-543 (0.2670)	902*** (0.0030)	359 (0.4510)	34	0.2453
Likelihood of selling maize to buyers other than WFP (%)	0.2308* (0.0730)	-0.0000 (0.3360)	0.2308* (0.0830)	34	0.1563
Average quantity of maize sold to buyers other than WFP (%)	-627 (0.1920)	31 (0.7000)	.596 (0.2040)	34	0.1030
Likelihood of providing financing to members (%)	-0.0577 (0.8450)	0.8654*** (0.0030)	0.8077** (0.0320)	34	.04115

Numbers in parentheses are p-values.
** significant at p< 0.10*
*** significant at p< 0.05*
**** significant at p< 0.01*

The statistically significant effects on CUs' marketing capacity associated with participating in P4P include:

- Between 2012 and 2013, P4P CUs significantly increased the average quantity of maize they sold relative to non-P4P CUs. Participating in P4P was responsible for increasing the average quantity sold by 902 mt relative to non-P4P CUs.
- Participating in P4P significantly increased P4P CUs' likelihood of selling maize (by 23 percentage points) relative to non-P4P CUs.
- Participating in P4P was associated with a significant increase in the likelihood of providing financing to members. The magnitude of the impact was 86 percentage points between 2012 and 2013 and 81 percentage points between 2009 and 2013.

Visual Inspection - PCs

The facilitators and indicators of marketing capacity relevant to PCs are the same as those for CUs. The major difference is that the stimulus provided by WFP's procurement is indirect in the sense that it is transmitted to PCs through the CUs from which WFP buys. The section on WFP's procurement (page 16) concluded that even the diluted stimulus experienced by PCs was relatively meaningful in the context of PCs' typical sales volumes. Because CUs did not record which PCs contributed commodities to a WFP contract, it is not possible to determine the consistency of the procurement stimulus at the PC level.

Panel 1 of Figure 14 shows that a slight majority of P4P and non-P4P PCs reported receiving loans prior to P4P but the difference between the two groups was not statistically significant. Between 2009 and 2012, the percentage of P4P PCs that received loans increased by much more than among non-P4P PCs (34 percentage points for P4P CUs compared to 11 percentage points for non-P4P CUs)..

Prior to P4P, a large majority (80 percent) of P4P PCs reported having received external assistance with organizational capacity building. The percentage increased to 100 percent by 2012 and this may have increased the transparency of operations and the trust of members.

A meaningful procurement stimulus, increased use of credit, and training aimed at building organizational capacity established some of the facilitating conditions that support increased marketing capacity. However, neither P4P nor non-P4P PCs showed much progress in their ability to provide financing to members between harvest and sale, an important indicator of marketing capacity (Panel 2 of Figure 14). With respect to marketing, Panel 3 of Figure 14 shows an increase in the cumulative percentage of PCs that reported selling maize for both P4P and non-P4P PCs. And while P4P PCs sold more maize on average than non-P4P PCs in 2009, the roles were reversed by 2013.

The PC data provides somewhat more information on prices than the CU data, between 17 and 36 observations per P4P status/survey stratum. These data (Panel 1 of Figure 15) show prices generally tracking, albeit at a lower level, annual average wholesale prices in Addis Ababa. The differential may reflect transportation costs, quality enhancement, or season of sale. None of the differences between prices received by P4P and non-P4P PCs are statistically significant.

Panel 2 of Figure 15 examines maize prices reported by households. The prices households reported receiving did not track wholesale prices as well as the PC-reported data. But, as with the PC-reported data, there was no statistically significant difference between prices reported by P4P and non-P4P households. Panel 3 of Figure 15 shows average prices households reported disaggregated by whether the household

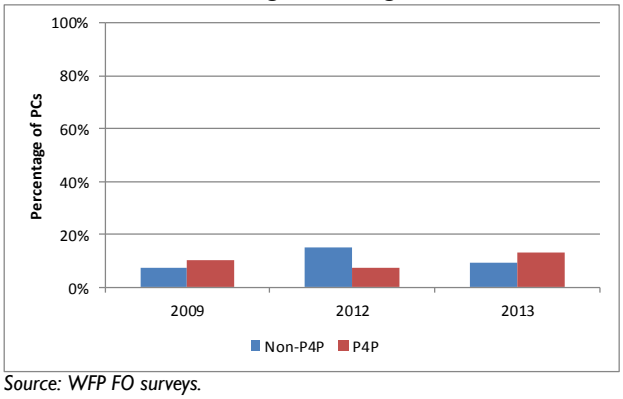
FIGURE 14: EVOLUTION OF PC MARKETING CAPACITY

Panel 1: Utilization of Credit

	2009	2012	2013
Non-P4P	58%	69%	69%
P4P	54%	88%	87%

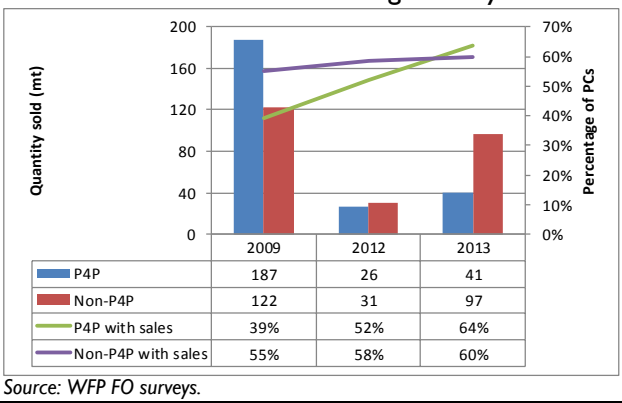
Source: WFP FO surveys.

Panel 2: Providing Financing to Members



Source: WFP FO surveys.

Panel 3: Maize Marketing Activity



	2009	2012	2013
P4P	187	26	41
Non-P4P	122	31	97
P4P with sales	39%	52%	64%
Non-P4P with sales	55%	58%	60%

Source: WFP FO surveys.

reported selling through the PC. There was no statistically significant difference in prices between households that reported selling maize through the PC and those that did not.

Visual inspection of the PC data reveals few obvious differences between P4P and non-P4P PCs, with the possible exception of the percentage utilizing credit and the quantity of maize sold.

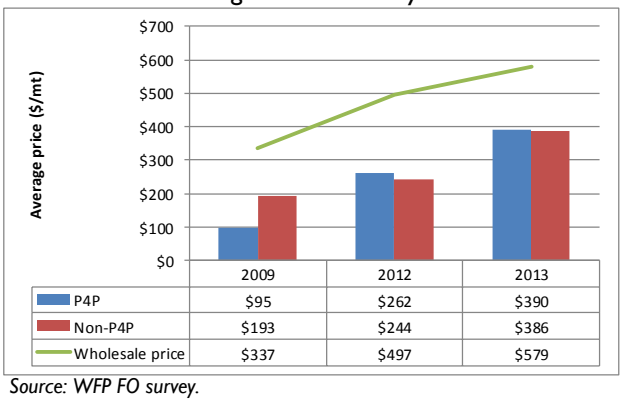
DiD Estimates of the Impact of P4P on Marketing Capacity - PCs

Table 10 reports DiD estimates of the impacts of P4P on PCs' maize marketing capacity indicators. These estimates largely confirm the visual inspection. The only statistically significant positive impact was a 22 percentage point increase in the percentage of P4P PCs providing financing to members relative to non-P4P PCs. As with CUs, this may be a result of CUs being able to access credit with the collateral of a forward delivery contract with WFP.

The large (relative to average sales volumes) and significant decline in the average quantity of maize P4P PCs reported selling relative to non-P4P PCs is difficult to interpret in the context of the large quantities WFP procured through the CUs. In 2012 (the calendar year associated with data collected in 2013), however, WFP used forward delivery contracts for almost 75 percent of its P4P purchases. It is possible that, at the time of the survey, the PCs had not yet delivered against these contracts and thus did not report sales associated with the WFP contracts.

FIGURE 15: AVERAGE MAIZE PRICES - PCS

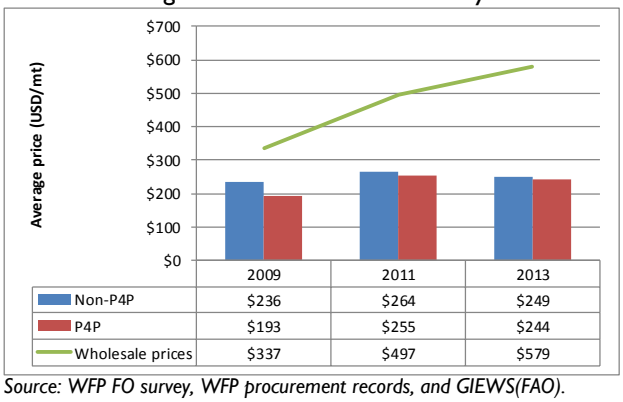
Panel 1: Average Maize Price by P4P Status



	2009	2012	2013
P4P	$95	$262	$390
Non-P4P	$193	$244	$386
Wholesale price	$337	$497	$579

Source: WFP FO survey.

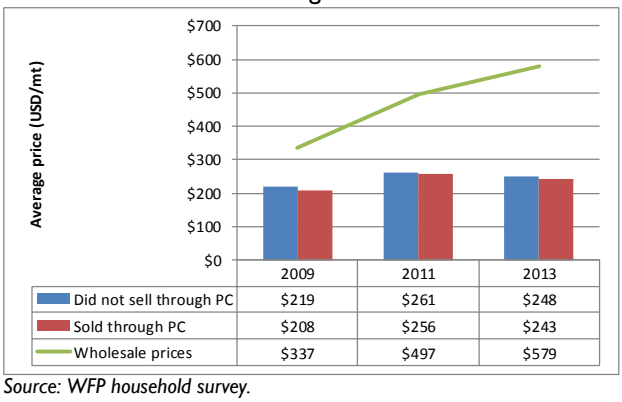
Panel 2: Average Household Maize Prices by P4P Status



	2009	2011	2013
Non-P4P	$236	$264	$249
P4P	$193	$255	$244
Wholesale prices	$337	$497	$579

Source: WFP FO survey, WFP procurement records, and GIEWS(FAO).

Panel 3: Average Household Maize Prices by Sales Through PC



	2009	2011	2013
Did not sell through PC	$219	$261	$248
Sold through PC	$208	$256	$243
Wholesale prices	$337	$497	$579

Source: WFP household survey.

TABLE 10: DID ESTIMATES OF THE IMPACT OF P4P ON PCS' MARKETING CAPACITY

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Likelihood of utilizing credit (%)	0.0698 (0.5140)	0.0426 (0.5080)	0.1124 (0.3520)	268	0.2482
Likelihood of selling maize (%)	0.1830* (0.0780)	-0.0550 (0.6680)	0.1280 (0.2700)	268	0.2873
Average quantity of maize sold (mt)	-111** (0.0300)	-21 (0.2240)	-132** (0.0180)	268	0.3632
Likelihood of providing financing to members (%)	-0.1262 (0.1770)	0.2235* (0.0550)	0.0973 (0.3220)	268	0.1295

Numbers in parentheses are p-values.
** significant at p< 0.10*
*** significant at p< 0.05*
**** significant at p< 0.01*

IMPACT OF P4P ON HOUSEHOLD MARKETING, PRODUCTION, AND WELFARE

The household analysis examines three broad categories of impacts aligned with the results framework of Figure 6; maize production, maize marketing, and household welfare. The sections on maize production and marketing present evidence of the impact of P4P on maize production and marketing "facilitators", behavioral change, and intermediate production and marketing outcomes. The household welfare section examines the combined effect of production and marketing on income and other measures of household wellbeing.

Each of the three main sections first presents the data in a graphical format that visually illustrates trends in the indicators over time for both P4P and non-P4P households and differences between the two groups. The analysis then presents DiD estimates derived from a regression model that incorporates covariates to control for factors other than participation in P4P that may influence the outcome measures differently for P4P and non-P4P households. Relevant covariates include factors that might be expected to differentially influence outcomes and which are exogenous to the treatment. Many of the candidate variables are not exogenous. For example, higher maize yields might indicate that a particular farmer is more likely to be using productivity-enhancing technologies or practices which are also anticipated outcomes of the treatment. For this reason, the regressions use baseline values for the selected covariates which are exogenous because they are measured prior to the treatment. Table 11 describes and summarizes baseline values for the covariates included in the analysis.

Location-specific characteristics such as weather, agricultural productivity, input availability, population, distance to urban centers, and transportation infrastructure might also influence agricultural production and marketing activity. To control for these factors, the covariate model included dummy variables for each of the three regions in which the households reside.[13]

The P4P development hypothesis suggests that many of the anticipated household-level outcomes of P4P are contingent on selling through the PC. However, few surveyed households reported selling through the PCs. In fact, only 27 percent of non-P4P households and 33 percent of P4P households reported having sold through the PCs at any time between 2009 and 2013. In an attempt to isolate impacts for this group of households, a separate set of analyses estimated impacts for all household indicators using selling through the PCs as the treatment. Those analyses identified no significant impacts, perhaps because the numbers are very small, and the results are not reported here.

[13] Amhara, Oromiya, and SNNPR.

TABLE 11: COVARIATES IN HOUSEHOLD ANALYSIS

Variable description	Baseline values				
	P4P status	N	Mean	Median	Standard deviation
Indicator of HH head completing at least a secondary education	Non-P4P	278	0.11	0.00	0.32
	P4P	312	0.14	0.00	0.35
Indicator of female HH head	Non-P4P	278	0.09	0.00	0.28
	P4P	312	0.10	0.00	0.36
Age of HH head	Non-P4P	278	47.49	45.00	12.27
	P4P	312	45.44	44.50	12.10
Indicator of HH head being engaged in agriculture	Non-P4P	274	0.97	1.00	0.16
	P4P	309	0.97	1.00	0.17
Food consumption score	Non-P4P	278	42.29	40.5	10.67
	P4P	312	45.12	40.75	12.47
Value of crops produced	Non-P4P	278	4,962	3,960	4,268
	P4P	312	6,212	4,567	5,941
Value of crops consumed	Non-P4P	278	4,073	3,250	3,396
	P4P	312	5,045	3,761	4,820
Expenditure on HH items	Non-P4P	278	1,183	973	801
	P4P	312	1,495	1,095	1,723
Income from farming	Non-P4P	278	5,228	4,250	4,373
	P4P	312	6,386	4,719	6,024
Total HH income from all sources	Non-P4P	278	6,760	5,795	4,836
	P4P	312	7,979	6,353	6,581
Indicator of getting price information from FO	Non-P4P	278	0.34	0.00	0.47
	P4P	312	0.43	0.00	0.50
Family size	Non-P4P	278	6.64	7.00	2.23
	P4P	312	6.21	6.00	2.44
Indicator of selling through the FO	Non-P4P	278	0.04	0.00	.020
	P4P	312	0.08	0.00	0.27
Indicator of cultivating maize	Non-P4P	278	0.66	1.00	0.48
	P4P	312	0.72	1.00	0.45
Quantity sold through the FO	Non-P4P	278	0.01	0.00	0.10
	P4P	312	0.03	0.00	0.15

Impact of P4P on Household Maize Marketing

Following the outline of the results framework illustrated in Figure 6, this section first examines changes in the factors facilitating changes in household marketing behavior and then links them to observed changes in marketing decisions, i.e., the location and timing of sales. It then presents evidence of changes in facilitating factors for intermediate marketing outcomes and links them to observed changes in prices received for maize, the primary intermediate household marketing outcome.

Visual Inspection

With respect to household marketing facilitators, the PC analysis found a sharp and significant decline in the quantity of maize P4P PCs sold relative to non-P4P PCs. It illustrated 11 percentage point and 17 percentage point increases, respectively, in the average percentage of quality and marketing services that PCs offered to members but these increases were not statistically different from those reported by non-P4P PCs. From the household perspective, the percentage of households that reported using post-harvest and marketing services

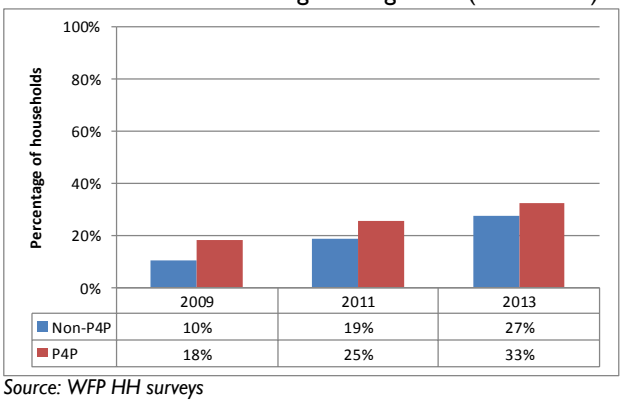
increased (Panels 1 and 2 of Figure 16). The percentage of households using credit for agricultural or other purposes remained relatively flat for both P4P and non-P4P households (Panels 1 and 2 of Figure 16). The only statistically significant differences between P4P and non-P4P households were the likelihood of using marketing services in 2011 and 2013 and the likelihood of using post-harvest services in 2011.

FIGURE 16: HOUSEHOLD MAIZE MARKETING FACILITATORS

Visual inspection of household marketing facilitators shows few improvements for P4P households relative to non-P4P households. It is, therefore, not surprising that P4P and non-P4P households reported similar changes in maize marketing behavior, i.e., selling through the PC and the selling four weeks or more after harvest (Figure 17). In fact, the only statistically significant difference between P4P and non-P4P households was the percentage that reported selling through the PC in 2009.

FIGURE 17: LOCATION AND TIMING OF MAIZE SALES

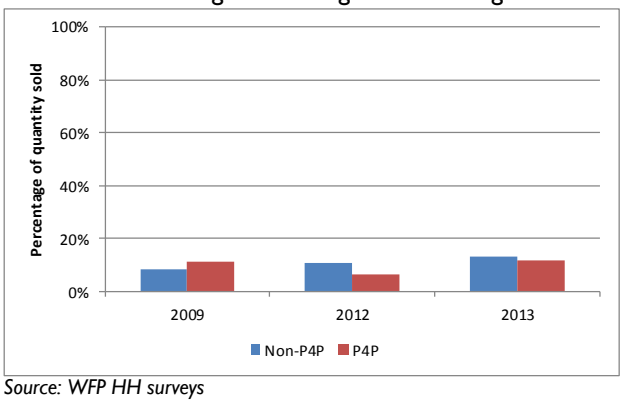
Panel 1: Households Selling Through PCs (cumulative)



	2009	2011	2013
Non-P4P	10%	19%	27%
P4P	18%	25%	33%

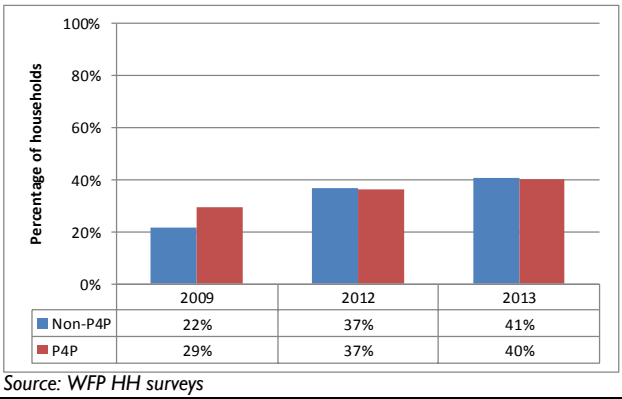
Source: WFP HH surveys

Panel 2: Average Percentage Sold Through FO



Source: WFP HH surveys

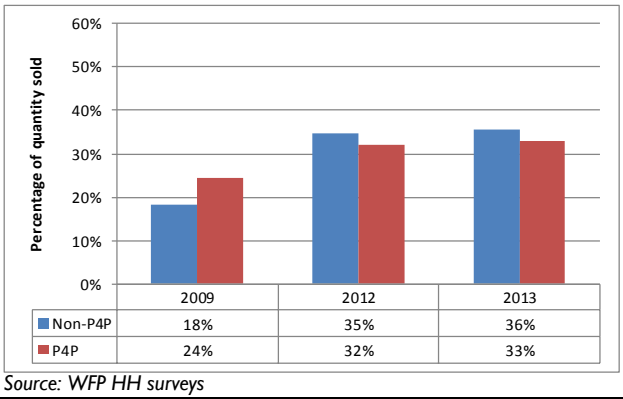
Panel 3: Likelihood of Selling at Least 4 Weeks After Harvest



	2009	2012	2013
Non-P4P	22%	37%	41%
P4P	29%	37%	40%

Source: WFP HH surveys

Panel 4: Average Percentage Sold at Least 4 Weeks After Harvest

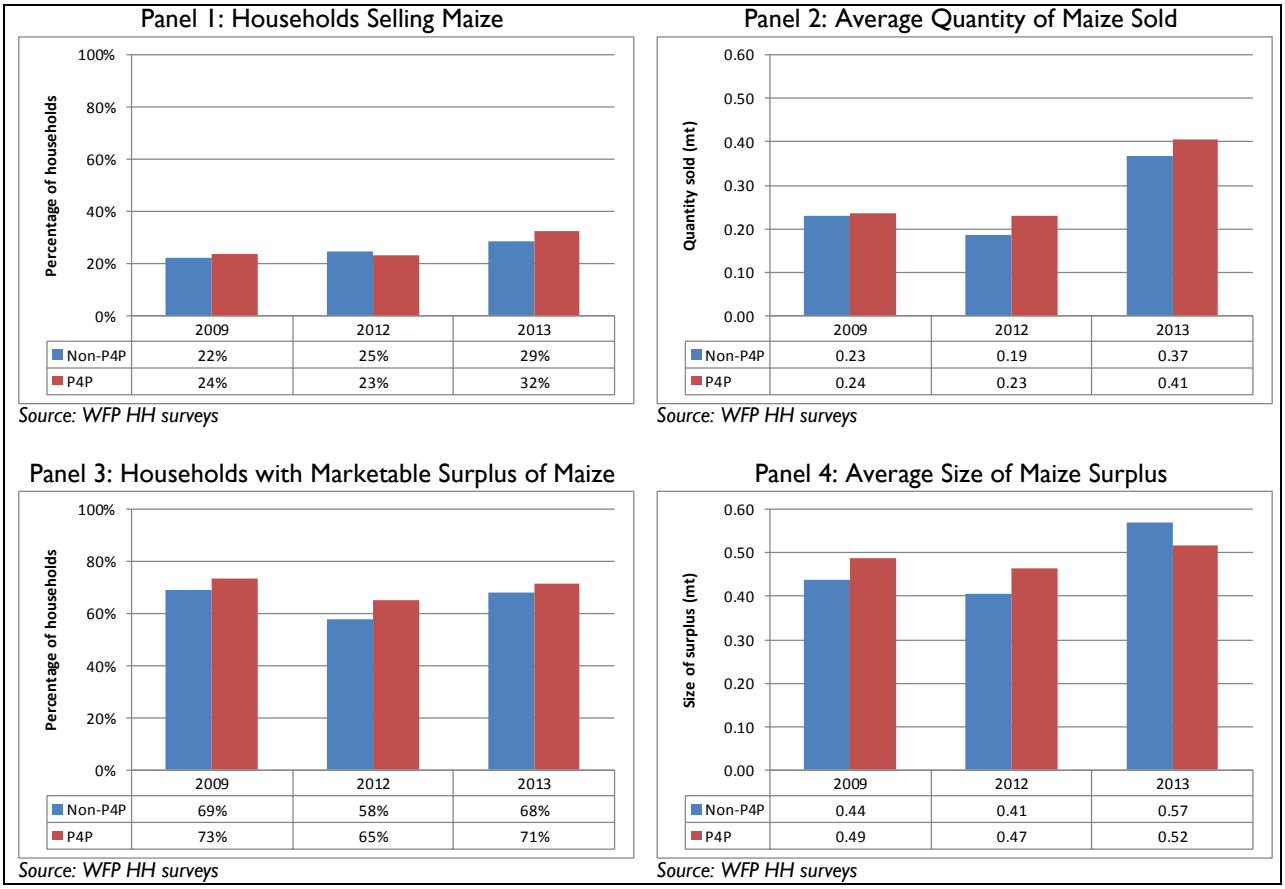


	2009	2012	2013
Non-P4P	18%	35%	36%
P4P	24%	32%	33%

Source: WFP HH surveys

Households with a marketable surplus will generally find a way to sell the surplus. The percentage of households selling maize and the quantities sold are therefore more related to production than to marketing. Nevertheless, Figure 18 presents the household data on maize surpluses and sales as context for other marketing outcomes. P4P and non-P4P households reported similar trends in these four marketing parameters. In fact, there were no statistically significant differences between the two groups of households on any of the four indicators in any time period.

FIGURE 18: MAIZE MARKETING PARAMETERS



DiD Estimates of the Impact of P4P on Household Maize Marketing

Table 12 reports DiD estimates of changes in household maize marketing facilitators and indicators of household marketing behavior. The results largely confirm expectations from visual inspection, i.e., that being a member of a P4P PC had little significant impact on changes in maize marketing facilitating conditions or in household marketing behavior, i.e., the timing and location of maize sales. The only significant impact was a 6 percentage point increase in the likelihood that P4P households used marketing services relative to non-P4P households between 2009 and 2012. P4P households did, however, see a significant USD 32 per mt increase in maize prices between 2009 and 2013 relative to non-P4P households.

TABLE 12: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Model	Impact (coefficient/p-value)			N	R^2
	2009-2011	2011-2013	2009-2013		
Household marketing facilitators					
Likelihood of using post-harvest services (%)	0.0439 (0.2550)	-0.0465 (0.2280)	-0.0037 (0.9290)	1,110	0.0531
Likelihood of using marketing services (%)	0.0564* (0.0600)	-0.0110 (0.7130)	0.0459 (0.2390)	1,110	0.0863
Likelihood of using agricultural credit (%)	0.0747 (0.1620)	-0.0510 (0.3390)	0.0234 (0.6690)	1,110	0.0334
Likelihood of using credit for any purpose (%)	0.0642 (0.2220)	-0.0767 (0.1450)	-0.0130 (0.8140)	1,110	0.0341
Household marketing outcomes					
Likelihood of selling maize through the PC (cumulative % of households)	-0.0071 (0.8630)	-0.0105 (0.7950)	-0.0180 (0.7420)	426	-0.0105
Average percentage of marketed maize sold through the PC (%)	-0.0732 (0.1540)	0.0222 (0.6660)	-0.0501 (0.3880)	426	0.0676
Likelihood of selling maize four weeks or more after harvest (%of households)	-0.0830 (0.4070)	0.0077 (0.9390)	-0.0735 (0.4680)	426	0.0606
Average percentage of marketed maize sold four weeks or more after harvest (%)	-0.1075 (0.2520)	0.0219 (0.8160)	-0.0842 (0.3590)	426	0.0539
Average maize prices to farmers (USD/mt)	-31 (0.4090)	-11 (0.7490)	32* (0.1000)	110	0.2856

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

Impact of P4P on Household Maize Production

Maize is a major staple crop in Ethiopia with 71 percent of households reporting producing it in the 2009 baseline. Teff and wheat are also major staples with 74 percent of households reporting that they produced teff and 56 percent producing wheat. The behaviors that affect the average quantity of maize households produce include the decision to cultivate maize, the land area allocated to maize production, and adopting productivity-enhancing agricultural technologies and practices such as certified seed or fertilizer. Positive changes in these behaviors should increase yields and total quantities produced.

Weather is also likely to strongly influence maize production. In the absence of accessible subnational rainfall data, the regional dummy variables control, to some extent, for weather-related factors that influence production.

Average cereal yields capture country-wide factors that affect yields and quantities produced. The World Bank reported average cereal yields for Ethiopia of 1,653 kg/ha in 2009 and 1,833 kg/ha in 2011.[14] Data from 2013 are not yet available but, while FAO reports good prospects for growth in yields, it also reported that hail and flooding may reduce yields in two of the primary P4P regions, Oromiya and Amhara.[15]

[14] Accessed at http://data.worldbank.org/indicator/AG.YLD.CREL.KG
[15] Accessed at http://www.thecropsite.com/news/15107/ethiopia-to-enjoy-above-average-yields

Visual Inspection

The results framework presented in Figure 6 defines a number of "facilitators" that might be expected to influence household production results. These include access to productivity-enhancing inputs and training and access to credit. Figure 19 illustrates changes in these facilitators over time for P4P and non-P4P households. Panels 1 through 4 present the household perspective while Panels 5 and 6 reflect results from the surveys of PCs.

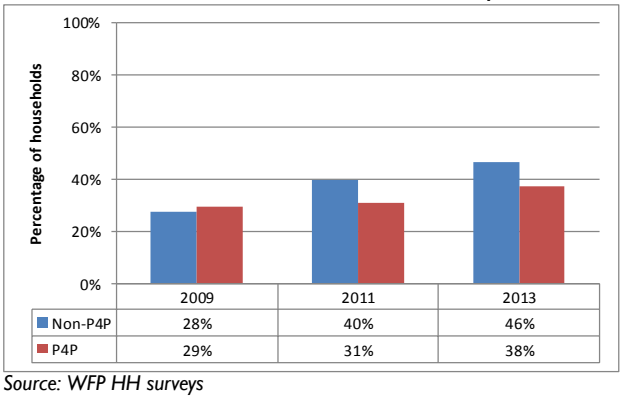
P4P households reported increasing trends in two of the six facilitators: obtaining subsidized inputs and participating in productivity training (Panels 1 and 2 of Figure 19). The latter corresponds to an increase in the percentage of PCs that reported providing production training (Panel 6 of Figure 19). However, the increase in the percentage of households reporting that they obtained subsidized inputs corresponds to a decline in the percentage of PCs reporting facilitating members' access to inputs. The percentage of households reporting that they had utilized credit for agricultural or other purposes (Panels 3 and 4 of Figure 19) remained relatively flat throughout the P4P pilot.

With the exception of the percentage of PCs facilitating access to inputs (an indirect measure of a facilitator), P4P and non-P4P households reported similar trends in production facilitators. The only statistically significant differences between P4P and non-P4P households were: a larger percentage of non-P4P than P4P PCs reported providing production training in 2009, a greater percentage of P4P than non-P4P PCs reported facilitating members' access to subsided inputs in 2009, and a greater percentage of non-P4P than P4P households reported obtaining subsidized inputs in 2011 and 2013.

In summary, it appears that P4P and non-P4P households experienced similar trends in most production-facilitating factors with the possible exception of their use of subsidized inputs and productivity training.

FIGURE 19: MAIZE PRODUCTION FACILITATORS

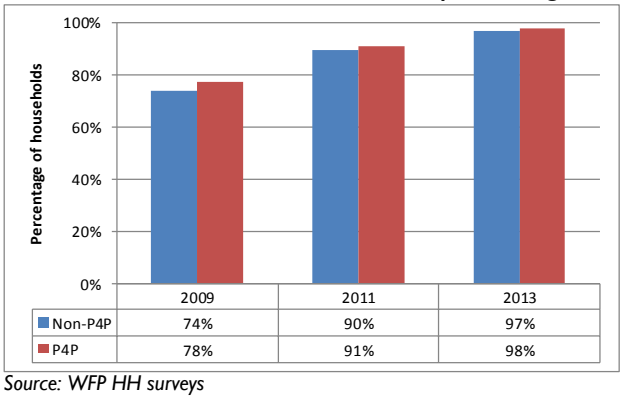
Panel 1: Utilization of Subsidized Inputs



	2009	2011	2013
Non-P4P	28%	40%	46%
P4P	29%	31%	38%

Source: WFP HH surveys

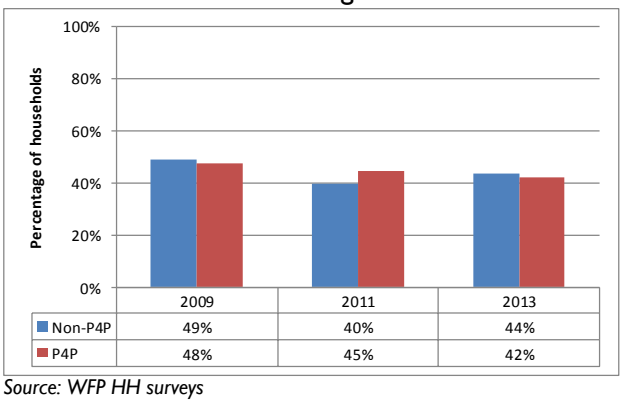
Panel 2: Utilization of Productivity Training



	2009	2011	2013
Non-P4P	74%	90%	97%
P4P	78%	91%	98%

Source: WFP HH surveys

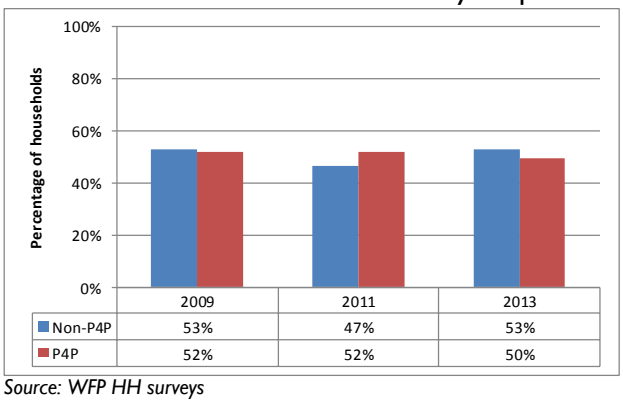
Panel 3: Utilization of Agricultural Credit



	2009	2011	2013
Non-P4P	49%	40%	44%
P4P	48%	45%	42%

Source: WFP HH surveys

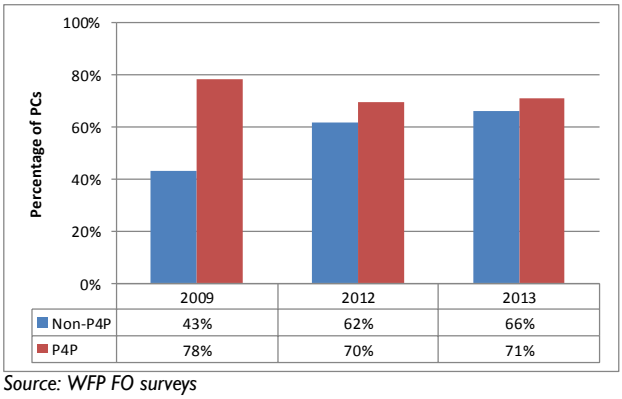
Panel 4: Utilization of Credit for Any Purpose



	2009	2011	2013
Non-P4P	53%	47%	53%
P4P	52%	52%	50%

Source: WFP HH surveys

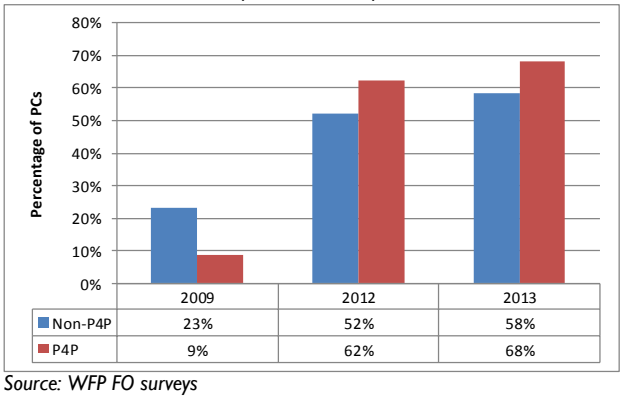
Panel 5: Access to Subsidized Inputs, PCs



	2009	2012	2013
Non-P4P	43%	62%	66%
P4P	78%	70%	71%

Source: WFP FO surveys

Panel 6: Access to Productivity Training, PCs (cumulative)



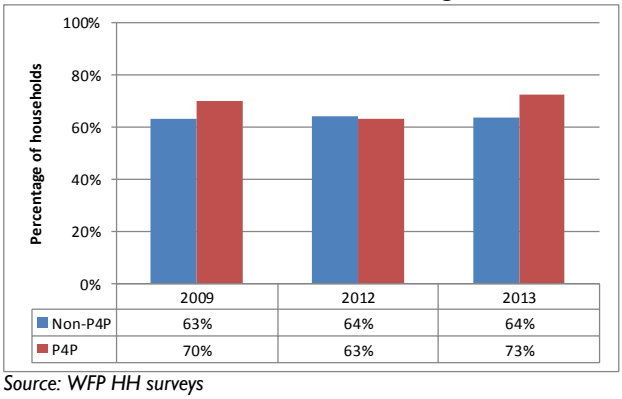
	2009	2012	2013
Non-P4P	23%	52%	58%
P4P	9%	62%	68%

Source: WFP FO surveys

Improvement in the conditions facilitating changes in household maize production behavior should influence behavior and, ultimately, quantities produced. Figure 20 summarizes changes in maize production behavior and production for P4P and non-P4P households.

FIGURE 20: MAIZE PRODUCTION PARAMETERS

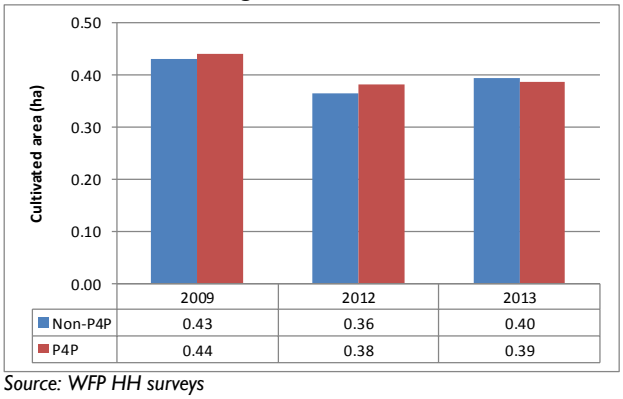
Panel 1: Households Cultivating Maize



	2009	2012	2013
Non-P4P	63%	64%	64%
P4P	70%	63%	73%

Source: WFP HH surveys

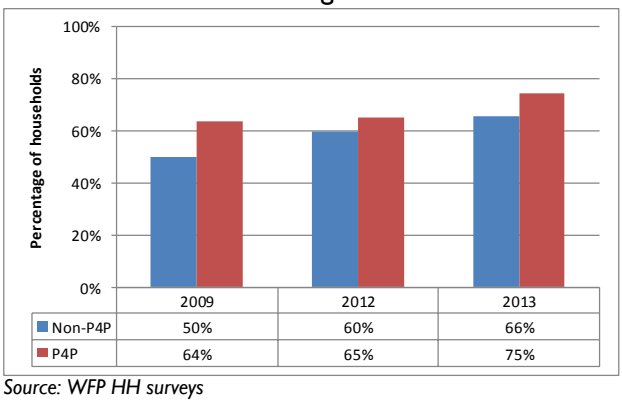
Panel 2: Average Area Planted to Maize



	2009	2012	2013
Non-P4P	0.43	0.36	0.40
P4P	0.44	0.38	0.39

Source: WFP HH surveys

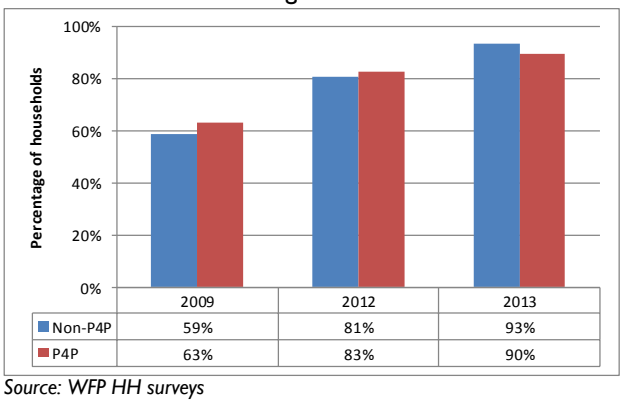
Panel 3: Households Using Certified Maize Seed



	2009	2012	2013
Non-P4P	50%	60%	66%
P4P	64%	65%	75%

Source: WFP HH surveys

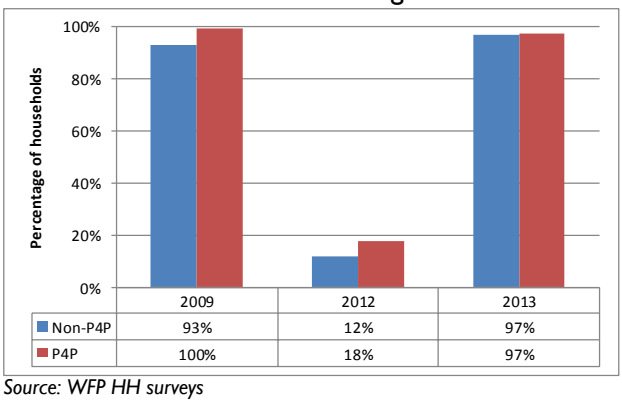
Panel 4: Percentage of Seed Certified



	2009	2012	2013
Non-P4P	59%	81%	93%
P4P	63%	83%	90%

Source: WFP HH surveys

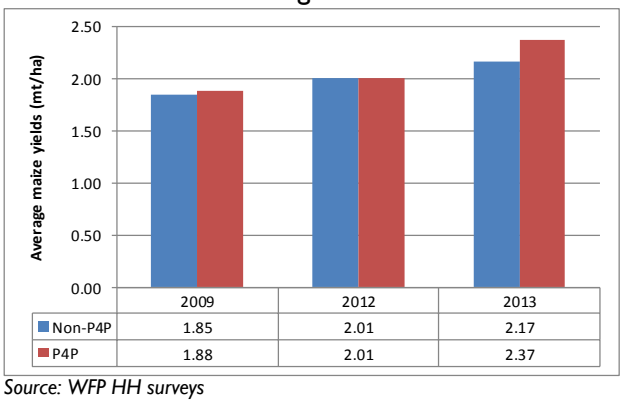
Panel 5: Households Using Fertilizer



	2009	2012	2013
Non-P4P	93%	12%	97%
P4P	100%	18%	97%

Source: WFP HH surveys

Panel 6: Average Maize Yields

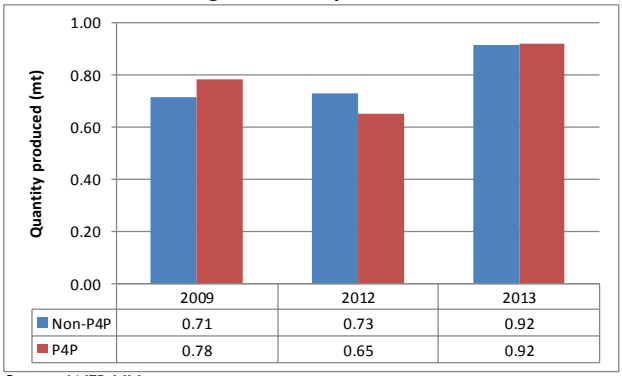


	2009	2012	2013
Non-P4P	1.85	2.01	2.17
P4P	1.88	2.01	2.37

Source: WFP HH surveys

FIGURE 20: MAIZE PRODUCTION PARAMETERS (CONTINUED)

Panel 7: Average Quantity of Maize Produced



	2009	2012	2013
Non-P4P	0.71	0.73	0.92
P4P	0.78	0.65	0.92

Source: WFP HH surveys

Figure 20 reveals no large differences in maize production parameters between P4P and non-P4P households or substantially different trends in the parameters over time. The two differences that were statistically significant include:

- P4P households were more likely than non-P4P households to plant maize in 2009 and 2013.
- P4P households were more likely than non-P4P households to use certified maize seed and fertilizer in 2009 and 2011.

DiD Estimates of the Impact of P4P on Maize Production

VISUAL INSPECTION OF THE DATA SUGGESTS THAT P4P HAD LITTLE IMPACT ON THE QUANTITY OF MAIZE HOUSEHOLDS PRODUCED OR ON THE FACTORS THAT MAY HAVE AFFECTED MAIZE PRODUCTION. WITH LITTLE SIGNIFICANT DIFFERENCE BETWEEN P4P AND NON-P4P HOUSEHOLDS IN MOVEMENT ON MAIZE PRODUCTION FACILITATORS, WE MIGHT ALSO EXPECT LITTLE DIFFERENCE IN MAIZE PRODUCTION INDICATORS. THE ESTIMATES PRESENTED IN Table 14, however, show several positive impacts associated with participating in P4P. These include:

- Participating in P4P increased the percentage of P4P households choosing to cultivate maize by 9 percentage points between 2012 and 2013 and 8 percentage points between 2009 and 2013 relative to what would have happened without P4P.
- Being a member of a P4P PC is associated with a 0.47 mt/ha increase in maize yields in 2011 relative to the yields households would have achieved without P4P. This result is somewhat difficult to square with the fact that non-P4P households increased the percentage of certified seed they used by less than non-P4P households and suffered a larger decline in the use of fertilizer. However, anecdotal data from country visits and a recent study by the Mali country office suggests that access to inputs is an important facilitator of increased yields but affordability, inconsistent use, and limited knowledge of correct application procedures are at least as important.

Table 13 presents DiD estimates of the impact of participating in P4P on the maize production facilitators measured at the household level, i.e. using inputs, participating in productivity training, and using credit. Participating in P4P had no statistically significant positive impact on any of the maize production facilitators. For the facilitators, however, movement in a direction that supports increases in production is more important than a causal connection to participating in P4P. This was the case for all facilitators except using credit and the likelihood of PCs facilitating access to subsidized inputs.

WITH LITTLE SIGNIFICANT DIFFERENCE BETWEEN P4P AND NON-P4P HOUSEHOLDS IN MOVEMENT ON MAIZE PRODUCTION FACILITATORS, WE MIGHT ALSO EXPECT LITTLE DIFFERENCE IN MAIZE PRODUCTION INDICATORS. THE ESTIMATES PRESENTED IN

Table 14, however, show several positive impacts associated with participating in P4P. These include:

- Participating in P4P increased the percentage of P4P households choosing to cultivate maize by 9 percentage points between 2012 and 2013 and 8 percentage points between 2009 and 2013 relative to what would have happened without P4P.
- Being a member of a P4P PC is associated with a 0.47 mt/ha increase in maize yields in 2011 relative to the yields households would have achieved without P4P. This result is somewhat difficult to square with the fact that non-P4P households increased the percentage of certified seed they used by less than non-P4P households and suffered a larger decline in the use of fertilizer. However, anecdotal data from country visits and a recent study by the Mali country office suggests that access to inputs is an important facilitator of increased yields but affordability, inconsistent use, and limited knowledge of correct application procedures are at least as important.

TABLE 13: DID ESTIMATES OF THE IMPACT OF P4P ON MAIZE PRODUCTION FACILITATORS

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Utilization of subsidized inputs (%) – all households	-0.0085 (0.9020)	0.0633 (0.3620)	0.0541 (0.4980)	1,110	0.1014
Utilization of productivity training (%) – all households	-0.0216 (0.4130)	-0.0149 (0.5720)	-0.0361 (0.2970)	1,110	0.0720
Utilization of agricultural credit (%) – all households	0.0747 (0.1620)	-0.0510 (0.3390)	0.0233 (0.6690)	1,110	0.0334
Utilization of credit for any purpose (%) – all households	0.0642 (0.2220)	-0.0767 (0.1450)	-0.0131 (0.8140)	1,110	0.0341
Likelihood of PCs facilitating access to subsidized inputs (%)	.0715 (0.2800)	-0.0150 (0.6390)	0.0565 (0.4600)	268	0.6050
Likelihood of PC providing productivity training (%)	0.0881 (0.3630)	-0.1317** (0.0270)	-0.0435 (0.6500)	268	0.3610

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

TABLE 14: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2013	2009-2013		
Likelihood of cultivating maize (%) – all households	-0.0107 (0.7830)	0.0868*** (0.0260)	0.0758** (0.0440)	1,110	0.1616
Average area planted to maize (ha) – cultivating households	0.0587 (0.2480)	-0.0452 (0.3740)	0.0131 (0.7710)	910	0.0875
Likelihood of using certified maize seed (%) – cultivating households	-0.0249 (0.6230)	0.0147 (0.7720)	-0.0111 (0.8330)	910	0.0596
Average percentage of maize seed that was certified (%) – certified seed using households	-0.0626 (0.3300)	-0.0297 (0.6290)	-0.1122* (0.0820)	583	0.0515
Likelihood of using fertilizer (%) – cultivating households	-0.0273 (0.4480)	-0.0310 (0.3890)	-0.0579*** (0.0130)	910	0.8389
Average maize yield (mt/ha) – producing	-0.0937	0.4766***	0.2107	610	0.0223

households	(0.5690)	(0.0030)	(0.2320)		
Average quantity of maize produced (mt) – producing households	-0.0143 (0.8650)	0.0868 (0.3040)	0.0714 (0.4580)	910	0.1172

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

Impact of P4P on Household Welfare

Welfare is a broad concept with dimensions including income, wealth, nutrition, food security, and physical security to name a few. The P4P proposal identified income as the primary household welfare measure. Because of the anticipated difficulty measuring small changes in income, however, the P4P logframe identified several alternate welfare indicators. These include the household asset score (a simple summary of household assets), the value of household livestock (an important store of wealth in many cultures), and the food consumption score (an indicator of food security). The analysis of the impacts of P4P on household welfare examines each of these indicators to provide a well-rounded picture of welfare change.

Visual Inspection

As with previous sections, the inquiry begins with illustrations of changes in income and welfare measures (Figure 21). P4P and non-P4P households reported similar trends on all four indicators. P4P households reported consistently lower real incomes than non-P4P households but the trends moved in tandem (Panel 1). Income from crops appears to have accounted for most of the difference between the two groups with non-P4P households consistently earning a larger share of their total income from crops (Panel 2). Panels 3 and 4 illustrate similar patterns of change in asset scores, real livestock value, and the food consumption score (Panels 3-5).

The statistically significant differences between the two groups include:

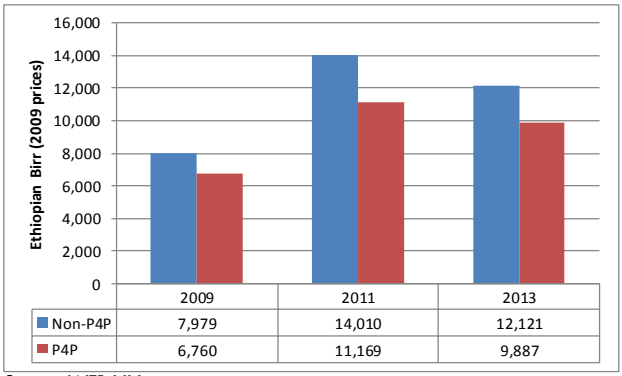
- Non-P4P household reported significantly higher incomes in all periods.
- Non-P4P households had a higher household asset score than P4P households in 2011.
- Non-P4P households had higher livestock values than P4P households in 2011 and 2013.
- Non-P4P households had higher food consumption scores than P4P households in 2009.

DiD Estimates of the Impact of P4P on Household Welfare

Table 15 reports DiD estimates of the impact of P4P on four household welfare indicators. Even though P4P households improved their wellbeing in 2013 relative to 2009 on all four indicators, non-P4P households experienced significantly greater improvements in total income and value of livestock. Being a member P4P had no identifiable impact on household welfare.

FIGURE 21: HOUSEHOLD WELFARE INDICATORS

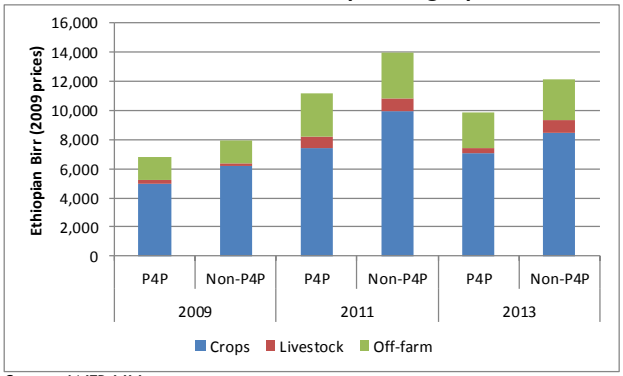
Panel 1: Household Income



	2009	2011	2013
Non-P4P	7,979	14,010	12,121
P4P	6,760	11,169	9,887

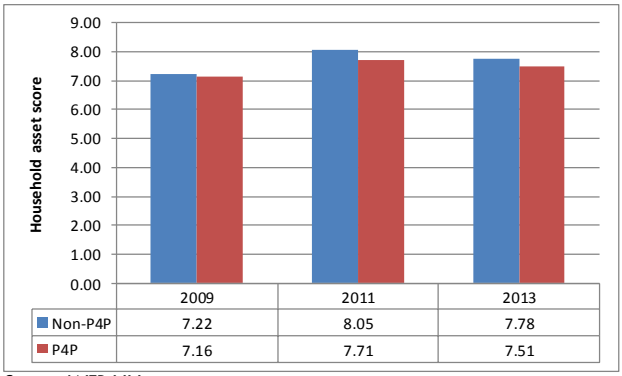
Source: WFP HH surveys

Panel 2: Income by Category



Source: WFP HH surveys

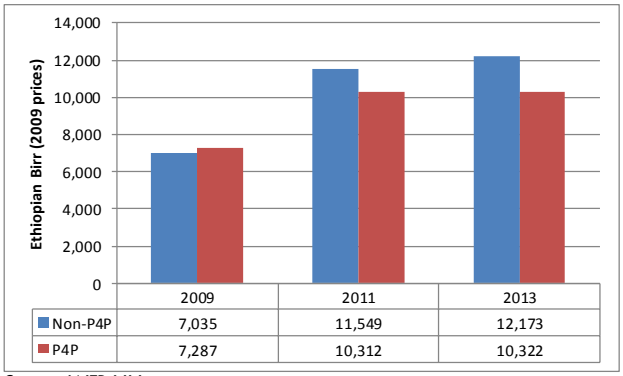
Panel 3: Household Asset Score



	2009	2011	2013
Non-P4P	7.22	8.05	7.78
P4P	7.16	7.71	7.51

Source: WFP HH surveys

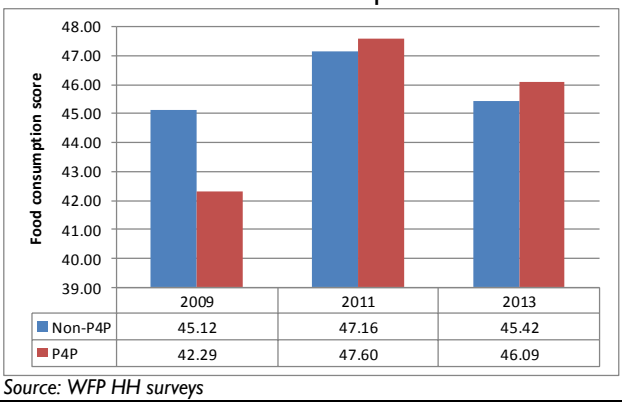
Panel 4: Livestock Value



	2009	2011	2013
Non-P4P	7,035	11,549	12,173
P4P	7,287	10,312	10,322

Source: WFP HH surveys

Panel 5: Food Consumption Score



	2009	2011	2013
Non-P4P	45.12	47.16	45.42
P4P	42.29	47.60	46.09

Source: WFP HH surveys

TABLE 15: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD WELFARE INDICATORS

Model	Impact (coefficient/p-value)			N	R^2
	2009-2011	2011-2013	2009-2013		
Household income (2009 Ethiopian Birr)	-3,088*** (0.0010)	1,250 (0.1690)	-1,854*** (0.0110)	1,110	0.1578
Household asset score	-0.4250** (0.0240)	.02082 (0.2680)	-0.2162 (0.3240)	1,110	0.0687
Value of livestock (2009 Ethiopian Birr)	-1,513*** (0.0130)	-735 (0.2260)	-2,256*** (0.0020)	1,108	0.1016
Food consumption score	1.2977 (0.4670)	-0.1778 (0.9210)	0.9977 (0.4840)	1,108	0.1744

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

CONCLUSIONS

Ethiopia elected to buy primarily from Cooperative Unions (CUs), second tier FOs with Primary Cooperatives (PCs) as members. WFP and its partners directed all of the P4P-facilitated support to the CUs. Even though partners were assisting the PCs, WFP did not direct capacity building activities at the PC or household level. The results framework thus includes an additional layer to capture the indirect capacity building of PCs that are members of P4P-supported CUs. Results at the PC level may be very different than at the CU level because the WFP stimulus is diluted (i.e., spread out in an unpredictable way among all the PCs that are members of a CU) and not linked to direct capacity building support from WFP and its partners.

At least on paper, Ethiopia's CUs and PCs appear to be relatively high capacity organizations. Fifty-four percent of P4P CUs and 50 percent of non-P4P CUs reported having sold maize in the two years prior to P4P. Similarly, 62 percent and 75 percent of P4P and non-P4P PCs, respectively, reported previous experience selling maize. P4P-supported CUs reported selling an average of 1,261 mt of maize in 2009, the baseline year for P4P and P4P-supported PCs reported selling an average of 187 mt. Sixty-nine percent of P4P CUs and 90 percent of P4P PCs reported having access to storage suitable for maintaining quality for the long-term.

All 13 of the P4P-supported CUs reported having access to storage at the time of the 2009 baseline and 8 owned their facilities. Average storage capacity accessible at baseline was 2,819 mt and average capacity of owned storage (for CUs that owned their warehouses) was 2,561 mt. The story is similar among PCs; 90 percent reported having access to warehouses in 2009 with an average capacity of 551 mt.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 5 and Figure 6 (in main body of report). The remainder of this section frames the conclusions in the context of the results framework. It presents results in the sequence in which they are likely to occur; CU capacity, PC capacity, household marketing, household production, and household welfare.

Impact of P4P on CU Capacity

Figure 22 summarizes anticipated results and facilitators of FO (CU or PC) capacity and serves to frame the conclusions presented in this section.

The baseline capacities of CUs suggest that they were relatively capable marketing organizations. Eighty-five percent reported selling some crops in the two years prior to the baseline and average quantities sold ranged from 61 to over 1,000 mt, depending on the crop. As a group, the 13 P4P CUs surveyed reported providing an average of 49 percent of 8 quality-oriented services and 69 percent of 3 marketing services. Over 75 percent reported having access to credit and more than 50 percent reported being able to provide financing to their PC members.

Prior (to P4P) external assistance had focused largely on organizational management (e.g., record keeping, financial management, group management, and business planning). More than 80 percent of CUs reported having received such assistance. Few, (no more than 30 percent) reported receiving other types of assistance (e.g., post-harvest management, production, marketing, inputs, tools, or infrastructure). Some of these results are not surprising perhaps since CUs' members are PCs, not farmers.

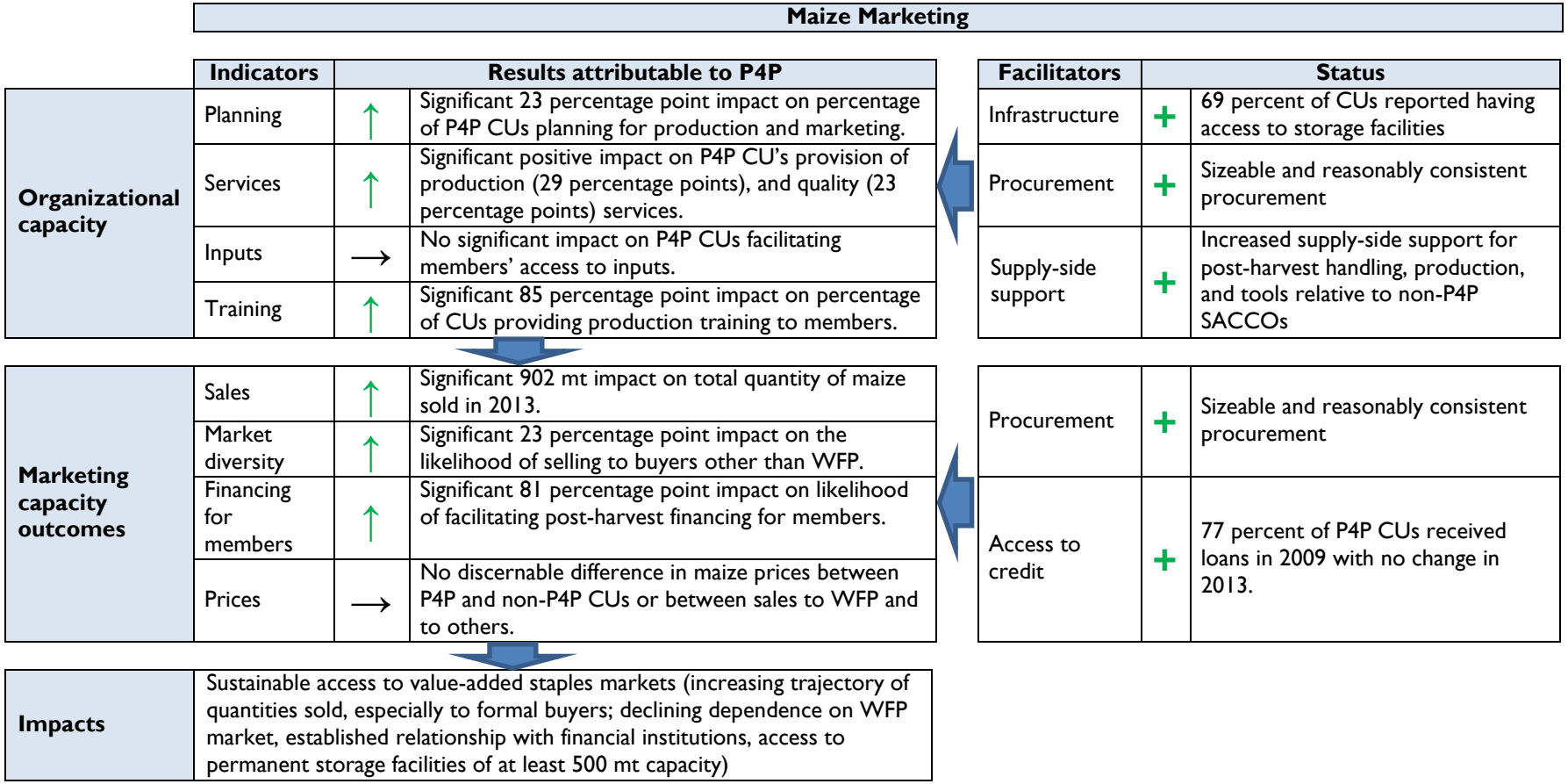
These baseline conditions established many of the facilitating factors necessary to support organizational capacity building. The other crucial facilitator is WFP's procurement stimulus. By the end of the pilot, WFP had registered 31 CUs as WFP suppliers. Of the 21 CUs WFP registered as vendors at the start of the pilot, it purchased from 4 (19 percent) in only one year, 6 (28 percent) in two separate years, 8 (38 percent) in three years, and 1 (5 percent) in four years. The size of individual contracts ranged from 50 mt to 6,500 mt with an overall mean of 1,093 mt. The total quantity contracted per CU (throughout the five-year pilot) ranged from 200 to 14,920 mt with an average of 2,682 mt. WFP appears to have provided a sizeable but andr relatively consistent procurement stimulus in Ethiopia.

The generally positive facilitating conditions for supporting organizational capacity building contributed to many significant positive changes in organizational capacity indicators that can be attributed to participating in P4P. These include:

- A 15 percentage point increase in the average percentage of 2 value addition services provided to members;
- A 23 percentage point increase in the average percentage of 8 quality services provided to members;
- A 29 percentage point increase in the average percentage of 5 production services provided to members;
- An 85 percentage point increase in the percentage of CUs providing production training to members; and
- A 23 percentage point increase in the percentage of CUs planning for production and marketing.

The facilitating environment for marketing outcomes was generally positive for P4P CUs. WFP's procurement stimulus was sizeable and relatively consistent but the percentage of P4P CUs selling to other buyers increased relative to non-P4P CUs, even though quantities sold were very small relative to quantities sold to WFP. And, although they experienced no significant increase in utilizing credit, most reported utilizing credit so there may have been little room for improvement.

FIGURE 22: SUMMARY OF IMPACT OF P4P ON CU CAPACITY



Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

Consequently, marketing capacity outcomes were positive. Those that could be attributed to participating in P4P included:

- An average 902 mt increase in the total quantity of maize sold between 2012 and 2013 relative to what would have happened without P4P;
- A 23 percentage point increase in the percentage of P4P CUs selling to buyers other than WFP relative to what would have happened without P4P; and
- A significant 81 percentage point increase in the percentage of CUs offering post-harvest financing to members relative to what would have happened without P4P.

The P4P CUs already seem to be sustainable marketing organizations and all reported selling to other buyers throughout the P4P pilot.

Impact of P4P on PC Capacity

Impacts at the PC level are indirect. PCs benefit from the WFP procurement stimulus only to the extent that CUs aggregate from a PC to supply WFP. Furthermore, since the surveys represent only a sample of the PCs that are members of P4P CUs, the magnitude and consistency of the stimulus are both diluted.

Figure 23 illustrates that, like the CUs, PCs appear to be relatively capable FOs with many of the facilitating conditions in place to support organizational capacity building. In particular, most (90 percent) reported having access to storage. Eighty-five percent had received external assistance in organizational management and the percentage reporting assistance with post-harvest management, production, and marketing increased markedly during the pilot.

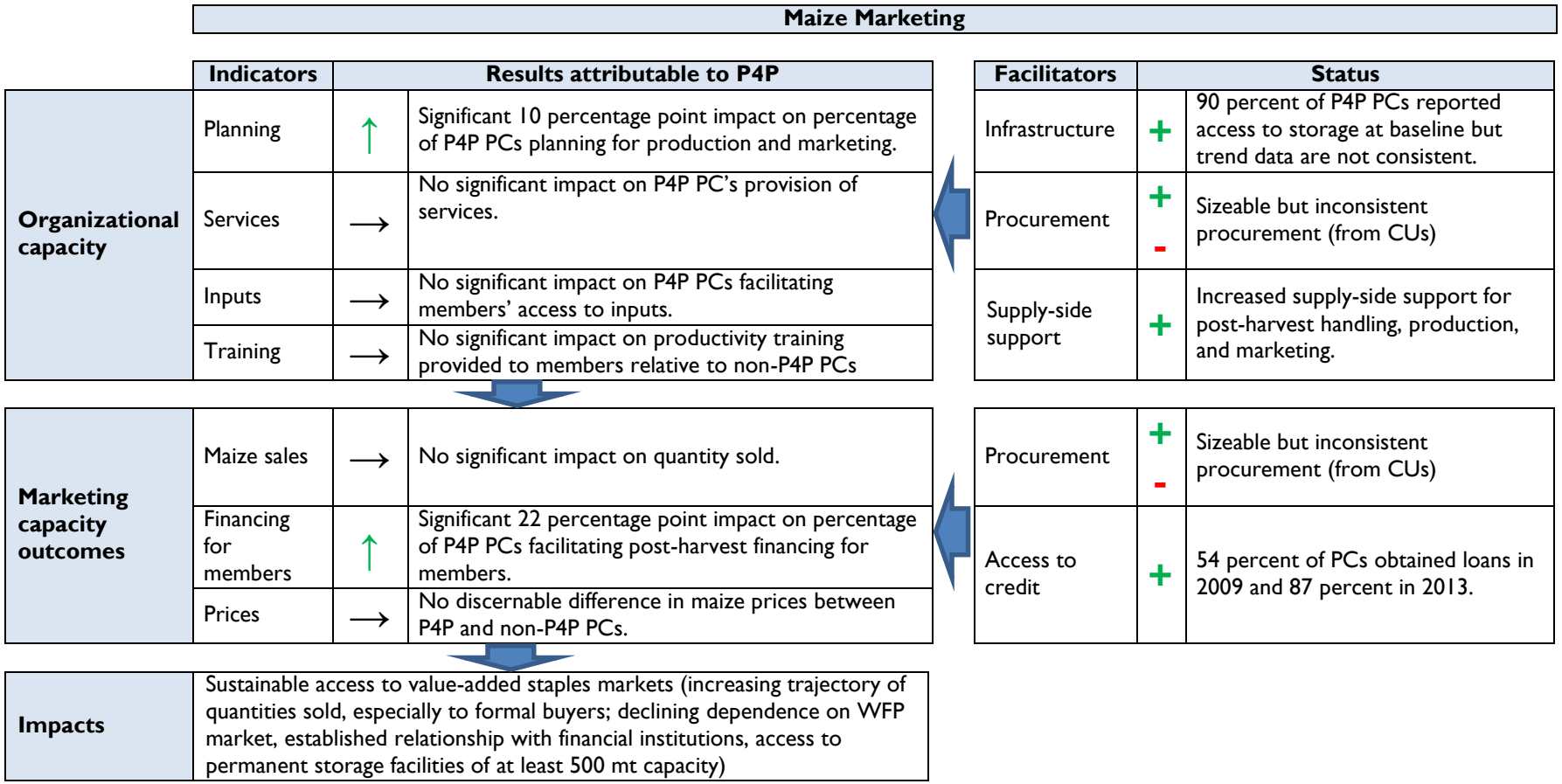
Positive change in facilitating conditions was associated with increased organizational capacity as measured by the selected indicators. Only one, however, was attributable to P4P. In particular:

- The percentage of P4P PCs planning for production and marketing increased by 10 percentage points relative to what would have happened without P4P – the only change statistically attributable to P4P;
- The average percentage of services offered by PCs increased – value addition services by 7 percentage points, quality services by 11 percentage points, production services by 8 percentage points, and marketing services by 17 percentage points. However, non-P4P PCs registered similar changes so the results are not attributable to P4P.
- Most (78 percent) of P4P PCs reported facilitating members' access to inputs at the time of the baseline and this percentage increased to 90 percent by 2013.
- P4P PCs registered a 59 percentage point increase in the percentage of PCs providing production training to members but non-P4P PCs experienced similar increases.

Similarly, the facilitating conditions for increased marketing capacity at the PC level were also mostly positive. More than half of P4P PCs (54 percent) reported utilizing credit prior to P4P but the percentage increased to by 23 percentage points to 87 percent by the end of the P4P pilot. This result is not statistically attributable to P4P but did improve the facilitating conditions for improved marketing capacity.

In spite of somewhat improved facilitating conditions, PCs reported few changes in marketing capacity indicators. Consistent with an increase in credit utilization, the percentage of P4P PCs that reported providing post-harvest financing to member farmers increased slightly but significantly during the pilot (from 10

FIGURE 23: SUMMARY OF IMPACT OF P4P ON PC CAPACITY



Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

percent to 13 percent). However, P4P PCs reported no significant increase in quantities sold or in prices received for maize.

Impact of P4P on Household Maize Marketing

In the Ethiopia context, capacity building results at the PC level are the most likely to affect households' marketing and production. Member households experienced little change in the factors facilitating marketing (Figure 24). A slightly larger percentage of P4P PCs (three percent) began offering post-harvest financing. P4P PCs also expanded the percentage of value addition, production, quality, and marketing services they offered (but not significantly relative to non-P4P PCs).

Predictably, these minor improvements in facilitating conditions did not stimulate significant changes in households' marketing behavior. Specifically:

- The percentage of P4P households that reported selling through the PC at some point during the pilot increased from 18 percent in 2009 to 33 percent in 2013. This result suggests a growing engagement with the PC. However, non-P4P households reported similar growth rates so the result is not statistically attributable to P4P.
- The percentage of P4P households that reported holding some maize for sale more than four weeks after harvest increased from 29 percent to 40 percent. However, the result is not significantly different from changes in behavior among non-P4P households.

Since P4P PCs do not appear to have altered their marketing behavior much in response to P4P, it is no surprise to find no significant marketing outcomes among member households. Household members of P4P PCs reported receiving no higher prices for maize than P4P households, nor did they report selling larger quantities.

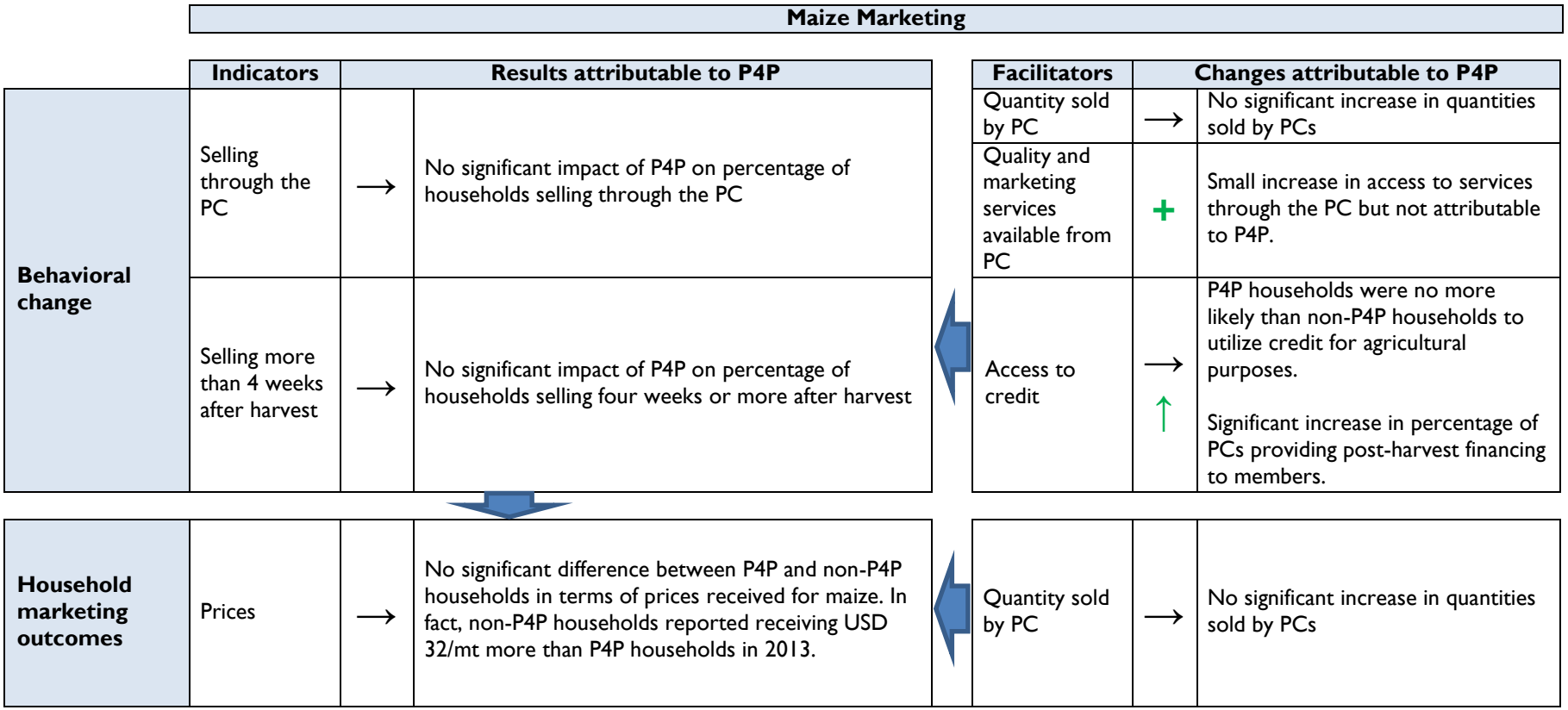
Impact of P4P on Household Maize Production

The P4P development hypothesis suggests that outcomes in household maize marketing lead to production outcomes. For example, higher prices obtained from selling maize through the PCs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. Specific changes in production facilitating conditions (documented in Figure 25) include:

- The percentage of P4P households reporting that they had received training in agricultural production practices increased from 78 percent to 98 percent.
- P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members. Although the change was significant, however, the percentage of PCs offering financing to their members was very small, 13 percent in 2013.
- The percentage of P4P PCs that reported facilitating access to inputs was high throughout the five-year period of the pilot, never dropping below 70 percent.
- The percentage of P4P households reporting access to subsidized inputs increased from 29 percent to 38 percent.

Given the apparent focus on production technologies and practices, it is not surprising that the only notable change in household production practices was increased use of certified seed. The percentage of P4P households reporting using certified seed increased from 64 percent to 75 percent and the average percentage

FIGURE 24: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING



Legend

↑	Statistically significant positive impact attributable to participating in P4P.
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→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

of all maize seed used that was certified increased from 63 percent to 90 percent. Non-P4P households reported similar changes, however, so these changes in production behavior are not attributable to P4P.

Consistent with the increased use of certified seed, P4P households reported a significant increase in average maize yields – from 1.88 mt/ha to 2.37 mt/ha. This increase was significantly greater than that reported by non-P4P households and is directly attributable to P4P. Given that P4P and non-P4P households' access to and use of productivity-enhancing inputs and training were similar, the difference in growth in yields may be due to the quality of training.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2013 than in 2009 by almost any measure of welfare.

- Real incomes increased by 46 percent;
- The average household asset score increased by 5 percent;
- The real value of household livestock increased by 42 percent;
- The food consumption score increased by 9 percent; and

However, non-P4P households experienced similar improvements and none of the changes observed with P4P households were significantly different from those experienced by non-P4P households.

FIGURE 25: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Maize Production						
	Anticipated Results	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Planting maize	→	P4P households were no more likely than non-P4P households to change their maize planting behavior.	Access to inputs/credit	→	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members.
	Area allocated to maize	→	P4P households were no more likely than non-P4P households to change the area they allocated to maize production.	Production training	→	P4P households were no more likely than non-P4P households to report receiving production training.
	Use of inputs	→	P4P households were no more likely than non-P4P households to change their use of certified seed (either to begin using it or to change the percentage they used) of to change their use of fertilizer.			
Intermediate outcomes	Yields	↑	P4P households reported significantly greater growth in yields than non-P4P households between 2011 and 2013.	Access to inputs/credit	→	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, P4P PCs were significantly more likely than non-P4P PCs to report providing post-harvest financing to members.
	Quantity produced	→	P4P households were no more likely than non-P4P households to increase the quantity of maize they produced.			
	Quantity sold	→	P4P households were no more likely than non-P4P households to sell larger quantities of maize.			

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
\+ Favorable conditions/change.
\- Unfavorable conditions/change.

ANNEXES

Annex A: Comparison of P4P and non-P4P FOs and Households

TABLE 16: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P CUS

CU characteristic	P4P	Non-P4P	p-value of difference
FO characteristics			
Number of full-time employees	9.23	12.25	0.0246
Distance from market (km)	270	295	0.8125
FO capacity indicators			
Indicator of planning for production and marketing	0.77	1.00	0.2897
Indicator of receiving credit in past two years	0.77	0.75	0.9368
Indicator of providing financing to members	0.54	0.50	0.8928
Indicator of access to storage	0.69	0.75	0.8247
Storage capacity (mt)	3,178	2,700	0.8275
Indicator of using price information	1.00	1.00	
Indicator of contract experience	0.69	0.50	0.4816
Indicator of defaulting on contracts	0.00	0.00	
External assistance received			
Indicator of receiving organizational assistance	0.85	0.75	0.6591
Indicator of receiving post harvest assistance	0.31	0.00	0.2046
Indicator of receiving production assistance	0.31	0.00	0.2046
Indicator of receiving marketing assistance	0.31	0.25	0.8247
Indicator of receiving assistance for inputs	0.15	0.00	0.4036
Indicator of receiving assistance for tools	0.08	0.25	0.3475
Indicator of receiving assistance for infrastructure	0.31	0.00	0.2046
Indicator of receiving any assistance	0.85	0.75	0.6591
Services provided			
Indicator of providing any services	0.92	0.75	0.3475
Indicator of providing value addition services	0.15	0.00	0.4036
Indicator of providing quality services	0.49	0.13	0.1929
Indicator of providing production services	0.25	0.25	0.9876
Indicator of providing marketing services	0.69	0.25	0.1160
Marketing activity			
Indicator of selling anything during past two years	1.00	1.00	
Maximum quantity of anything sold in past two years	1,931	1,274	0.7382
Indicator of selling maize in past two years	0.69	0.75	0.8247
Maximum quantity of maize sold in past two years (mt)	776	56	0.4056

TABLE 17: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P PCS

PC characteristic	P4P	Non-P4P	p-value of difference
FO characteristics			
Number of members	1,034	1,368	0.0320
Percentage of female members	0.87	0.87	0.9892
Number of full-time employees	13	10	0.0081
Distance from market (km)	72	122	0.0324
FO capacity indicators			
Indicator of planning for production and marketing	0.86	0.99	0.0063
Indicator of receiving credit in past two years	0.54	0.58	0.5728
Indicator of providing financing to members	0.10	0.08	0.6192
Indicator of access to storage	0.90	0.86	0.4983
Storage capacity (mt)	551	470	0.5523
Indicator of using price information	0.91	0.92	0.8325
Indicator of contract experience	0.17	0.52	0.0000
Indicator of defaulting on contracts	0.08	0.09	0.9371
External assistance received			
Indicator of receiving organizational assistance	0.81	0.85	0.5959
Indicator of receiving post harvest assistance	0.30	0.22	0.2431
Indicator of receiving production assistance	0.36	0.19	0.0215
Indicator of receiving marketing assistance	0.33	0.43	0.2456
Indicator of receiving assistance for inputs	0.00	0.06	0.0364
Indicator of receiving assistance for tools	0.01	0.12	0.0121
Indicator of receiving assistance for infrastructure	0.04	0.09	0.2591
Indicator of receiving any assistance	0.08	0.09	0.5467
Services provided			
Indicator of providing any services	0.99	0.89	0.0229
Indicator of providing value addition services	0.09	0.06	0.5758
Indicator of providing quality services	0.29	0.16	0.0741
Indicator of providing production services	0.27	0.19	0.2271
Indicator of providing marketing services	0.52	0.30	0.0098
Marketing activity			
Indicator of selling any crop	0.99	0.99	0.9661
Average quantity of all crops sold (mt)	430	440	0.9685
Indicator of selling maize	0.39	0.55	0.0596
Average quantity of maize sold (mt)	73	76	0.9537

TABLE 18: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P HOUSEHOLDS

Household characteristic	P4P	Non-P4P	p-value of difference
Number of individuals in household	6.21	6.64	0.0328
Indicator of using certified maize seed	0.54	0.41	0.0013
Indicator of using certified seed on crops other than maize	0.23	0.16	0.0362
Indicator of using certified seed on any crop	0.64	0.50	0.0010
Area of land owned (ha)	1.20	1.25	0.2949
Area allocated to maize (ha)	0.37	0.35	0.5129
Area allocated to crops other than maize (ha)	1.16	1.11	0.5038
Total cultivated area (ha)	1.53	1.46	0.3530
Average maize yield (mt/ha)	1.83	1.88	0.6401
Average quantity of maize harvested (mt)	0.66	0.57	0.1985
Average quantity of crops other than maize harvested (mt)	1.86	1.44	0.0028
Average quantity of all crops harvested (mt)	2.52	2.02	0.0009
Quantity of maize sold (mt)	0.10	0.09	0.7564
Quantity of crops other than maize sold (mt)	0.52	0.33	0.0117
Quantity of all crops sold (mt)	0.62	0.42	0.0129
Size of maize surplus (mt)	0.47	0.39	0.2583
Average percentage of maize sold within 4 weeks of harvest (%)	0.09	0.08	0.3640
Average percentage of maize sold 4 weeks after harvest (%)	0.11	0.09	0.4193
Average quantity of maize sold within 4 weeks of harvest (mt)	0.03	0.03	0.6901
Average quantity of maize sold 4 weeks after harvest (mt)	0.04	0.02	0.2524
Average percentage of maize sold through FO (%)	0.05	0.03	0.3622
Average percentage of maize sold elsewhere (%)	0.01	0.00	0.1989
Average percentage of maize sold at the farm gate (%)	0.15	0.13	0.5576
Average quantity of maize sold through FO (mt)	0.03	0.01	0.1029
Average quantity of maize sold elsewhere (mt)	0.01	0.00	0.0860
Average quantity of maize sold at the farm gate (mt)	0.03	0.04	0.6174
Value of loans received for agricultural purposes (2009 Ethiopian Birr)	756	858	0.3259
Value of loans received for non-agricultural business (2009 Ethiopian Birr)	54	79	0.6401
Value of loans received for any purpose (2009 Ethiopian Birr)	896	989	0.4473
Average food consumption score	45	42	0.0034
Average food consumption rank	2.83	2.82	0.6988
Average household asset score	7.22	7.16	0.7545
Value of livestock assets (2009 Ethiopian Birr)	1,013	7,287	0.5612
Average annual household income (2009 Ethiopian Birr)	7,979	6,760	0.0114
Average annual income from farming (2009 Ethiopian Birr)	6,386	5,228	0.0085

Household characteristic	P4P	Non-P4P	p-value of difference
Average annual off-farm income (2009 Ethiopian Birr)	1,593	1,531	0.7484
Net value of crops produced (2009 Ethiopian Birr)	6,212	4,962	0.0038
Net value of crops consumed (2009 Ethiopian Birr)	5,045	4,074	0.0053
Net value of crops sold (2009 Ethiopian Birr)	1,201	938	0.1088
Net value of staples sold (2009 Ethiopian Birr)	138	121	0.5546
Net income from livestock (2009 Ethiopian Birr)	174	267	0.1123
Income from livestock sales (2009 Ethiopian Birr)	63	143	0.0602
Value of livestock consumed (2009 Ethiopian Birr)	3	6	0.3516
Income from livestock products and services (2009 Ethiopian Birr)	108	118	0.7939
Annual cost of keeping livestock (2009 Ethiopian Birr)	813	630	0.1564
Percentage of household income from off-farm sources	0.21	0.23	0.4829
Annual expenditure (2009 Ethiopian Birr)	6,933	6,340	0.3496
Annual expenditure on household items (2009 Ethiopian Birr)	1,495	1,183	0.0059
Annual expenditure on food (2009 Ethiopian Birr)	2,740	2,654	0.8702
Annual expenditure on other items (2009 Ethiopian Birr)	2,670	2,493	0.4923
Annual expenditure on rent (2009 Ethiopian Birr)	28	9	0.4748
Annual crop production expenses (2009 Ethiopian Birr)	2,438	1,734	0.0000
Indicator of female household head	0.03	0.03	0.9823
Indicator of metal roof on house	0.31	0.34	0.5372
Indicator of concrete floor in house	0.91	0.90	0.5487
Indicator of concrete or fired brick walls on house	0.99	0.98	0.3302
Indicator of improved toilet facilities in house	0.99	0.98	0.6162
Indicator of household access to improved water source	0.62	0.64	0.7690
Indicator of using fertilizer	1.00	0.92	0.0000
Indicator of access to inputs on credit or subsidized	0.36	0.34	0.6692
Indicator of irrigating maize	0.00	0.00	
Indicator of planting maize	0.72	0.66	0.0988
Indicator of planting crops other than maize	0.94	0.92	0.3032
Indicator of producing a surplus of maize	0.70	0.63	0.1070
Indicator of selling maize within 4 weeks of harvest	0.12	0.09	0.2704
Indicator of selling maize 4 weeks after harvest	0.13	0.11	0.3226
Indicator of selling maize through the FO	0.08	0.04	0.0873
Indicator of selling maize at the farm gate	0.02	0.00	0.1331
Indicator of selling maize elsewhere	0.16	0.14	0.4345
Indicator of receiving loans for agriculture	0.48	0.49	0.7115
Indicator of receiving loans for non-agricultural business	0.02	0.02	0.6184
Indicator of receiving loans for any purpose	0.52	0.53	0.8167

Household characteristic	P4P	Non-P4P	p-value of difference
Indicator of obtaining crop price information through FO	0.43	0.34	0.0181
Indicator of using crop price information	0.99	0.99	0.8870
Indicator of finding price information from FO useful	0.37	.029	0.0457

Annex B: P4P Treatment Details

TABLE 19: QUANTITIES PROCURED BY WFP BY CU AND YEAR

Surveyed CU?	FO name	Quantity delivered (mt)					Number of contracts	Years w/ contracts	Average contract size (mt)[a]
		2009	2010	2011	2012	2013			
Yes	DAMOT MULTIPURPOSE FARMERS COOPERATIVE		2,512		2,000		9	4	824
Yes	GOZAMIN FARMERS COOPERATIVE UNION LTD.				1,700		2	2	1,125
Yes	GIBE DEDESA FARMERS COOPERATION UNION				1,143		2	2	1,500
Yes	MIRA SERVICE DEVELOPMENT PLC		800		500		4	3	1,025
Yes	Lume-Adama Farmers Cooperative Unio		250		389		2	3	375
Yes	Mencheno Alaba Farmers cooperative Union				600		2	2	1,375
Yes	Walta Farmers Cooperative Union				700	240	3	2	567
Yes	Sidama Elto Farmers Cooperative Union			800	2,500		4	3	1,875
Yes	Melik Siltie's Farmers Cooperative Union			740	2,154	2,161	4	3	1,685
Yes	Damota wolayta Farmers Cooperative union				612		3	3	1,267
Yes	LICHA HADIYA FARMERS COOPERATIVE UNION		1,541		500		4	4	510
Yes	Ambericho farmer's Cooperative Union Ltd				550	140	4	3	275
No	Admas Farmers Cooperative Union				2,150	3,300	4	2	1,663
No	Somali Regional State West Gode Integrat		1,000				1	2	4,000
No	SOUTHERN REGION FARMERS COOPERATIVE		2,900				4	3	725
No	BORA DENBEL FARMERS MULTIPURPOSE		200		329	336	4	4	625
No	Merkeb Farmers Cooperative Union LTD			80	10,038		6	3	2,487
No	Angacha Farmers Cooperative Union				250		4	3	163
No	Barsan Primary Cooperative				200		1	2	200
No	Uta Wayu Multipurpose Farmers Cooperaliv					995	1	1	1,500
No	Buno Bedele Farmers Cooperative Union						1	1	750
No	Admas Multipurpose Farmers Cooperative						1	1	1,500
No	Anger Abaya Farmers Cooperative Union						1	1	1,000
No	Esipe Dicha Farmers Cooperative Union Li						1	1	500
No	Oysa Dawro Farmers Multipurpose Cooperat						1	1	500
No	South Omo Crop Producer Farmers Cooper						0	0	

Surveyed CU?	FO name	Quantity delivered (mt)					Number of contracts	Years w/ contracts	Average contract size (mt)[a]
		2009	2010	2011	2012	2013			
No	Limu Inara Farmers Multipurpose Cooperat						1	1	1,500
No	Liben Farmers Cooperative Union					200	0	1	1,000
No	Haragu Farmers Cooperative Union						0	1	1,500
No	Ambo Farmers Cooperative Union						0	1	1,000
No	Jergo Birbir Farmers Multipurpose Union						0	1	550
No	Mete Yoma Badewacho Farmers Union Coope						0	1	500
No	Bore Bakko Farmers Cooperative Union						0	1	1,000
No	Jimma Farmers Cooperative Union Limited						0	1	750
Totals			**9,203**	**1,620**	**26,315**	**7,372**			1,093

Source: WFP procurement records

a. Average contract size may be different than average quantity delivered per year because many FOs had multiple contracts in a given year. Defaults may also cause differences between quantities delivered and quantities contracted.

TABLE 20: INVESTMENTS IN WAREHOUSE REHABILITATION AND CONSTRUCTION (2009-2010)

FO Name	Ownership status	Capacity by year (mt)					WFP and partner roles
		2009	2010	2011	2012	2013	
Ambericho	All storage	2,000	900	1,200	1,200	3,200	2011: WFP set up a mobile warehouse (rubhall) 2013: WFP partially funded a prefabricated warehouse
	Owned storage	0	0	500	500	2,500	
Angacha	All storage	4,800	150	500	1,000	1,000	2011: JICA built 500 mt warehouse w/ WFP financial help 2012: WFP set up a mobile warehouse (rubhall)
	Owned storage	0	0	500	1,000	1,000	
Damot	All storage	1,500	1,500	2,000	2,000	3,000	WFP committed to provide permanent warehouse
	Owned storage	1,500	1,500	2,000	2,000	2,000	
Damotta Wolayita	All storage	1,000	1,000	1,400	1,900	3,900	WFP set up a mobile warehouse (rubhall)
	Owned storage	1,000	1,000	1,400	1,900	3,900	
Gibe Dedessa	All storage	2,500	1,000	1,000	1,900	2,750	ACDI/VOCA committed to build 5,000 mt warehouse, no WFP financial assistance
	Owned storage	0	0	0	0	2,750	
Gozamin	All storage	3,000	6,000	13,580	11,000	21,000	None recorded
	Owned storage	3,000	6,000	6,000	6,000	6,000	
Licha Hadiya	All storage	5,000	8,000	8,500	8,500	8,500	WFP partially financed unspecified warehouse work
	Owned storage	5,000	8,000	8,500	8,500	8,500	
Lume Adama	All storage	12,000	10,000	10,000	10,000	10,000	None recorded
	Owned storage	10,000	10,000	10,000	10,000	10,000	
Malik Siltie	All storage	950	950	1,450	1,450	3,450	2011: WFP set up a mobile warehouse (rubhall) WFP committed to provide permanent warehouse
	Owned storage	950	950	1,450	1,450	3,450	
Menchemo Alaba	All storage	1,000	600	200	1,050	3,500	2012: WFP set up a mobile warehouse (rubhall) 2013: WFP partially funded a permanent warehouse
	Owned storage	0	0	0	500	2,500	
Mira	All storage	600	300	1,200	1,200	1,600	2012: WFP set up a mobile warehouse (rubhall)
	Owned storage	0	0	0	500	500	
Sidama Elto	All storage	1,700	1,700	1,500	1,500	1,500	2011: WFP set up a mobile warehouse (rubhall) ACDI/VOCA committed to build 5,000 mt warehouse, no WFP financial assistance
	Owned storage	1,000	1,000	1,500	1,500	1,500	
Walta	All storage	600	600	600	600	2,600	2013: WFP fully funded a prefabricated warehouse
	Owned storage	600	600	600	600	2,600	

TABLE 21: WFP PROCUREMENT BY MODALITY

Contract year	Procurement modality									Total (all modalities)		
	Competitive tenders			Direct contracts			Forward contracts					
	Beans	Maize	Total				Beans	Maize	Total	Beans	Maize	Total
2010	1,041	3,462	4,503	1,000	3,700	4,700				2,041	7,162	9,203
2011		80	80		740	740		800	800		1,620	1,620
2012		520	520		6,968	6,968		18,827	18,827		26,315	26,315
2013								0	0		0	0
Total	1,041	4,062	5,103	1,000	11,408	12,408		19,627	19,627	2,041	35,098	37,139

Source: WFP procurement records.

TABLE 22: WFP PROCUREMENT DETAIL

CU name	Surveyed	2010	2011	2012	2013[a]
Lume-Adama Farmers Cooperative Union	Yes	250		389	
MIRA SERVICE DEVELOPMENT PLC	Yes	800		500	0
GIBE DEDESA FARMERS COOPERATION UNION	Yes			1,143	0
SOUTHERN REGION FARMERS COOPERATIVE		2,900			
BORA DENBEL FARMERS MULTIPURPOSE		200		329	0
LICHA HADIYA FARMERS COOPERATIVE UNION	Yes	1,541		500	
DAMOT MULTIPURPOSE FARMERS COOPERATIVE	Yes	2,512	0	2,000	0
GOZAMIN FARMERS COOPERATIVE UNION LTD.	Yes			1,700	0
Somali Regional State West Gode Integrat		1,000			
Admas Farmers Cooperative Union	Yes			2,150	0
Merkeb Farmers Cooperative Union LTD			80	10,038	0
Walta Farmers Cooperative Union	Yes			700	0
Melik Siltie's Farmers Cooperative Union	Yes		740	2,154	0
Angacha Farmers Cooperative Union			0	250	0
Damota wolayta Farmers Cooperative union	Yes		0	612	0
Ambericho farmer's Cooperative Union Ltd	Yes		0	550	0
Mencheno Alaba Farmers cooperative Union	Yes			600	0
Sidama Elto Farmers Cooperative Union	Yes		800	2,500	0
Barsan Primary Cooperative				200	
Uta Wayu Multipurpose Farmers Cooperalive					0
Buno Bedele Farmers Cooperative Union					0
Admas Multipurpose Farmers Cooperative					0
Anger Abaya Farmers Cooperative Union					0
Esipe Dicha Farmers Cooperative Union Limited					0
Oysa Dawro Farmers Multipurpose Cooperative					0
South Omo Crop Producer Farmers Cooperative					0
Limu Inara Farmers Multipurpose Cooperative					0
Liben Farmers Cooperative Union					0
Haragu Farmers Cooperative Union					0
Ambo Farmers Cooperative Union					0
Jergo Birbir Farmers Multipurpose Union					0
Mete Yoma Badewacho Farmers Union Cooperative					0
Bore Bakko Farmers Cooperative Union					0
Jimma Farmers Cooperative Union Limited					0

a. 2013 figures reflect signed forward contracts that have not yet been delivered.

Photo front cover: WFP/Judith Schuler

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P4P on Twitter: @WFP_P4P

20 P4P pilot countries
Asia: Afghanistan
Africa: Burkina Faso, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Liberia, Malawi, Mali, Mozambique, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, Zambia
Latin America: El Salvador, Guatemala, Honduras, Nicaragua

P4P Global Learning Series

Impact Assessment Report: Tanzania

March 2014

WFP World Food Programme wfp.org

P4P Purchase for Progress

The Impact of P4P on SACCOs and Smallholder Farmers in Tanzania

March 2014

Author: Douglas Krieger

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ACRONYMS

AMCO	Agricultural Marketing Cooperative
DiD	Difference in Differences
FO	Farmers' Organization
ha	hectares
HH	Household
LRP	Local and Regional Procurement
mt	metric tonnes
NFRA	National Food Reserve Agency
P4P	Purchase for Progress
SACCO	Savings and Credit Cooperative
USD	United States Dollars
WFP	World Food Programme
WRS	Warehouse Receipt System

EXECUTIVE SUMMARY

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[1] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[2]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to become active market participants is at the center of all the strategies and WFP buys directly from FOs in almost all pilot countries. When the opportunities existed, some countries integrated structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors into the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to engage their members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

P4P in Tanzania

Tanzania buys from Savings and Credit Cooperatives (SACCOs), SACCOs networks, and Agricultural Marketing Cooperatives (AMCOs) and works to link them to a nascent warehouse receipt system (WRS) to facilitate financing for SACCO members. However, SACCOs are prohibited from marketing and the few AMCOs that were functioning when implementation began lacked meaningful capacity. For example, few had marketing experience and most warehouses were dilapidated and unsuitable for commodity aggregation and storage. Nevertheless, these were the structures that were in place in Tanzania with which P4P could engage.

[1] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.
[2] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

The low baseline capacity in Tanzania necessitated a substantial investment of time and resources to develop even a minimal capacity among P4P-supported SACCOs and AMCOs. Furthermore, because it was working with organizations that are prohibited from marketing agricultural commodities, the program had to negotiate with government to begin operations. It also expended considerable effort supporting, operationally and on the policy side, an emerging WRS. The program has directly contributed to substantial capacity improvements for SACCOs and AMCOs by rehabilitating and equipping 23 warehouses, 10 of which are certified by the Tanzania Warehouse Licensing Board to operate WRS. It also invested substantially in an ambitious program to train SACCOs members and leaders in topics focused on production, institutional capacity building, agri-business management, quality control, gender issues, and WFP procurement. On the demand side, WFP has supported the SACCOs by purchasing over 9,000 mt of commodities from 27 P4P-supported SACCOs, AMCOs, and SACCOs networks.[3] All of these activates are part of the P4P "treatment" in Tanzania and therefore, not outcomes of P4P.

Assessing the Impact of P4P

Based on an M&E report covering the first half of the Tanzania pilot, P4P-supported SACCOs and farmers were unquestionably better off in 2011 than in 2009 by almost any objective measure. For example, the 25 P4P-supported SACCOs from which the country office collected data reported substantial increases in marketing capacity (percentage marketing and quantities sold to WFP and other buyers), the number of marketing and quality services provided to members, and use of market price information. A random sample of 321 farmer members of these SACCOs reported an average 60 percent increase in the quantity of maize produced, an increase in the likelihood of producing a maize surplus, an average 58 percent increase in the size of maize surpluses, and a 67 increase in annual household income, with the greatest percentage increase coming from crop production.

Trends in SACCO capacity and household production and welfare, however, do not constitute evidence that the observed changes are caused by participating in P4P. To credibly attribute changes to P4P it is necessary to compare these outcomes to those that *would have occurred had these same SACCOs and households not participated in P4P*. This report applies appropriate analytical techniques to the data to estimate the causal effects of P4P on key indicators of SACCO capacity and smallholder farmers' production and marketing of staple commodities and on their household income.

Data and Methods

The impact assessment analysis for SACCOs draws largely from survey data collected from 25 P4P-supported SACCOs and a matched set of 25 SACCOs that are not participating in P4P. The Tanzania country office collected data from all of these SACCOs annually throughout the pilot (2009-2013). The household analysis draws from surveys of random samples of farmer members of both P4P and non-SACCOs conducted at the baseline, midpoint, and final periods of the pilot (2009, 2011, and 2013). Accounting for attrition, the panel dataset contains observations for 321 P4P and 343 non-P4P households.

The SACCO and household impact analyses uses a difference-in-differences (DiD) approach to estimate the causal effects of participating in P4P on SACCO capacity and household production, marketing, and welfare indicators. Both analyses rely on comparing outcomes for P4P groups with those of non-P4P groups which represent the counterfactual of not having participated in P4P. To control for potential differences between

[3] WFP procurement records through December 2013.

the two groups, both models control for other factors that may have affected observed outcomes. Both analyses bolster the analytical results with visual inspection of the data to build a convincing case for causal effects.

Findings and Conclusions

SACCOs were not the ideal entry point for P4P because they focus on savings and credit and are legally prohibited from aggregating or marketing agricultural commodities. However, they were the only viable organizations WFP found that were supporting smallholder farmers in Tanzania. In spite of the legal difficulties, WFP targeted SACCOs while simultaneously building the capacities of parallel marketing organizations (AMCOs, networks, associations) to manage aggregation, warehouse management, and marketing on behalf of the SACCOs. Consequently, WFP began in Tanzania working with FOs that had limited to no marketing experience or capacity. In fact, none of the 25 P4P and 25 non-P4P SACCOs surveyed reported any experience selling maize in the two years prior to the 2009 baseline.

At the production level, Tanzania initially implemented P4P in eight regions[4] proximate to WFP operations and the surveyed SACCOs are all in these regions. Only two are in the major maize production areas (Manyara and Kigoma) while the remaining six are often in deficit.[5] Therefore, production capacity was also lower than the national average for many P4P households. Furthermore, the primary regions in which P4P operates suffered from drought in 2009 which probably depressed production in 2009 relative to other years.[6] Distances, poor transportation infrastructure, and poorly integrated markets also hamper the flow of food from surplus to deficit areas and the distribution of agricultural inputs.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 4and Figure 5. The remainder of this section frames the conclusions in the context of the results framework. It presents results in the sequence in which they are likely to occur; SACCO capacity, household marketing, household production, and household welfare.

Impact of P4P on SACCO Capacity

Figure 4 summarizes anticipated results and facilitators of SACCO capacity and serves to frame the conclusions presented in this section.

Although the SACCOs selected to participate in P4P represented smallholder farmers, they were not marketing organizations. Consequently, they lacked the physical infrastructure (warehouses and equipment) necessary to manage aggregation and marketing. Even though 30 percent of P4P SACCOs reported having access to storage in the 2009 baseline survey, WFP's assessment found that these were largely dilapidated community-owned sheds unsuitable for effectively managing aggregation and quality.

The services P4P SACCOs reported providing their members also reflected SACCOs' limited capacities to support agricultural production, value addition, and marketing. In fact, in 2009, 60 percent of the P4P SACCOs reported providing no agricultural services to their members. Those that did provide services appear to have concentrated on supporting agricultural production (e.g., training and facilitating access to

[4] Kilimanjaro, Manyara, Arusha, Kigoma, Kagera, Dodoma, Singida, and Tabora.
[5] http://www.fao.org/fileadmin/templates/mafap/documents/technical_notes/URT/TANZANIA_Technical_Note_MAIZE_EN_Oct2013.pdf
[6] Tanzania P4P Story.

FIGURE 1: SUMMARY OF IMPACT OF P4P ON SACCO CAPACITY

Maize Marketing

	Indicators		Results attributable to P4P
Organizational capacity	Planning	↑	Significant positive impact on P4P SACCOs planning for production and marketing.
	Services	↑	Significant positive impact on P4P SACCOs provision of production, marketing, and quality services.
	Inputs	↑	Significant positive impact on P4P SACCOs facilitating members' access to inputs.
	Training	→	No significant impact on productivity training provided to members relative to non-P4P SACCOs
Marketing capacity outcomes	Sales	↑	Significant positive impact on total quantity of maize sold.
	Market diversity	↑	Significant positive impact on quantity sold to buyers other than WFP.
	Financing for members	↑	Significant positive impact on facilitating post-harvest financing for members.
	Prices	↑	Several sources of evidence suggest that by 2013, P4P households obtained higher average prices for maize than non-P4P households and that the margin was larger for households that sold through the SACCO.
Impacts	Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)		

Facilitators		Changes attributable to P4P
Infrastructure	↑	Improved quality of warehouse facilities and access to equipment
Procurement	↑	Relatively consistent and sizable procurement
Supply-side support	↑	Increased supply-side support for infrastructure, production, marketing, and inputs relative to non-P4P SACCOs
Procurement	↑	Relatively consistent and sizable procurement
Access to credit	↑	Greater access to credit in 2013 relative to non-P4P SACCOs

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

inputs), marketing (i.e., weighing and bagging, connecting farmers to buyers), and storage (i.e., warehousing and fumigation).[7]

At the time of the 2009 baseline, the development community was supporting P4P and non-P4P SACCOs but the assistance focused largely on organizational strengthening and management (i.e., record keeping, financial management, group management, and business planning). Ninety-six percent of surveyed SACCOs reported having received such assistance. Few SACCOs reported receiving other types of assistance although P4P SACCOs were significantly more likely than non-P4P SACCOs to have received assistance with agricultural production (48 percent versus 12 percent) and marketing (40 percent versus 8 percent).

In response to these limitations, WFP initially focused, with the help of partners, on strengthening marketing infrastructure and skills, and preparing SACCOs to sell to WFP. By the end of 2010, WFP had directly rehabilitated 23 warehouses, 10 of which were ultimately licensed with the Tanzania Warehouse Licensing Board to be used as WRS warehouses. To further build organizational capacity, WFP also provided (loaned) warehousing equipment (tarps, fumigation sheets, scales, stitching machines, generators, pallets, spears, moisture analyzers, first extinguishers, and milling machines) to 29 SACCOs and trained SACCOs in their use.

WFP and its partners also trained all P4P-supported SACCOs in agribusiness management; credit and finance; institutional capacity building; gender sensitivity; monitoring and evaluation; post-harvest handling, storage, and quality control; production and productivity; and WFP procurement procedures. As a consequence, the percentage of P4P SACCOs reporting receiving external assistance with production, marketing, inputs, and infrastructure increased by greater margins than among non-P4P SACCOs. To the extent that WFP did not provide this assistance directly, it reflects supply-side support catalyzed by WFP's commitment to buy from the SACCOs.

These direct investments and training put in place many of the facilitating factors necessary to support organizational capacity building. The other crucial facilitator is WFP's procurement stimulus. By the end of the pilot, WFP had registered 27 SACCOs and other organizations (AMCOs, networks, associations) as WFP suppliers and had purchased at least once from all of them. It had purchased in only one year from 7 (26 percent), in two years from 7 (26 percent), in three years from 10 (37 percent), and in four years from 3 (11 percent). On average, SACCOs that sold to WFP in any given year received contracts for 223 mt. WFP appears to have provided a reasonably consistent and sizable procurement stimulus in Tanzania.

These investments in the facilitators of organizational capacity quickly paid dividends in measurable indicators of SACCO capacity. Specifically:

- The availability of storage infrastructure and equipment coupled with training quickly led to large increases in the number of production, marketing, and quality services P4P SACCOs were able to provide to their members. P4P is responsible for an increase of 63 percentage points in the average percentage of quality services offered by P4P SACCOs, a 14 percentage point increase in production services, and a 54 percentage point increase in marketing services.
- The percentage of P4P SACCOs planning for production and marketing jumped from 48 percent to 92 percent between 2009 and 2013 compared to a change from 20 percent to 56 percent among non-

[7] SACCOs that reported supporting storage and marketing probably did so in conjunction with an AMCO or other marketing organization.

P4P SACCOs. A 10 point increase in the percentage of P4P SACCOs planning for production and marketing between 2011 and 2013 can be attributed to P4P.

- The percentage of P4P SACCOs able to facilitate members' access to inputs increased from 16 percent in 2009 to 96 percent in 2013. Relative to non-P4P SACCOs, a 24 percentage point increase is attributable to P4P.
- The percentage of P4P SACCOs providing production training to members increased from 12 percent in 2009 to 64 percent in 2013. However, non-P4P SACCOs experienced similar growth so this aspect of improved organizational capacity is not attributable to P4P.

The impact of P4P on sustainable market access for SACCOs is still an open question. One SACCOs network (Kaderes) has "graduated" from P4P and is now eligible to sell to WFP through its normal competitive tendering process. While the summary statistics suggest that the other P4P SACCOs increasingly engaged with staples markets, by 2013 only 24 percent (6 SACCOs) reported ever having sold to buyers other than WFP. The contracts WFP helped negotiate between 17 P4P SACCOs and the National Food Reserve Agency (NFRA) for 3,560 mt of maize (sales not reflected in the survey data) in 2013 will change this picture substantially.

The Tanzania P4P story and intervention details reveal several barriers SACCOs have faced building their marketing capacity. These include reliable access to warehouses and weak leadership and lack of member trust in leaders. Only 6 of the 25 surveyed SACCOs own their warehouses and the WFP country office has documented at least three instances where the warehouse used by a P4P SACCO was leased to other businesses.

Impact of P4P on Household Maize Marketing

The positive impacts of P4P on SACCO capacity established many of the facilitating conditions necessary to support household maize marketing. In particular, significant increases in quantities sold by P4P SACCOs, an expanded range of services offered by the SACCOs, and increasing market diversity should eventually influence household marketing choices, particularly the choice to sell through the SACCO (Figure 19).

Participating in P4P has significantly affected members' marketing behavior. Members of P4P-supported SACCOs were significantly more likely than members of non-P4P SACCOs to begin selling maize through the SACCO. In fact, between 2009 and 2013 the percentage of P4P SACCO members that reported ever selling maize through the SACCO increased significantly from 8 percent to 22 percent. Extrapolated to the entire reported membership of P4P-supported SACCOs, this implies that the total number of SACCO members selling through the SACCOs increased by 169 percent, from 1,001 in 2009 to 2,639 in 2013. This result reflects expanded market choices (households previously reported selling at the farm gate and in local markets) and increasing engagement with more diverse markets. It also indicates a level of trust in the SACCOs.

Prior to P4P, a majority of households reported selling at least part of their surplus maize at least four weeks after harvest. Between 2009 and 2013, the percentage fell for both P4P and non-P4P households. However, it fell by significantly more among P4P than non-P4P households – an unanticipated "impact" of P4P. The result is difficult to interpret; it is not correlated with selling through the SACCO or with the SACCO selling to WFP.

FIGURE 2: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Maize Marketing						
	Indicators	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Selling through the SACCO	↑	P4P households were significantly more likely than non-P4P households to begin selling maize through the SACCO	Quantity sold by SACCO	↑	Significant increase in total quantity of maize sold relative to non-P4P SACCOs
				Quality and marketing services available from SACCO	↑	Significantly more P4P SACCOs providing production, marketing, and quality services relative to non-P4P SACCOs
	Selling more than 4 weeks after harvest	↓	By 2013, P4P households were significantly less likely than non-P4P households to report selling at least 4 weeks after harvest. Furthermore, those that sold at least 4 weeks after harvest reported selling a significantly smaller percentage of their surplus at that time.	Access to credit	→ ↑	P4P households were no more likely than non-P4P households to utilize credit for agricultural purposes. By 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members.
Household marketing outcomes	Prices	↑	Several sources of evidence suggest that by 2013, P4P households obtained higher average prices for maize than non-P4P households and that the margin was larger for households that sold through the SACCO.	Quantity sold SACCO	↑	Significant increase in total quantity of maize sold relative to non-P4P SACCOs
				Market diversity	↑	Significant increase in quantity sold to buyers other than WFP relative to non-P4P SACCOs

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

An anticipated household level outcome is that members of P4P SACCOs will receive higher prices for their maize than members of non-P4P SACCOs, presumably because they sell through a SACCO with better marketing capacity and access to quality conscious buyers. This is a particularly important outcome since increased income from staple commodities is expected to drive increases in production and higher household incomes. Data on prices from the SACCO survey are very thin and data from the household survey very variable. However, both of these sources, triangulated with more reliable data from WFP procurement records,[8] suggest that P4P households obtained higher average prices for their maize than non-P4P households. Starting from a point of receiving statistically equivalent prices in 2009, by 2013, P4P households reported receiving an average of 8 percent more (USD 15/mt) for maize than non-P4P households and households that reported selling through the SACCO reported receiving an average of 24 percent more (USD 60/mt) than those who sold elsewhere. Neither of these differences, however, can be attributed to participation in P4P. This is not necessarily because P4P is not responsible for the change but could be that the data are too thin and variable to statistically attribute the change to P4P.

Impact of P4P on Household Maize Production

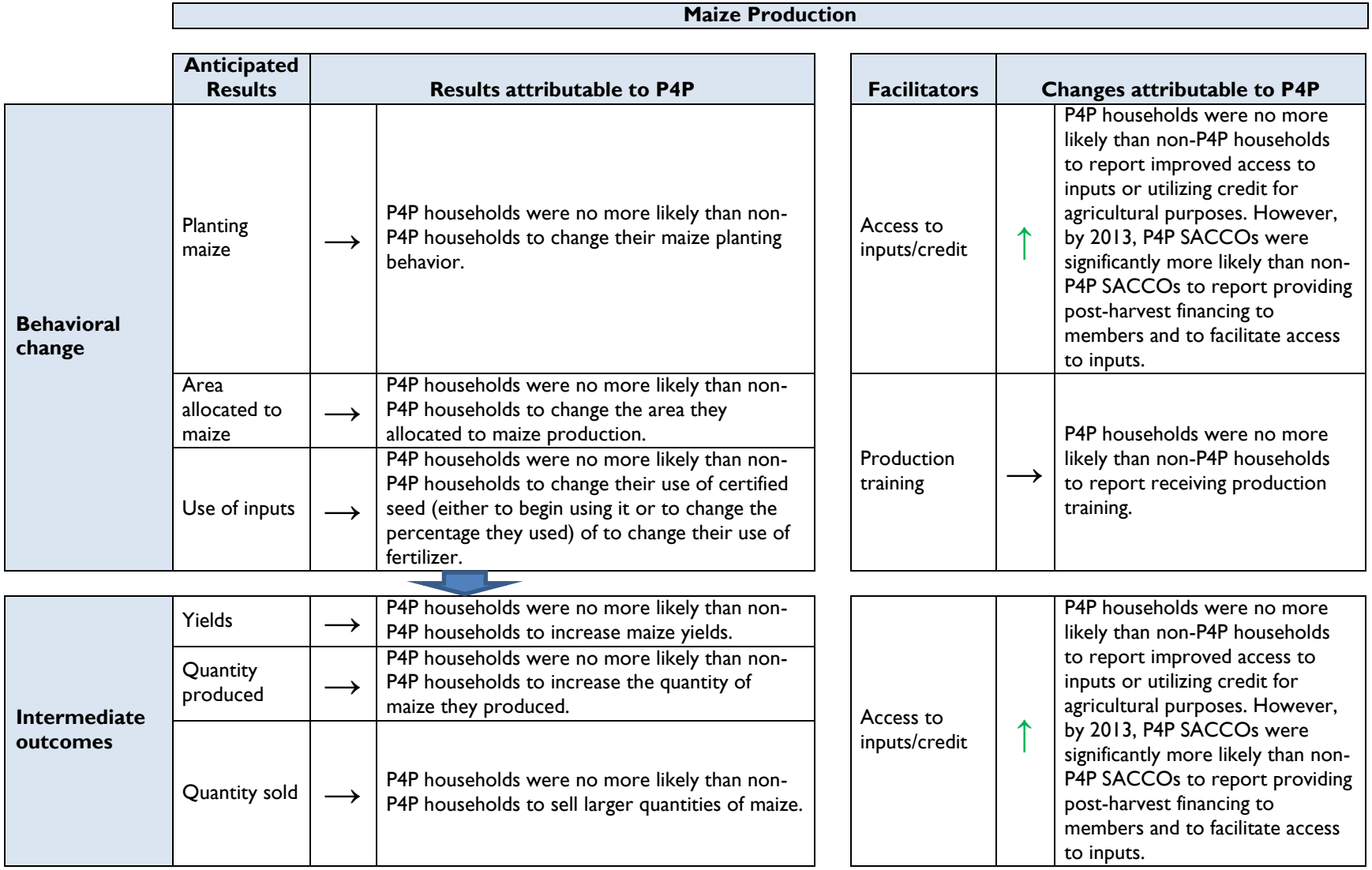
The P4P development hypothesis suggests that outcomes in household maize marketing lead to production outcomes. For example, higher prices obtained from selling maize through the SACCOs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, by 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members and to facilitate access to inputs. Specifically, between 2009 and 2013, the percentage of P4P SACCOs that reported providing financing to members between harvest and sale increased from 36 percent to 52 percent, with 24 percentage points attributable to participating in P4P. With respect to inputs, 16 percent of P4P SACCOs reported facilitating members' access to inputs in 2009. By 2013, 96 percent reported having helped members obtain inputs, an increase of 80 percentage points. The impact of participating in P4P was a 48 point increase in the percentage of P4P SACCOs facilitating access to inputs for members.

P4P households experienced some improvement in the factors facilitating maize production results and have changed their production behavior as a result. In particular:

- The percentage of P4P households planting maize increased from 83 percent to 94 percent between 2009 and 2013;
- The average area planted to maize increased by 0.20 ha (16 percent);
- The number of households using certified seed increased by 4 percentage points, from 29 percent to 33 percent, and the average share of maize seed households used that was certified increased by 5 percentage points, from 47 percent to 60 percent; and
- The number of households using fertilizer increased from 17 percent to 28 percent.

[8] Although the price data in the WFP procurement records are more reliable than the survey data, they may also reflect concessions made to facilitate sales from low-capacity FOs.

FIGURE 3: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION



Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

These behavioral changes led to improved production results. Specifically:

- Average maize yields increased 75 percent, from 0.93 mt/ha to 1.63 mt/ha;[9]
- The average quantity of maize produced increased by 71 percent, from 1.08 mt to 1.85 mt; and
- The average quantity of maize sold increased by 96 percent, from 0.58 mt to 1.14 mt.

However, non-P4P households reported similar outcomes and the differences between P4P and non-P4P households were not statistically significant. These substantial changes in agricultural productivity cannot, therefore, be attributed to participating in P4P.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2013 than in 2009 by almost any measure of welfare.

- Real incomes increased by 88 percent;
- The average household asset score increased by 7 percent;
- The real value of household livestock increased by 143 percent;
- The food consumption score increased by 7 percent; and
- The quality of the housing stock improved
    - Three percent of households replace thatch roofs with metal;
    - The percentage of households with dirt floors fell from 55 percent to 46 percent while the percentage with concrete floors increased from 43 percent to 51 percent; and
    - The percentage of households with mud or mud-brick walls fell from 83 percent to 71 percent with a corresponding increase in concrete walls.

However, non-P4P households experienced similar improvements and none of the changes observed with P4P households were significantly different from those experienced by non-P4P households.

[9] The yield estimates reflect averages over regions and seasons.

INTRODUCTION

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[10] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[11]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to be active market participants is at the center of all the strategies and WFP buys directly from FOs in almost all of the pilot countries. When the opportunities existed, some countries integrated structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors into the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to support and engage their farmer members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

The country's P4P Story[12] recounts that in Tanzania WFP found a weak FO structure that provided limited support to smallholder farmers. A large network of Savings and Credit Cooperatives (SACCOs) existed to provide financial services to members. The 56 percent of the 4,078 active SACCOs in rural areas probably largely supported smallholder farmers since a majority of rural residents are engaged in agriculture. However, the SACCOs were legally prohibited from aggregating commodities, managing warehouses, or marketing agricultural products. Agricultural Marketing Cooperatives (AMCOs) were responsible for marketing but most were not functioning and those that were had very low capacities. In this environment, the Tanzania program elected to work with rural SACCOs to increase production while concurrently working to build the marketing capacity of the AMCOs and other organizations that served the marketing needs of the SACCOs.

[10] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.

[11] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

[12] Each of the 20 pilot countries is in the process of documenting its experiences with P4P from design to implementation. These reports are available in various stages of completion from the P4P Coordination Unit in Rome.

In short, P4P started with very low capacity FOs[13] with limited experience supporting smallholder farmers' production, little formal marketing experience, and limited to no infrastructure to support production or marketing.

From this low base, WFP selected about 30[14] SACCOs, AMCOs, networks of SACCOs, and associations to participate in P4P. An initial assessment found many of the community warehouses in the 30 intervention areas unsuitable and inadequately equipped to support smallholder aggregation and marketing. Consequently WFP invested directly in rehabilitating and equipping community warehouses for use by SACCOs' members and AMCOs. The overall strategy aims to connect these warehouses to an emerging warehouse receipt system (WRS) that will "expand farmers' access to credit, provide greater marketing flexibility, and facilitate access to new markets."[15] To build the capacities of the SACCOs and AMCOs to benefit from these investments, WFP and its partners have trained SACCOs members and leaders in topics including production, institutional capacity building, agri-business management, quality control, gender issues, and WFP procurement. On the demand side, WFP has supported the SACCOs by purchasing 10,287 mt of maize (8,824 mt) and beans (1,463 mt) from 29 P4P-supported SACCOs, AMCOs, and SACCOs networks.[16]

P4P-supported SACCOs and farmers were substantially better off in 2013 than in 2009 by almost any objective measure. For example, of 25 P4P-supported SACCOs and a random sample of 321 of their member farmers from which the country office collected data:[17]

- The percentage of surveyed P4P SACCOs reporting any marketing experience increased from 0 percent in 2009 to 72 percent (18 organizations) in 2013. Total quantities sold increased from no sales in 2009 to 2,337 mt in 2013, 37 percent of which represents sales of high-quality commodities to WFP.
- The average percentage of selected production, marketing, and quality services P4P SACCOs provided to their members increased by an average of 49 percentage points between 2009 and 2013. WFP and its partners emphasized these services during training.[18]
- The percentage of P4P-supported households using fertilizer increased from 17 to 28 percent and the percentage using certified maize seed increased from 29 percent to 33 percent. Increased use of productivity-enhancing inputs mirrored a 75 percent increase in maize yields (from 0.93 mt/ha to 1.63 mt/ha) and a 71 percent increase in the average quantity of maize produced (from 1.08 mt to 1.85 mt).
- The percentage of P4P households producing a surplus of maize increased from 67 percent to 80 percent, the average size of the surplus increased from 0.85 mt to 1.43 mt, and the average quantity sold increased from 0.58 mt to 1.14 mt.
- Household income increased by 89 percent in real terms between 2009 and 2013. Other measures of household welfare also increased including a 143 percent increase in the value of household livestock.

Trends in SACCO capacity and household production and welfare, however, do not constitute evidence that the observed changes are attributable to P4P. To credibly attribute changes to P4P it is necessary to compare these outcomes to those that *would have occurred had the SACCOs and households not participated in P4P*. This is the major challenge of assessing impact; that analysts cannot simultaneously observe outcomes under P4P and those under the counterfactual of not participating in P4P. This report applies appropriate analytical

[13] Throughout this report, "FO" refers to a generic farmers' organization while "SACCO" refers to the specific FO structure in Tanzania.
[14] The number of P4P-supported organizations has varied slightly throughout the five-year pilot but has hovered in the neighborhood of 30 organizations.
[15] Tanzania P4P Story.
[16] WFP procurement records through May 2014.
[17] The results reported below are all statistically significant with p-values≤0.10.
[18] These results differ from those in the report due to a different interpretation of data on service provision.

techniques to the data to estimate the causal effects of P4P on key indicators of SACCO capacity and smallholder farmers' production and marketing of staple commodities and on indicators of household welfare.

To make a credible case for impact, it is first necessary to understand the details of what WFP did in Tanzania so anticipated outcomes are not confused with the P4P "treatment." For example, increased access to storage is an important anticipated outcome of participating in P4P and an indicator of FO capacity in the P4P logframe. In Tanzania, however, WFP invested directly in rehabilitating storage facilities. Increased access to storage in Tanzania is therefore part of the P4P treatment and not an outcome of P4P. Following sections that articulate a results framework and describe data and methods used in the impact assessment, this report describes in detail the elements of the P4P treatment in Tanzania.

Separate sections of the report then examine the evidence of causal effects of P4P participation on selected indicators of SACCO capacity and household production, marketing, and welfare theoretically linked to participating in P4P. The final section of the report summarizes conclusions with respect to the impacts of P4P in Tanzania.

RESULTS FRAMEWORK

The results framework articulated in this section illustrates the interdependent, and often sequential, nature of anticipated P4P results and provides a context within which to interpret the findings and frame the conclusions. It is relevant at this juncture as a framework for understanding the relevance of the findings and analysis presented in the remainder of the report.

P4P is a capacity building program set within a market development framework. WFP's primary entry point in most countries, including Tanzania, is farmers' organizations (FOs). The overarching rationale for WFP's involvement is the hypothesis that channeling a portion of the organization's local and regional procurement to a point in the supply chain that is closer to smallholder producers (usually FOs) can provide the market necessary to catalyze other development partner's efforts to build FOs' organizational and marketing capacities. FOs more capable of identifying markets, adding value, and reliably meeting market demands will improve households' marketing opportunities and outcomes. Improved access to markets for households will increase returns to agriculture, provide an incentive for investing in production, and ultimately, lead to improvements in household welfare.

This is an obviously simplistic summary of a much more complex and nuanced development hypothesis. For instance, it makes no mention of the myriad barriers FOs and smallholder farmers face pursuing these outcomes. It does, however, illustrate the sequential and interdependent aspects of the pathway through which P4P expects to produce results.

Figure 4 and Figure 5 illustrate the results framework for FOs and households, respectively. The vertical dimension of the figures illustrates the hypothesized progression of FO and household results, respectively. The second column of each figure (the second column of both the marketing and production components of Figure 5) lists the primary indicators at each level of result. For FOs, improved organizational capacity supports enhanced marketing capacity which ultimately leads to sustainable market access. For households, changing marketing behavior produces favorable market outcomes which then provide the incentive to change production behavior which increases production and, coupled with improved market access, improves

the welfare of the household. On the horizontal dimension, moving right to left, the "facilitators" acknowledge some of the fundamental conditions necessary to support achievement of the results.

There are several other important things to note about the results frameworks outlined in Figure 4 and Figure 5.

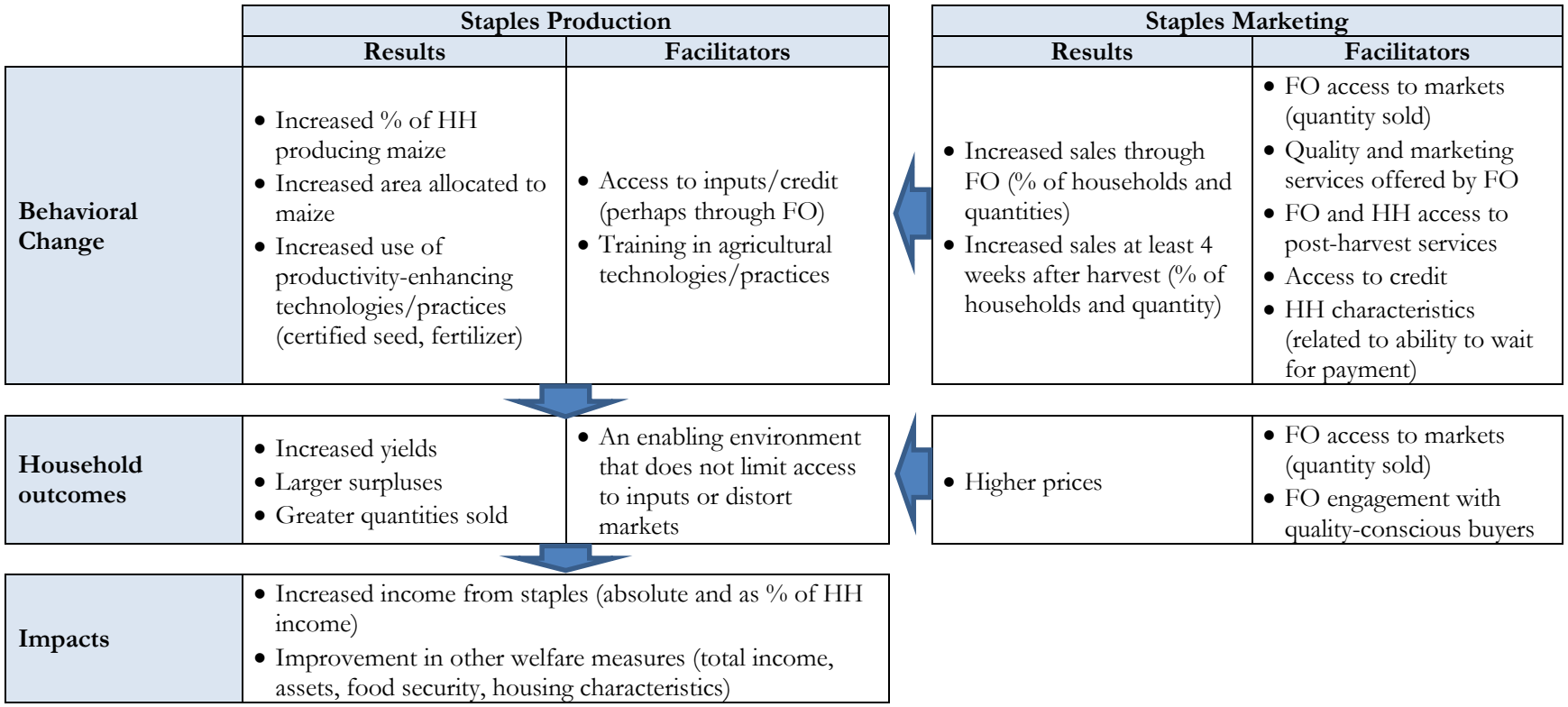
1. Household marketing and production results are not necessarily independent. For example, the development hypothesis posits that higher prices associated with selling through the FO (a household marketing outcome) will provide an incentive to invest in productivity-enhancing technologies and practices (a behavioral change in the production column). The interdependence of results therefore works horizontally and vertically in the household figure.
2. Results often depend on "facilitators", some of which fall within the remit of development partners' or governments.
3. Many FO results appear as facilitators in the household results framework. This implies that household results depend, in many cases, on FO results. The FO and household frameworks are therefore interdependent and household results may lag FO results. It is also possible that FO results may lag household results. For example, an FO may find it difficult to aggregate large quantities before achieving a level of trust with its members that will encourage them to sell through the FO.

The remainder of this section more fully articulates this framework, describes its components, and illustrates the interdependencies between anticipated results. It is organized around the four basic elements of FO capacity, household marketing, household production, and household welfare. Following a detailed description of the quantitative results, the conclusions section returns to the results framework articulated in this section to draw the quantitative and qualitative evidence together into a coherent story of the impact of P4P in Tanzania.

FIGURE 4: P4P RESULTS FRAMEWORK: FO CAPACITY

	Staples Marketing	
	Results	**Facilitators**
Organizational capacity	• Acquiring a business orientation • Planning for production and marketing • Increased services/training offered to members	• Access to post-harvest facilities and equipment • WFP procurement (catalyst) • Supply-side support (capacity building, infrastructure)
Marketing capacity outcomes	• Increased quantities aggregated and sold • Increased range of markets (including quality-conscious buyers) • Able to facilitate financing for members • Obtaining higher prices	• Creation of AMCOs • Consistent and sizeable WFP procurement • Trust of membership, transparency • Improved access to credit • FO engagement with quality-conscious buyers
Impacts	• Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)	

FIGURE 5: P4P RESULTS FRAMEWORK: HOUSEHOLD MARKETING, PRODUCTION, AND WELFARE



FO Capacity

Organizational capacity refers to the capacity of the FO to operate effectively to support its farmer members' agricultural endeavors, particularly in production and marketing. It encompasses the human and physical capacity required to aggregate, add value, and market staple commodities. Initial FO capacities, as documented in country assessments, varied substantially across the P4P pilot countries. Some countries (e.g., Tanzania, DRC) found few viable FOs with which to engage. Others (e.g., Ethiopia, Mali, Mozambique) found well established FOs, some of which had substantial marketing capacity. The rate at which countries are able to progress through the results framework will depend to some extent on the baseline situation with respect to FO and farmer capacity and facilitating factors at both the FO and household levels. When the capacity of P4P-supported FOs was particularly low, which it was in many countries, WFP and its partners often had to start organizational capacity building by establishing basic facilitating conditions. Important among these are:

- **Management capacity:** Building the organizations' internal management capacity. Capable management promotes financial viability, efficiency, and sustainability. It also contributes to operational and financial transparency which may foster members' trust in the FO, an important factor supporting participation and reliable aggregation. To support building management capacity WFP and its partners often train FO leaders and members in topics such as bookkeeping, financial management, group dynamics, and other topics.
- **External assistance:** Marshalling the technical, financial, and material assistance necessary to improve FOs' commodity management and marketing skills and farmers' knowledge of, and access to, productivity-enhancing technologies and practices. Training, in topics such as warehouse management, procurement procedures, negotiation, and production contribute to building these skills. In some countries, WFP and its partners help FOs build relationships with service providers such as financial institutions and input suppliers to help resolve barriers to aggregation and production.
- **Post-harvest infrastructure and equipment:** Establishing the storage infrastructure necessary to support aggregation and quality management. Equipment to clean, dry, grade, weigh, and bag commodities and storage facilities capable of maintaining quality are essential material capacities for marketing. Many countries found it necessary to enhance the quality and size of FOs' storage facilities and provide the equipment required to properly store and market commodities.
- **WFP's procurement:** Finally, access to a market will help provide the incentives for FOs and farmers to invest the time and resources to build these capacities. The basic tenet of P4P is that WFP's commitment to buy from FOs for a period of time will provide this market. Thus, the consistency and size of WFP's procurement is important; it must be large and regular enough to stimulate the necessary investments.

Establishing these facilitating conditions should contribute to improving organizational capacity. Relevant indicators of improved FO organizational capacity include:

- **Planning for production and marketing**: Planning is an important discipline that encompasses developing marketing strategies and predicting quantities that will be available from members. It may also provide farmers with some expectation that a market exists and thus ease aggregation.
- **Providing services to members**: FOs exist to provide services to their members and the greater the range and number of beneficial services they can offer, the more relevant they will be to the needs of their members. In the context of P4P, services associated with production and marketing are particularly germane. The ability to provide some services is contingent on facilitating conditions. For example, to provide storage and quality management services, an FO must have access to a warehouse and equipment and training in commodity management.

- **Facilitating members' access to inputs**: Smallholder farmers' access to productivity-enhancing inputs may be constrained by limited access to input markets or by financial considerations. FOs have facilitated members' access to inputs in a number of ways including providing inputs on credit, serving as a conduit for subsidized inputs provided by government programs, or by buying inputs in bulk at lower prices than farmers could obtain on their own.
- **Providing production training to members**: Access to inputs is not sufficient in itself to increase production. Farmers must also know how to use inputs correctly. Facilitating access to training on the appropriate use of a full range of other productivity-enhancing technologies and practices is another important role for FOs and one that reflects their overall capacity to serve members' needs.

As FOs become better managed and gain access to the infrastructure, equipment, and knowledge necessary to support production and marketing, they should become more capable marketing organizations. As with organizational capacity, a number of factors will facilitate improvements in marketing capacity. These include:

- **WFP's procurement**: WFP's procurement plays a central role in the P4P development hypothesis. By providing an assured and forgiving market for quality, WFP expects to create a window for capacity building – especially the capacity to reach quality-conscious buyers. Access to an assured market will also create the incentive for FOs to make the investments of time, energy, and money to build their capacities.
- **Access to marketing credit**: Limited access to credit is a major barrier to FOs' ability to aggregate and become reliable market participants. Many smallholder farmers do not have the financial capacity to wait for payment when they sell their crops. They need immediate cash to meet household expenses and to invest in inputs for the next season. In this environment, FOs without the ability to pay members prior to receiving payment from a buyer have trouble competing with traders who usually pay cash at the farm gate. This situation often leads to side-selling, when a farmer who has committed to sell through the FO sells instead to a different buyer. Volatile prices can exacerbate the problem of side selling. In 2010, volatile commodity prices in many east African countries contributed to side-selling when farmers (and FOs and even large traders) that had committed to selling to WFP sold to other buyers as prices rose above the WFP contract price in the interval between signing a contract and delivering the commodity. Widespread side-selling can cause an FO to default on contracts. For FOs without sufficient internal capital, access to marketing credit can give them the ability to buy from farmers at the time they deposit commodities, eliminating the problem of side selling, and make them more reliable sellers. Many P4P countries have focused on building relationships between FOs and financial institutions to address this issue. And in many instances, financial institutions have agreed to accept a contract with WFP as collateral for a marketing loan.

Organizational capacity building coupled with establishing the facilitating conditions for more effective marketing should contribute to improved marketing capacity outcomes. Relevant indicators of marketing capacity in the P4P context include:

- **Quantity sold**: The total quantity an FO is able to aggregate and sell is an obvious indicator of marketing capacity. It reflects not only the FO's ability to find markets but also its ability to aggregate members' surpluses which, in turn, reflects the organizational capacity of the FO.
- **Quantity sold to buyers other than WFP**: WFP will not commit to buying from an FO indefinitely in a capacity building role. For results to be sustainable, FOs must develop the capacity to identify and sell to buyers other than WFP, and preferably to buyers who are willing to pay a premium for value addition (quantity, quality, or other commodity characteristics).
- **Facilitating post-harvest financing to members**: Access to credit, a facilitating factor, may give an FO the ability to provide post-harvest financing to members thus extending members' feasible marketing options and improving the reliability of aggregation. Using credit or other sources of

capital to buy from members prior to a sale is only one technique for facilitating post-harvest financing. Some countries, including Tanzania, have supported warehouse receipt systems which can give farmers access to a loan secured by deposited commodities. In other countries, e.g., Burkina Faso, FOs may provide inputs on credit and then compel members to sell a sufficient quantity of commodities through the FO to cover the loan.

- **Prices**: An FO's ability to offer competitive prices will be an important consideration in farmers' decisions to sell through the FO. The prices an FO is able to obtain reflect its ability to identify markets where it has a competitive advantage, negotiate effectively, and deliver reliably. Prices are not the only consideration however. Others include the timeliness of payment and valuable services farmers receive from FO membership (e.g., credit, inputs, and training). Nevertheless, prices are a relevant indicator of FO marketing capacity.

The ultimate objective of FO capacity building under P4P is to leave in place an FO that can add value to members' commodities (through aggregation, quality, or transformation/processing) and sustainably access markets that appropriately compensate the FO for commodity characteristics. It is too early to assess the sustainability of P4P results but positive change in organizational and marketing capacity indicators may point to the sustainability of results.

Household Marketing

To fully benefit from improved FO marketing capacity, farmers must elect to sell through the FO. A small handful of farmers (eight percent of P4P farmers in Tanzania) reported selling through the FO at the time of the 2009 baseline. To extend results to a wider range of members, farmers must change their marketing behavior and begin selling their surpluses through the FO. Farmers collectively channeling larger quantities through the FO will further build the organization's capacity, further enhancing overall results.

As in the FO marketing capacity results framework, several factors are likely to facilitate behavioral change. Many of these are FO marketing capacity outcomes reflecting the P4P development hypothesis that stronger FOs will support better marketing and production outcomes for farmers. Facilitators of household marketing include:

- **Services provided by the FO**: Services provided to members through the FO serve several purposes. From the perspective of household marketing behavior, FO's that provide services relevant to improving their member's production and marketing outcomes are likely to earn members' trust and loyalty and capture a larger share of their marketed surplus. From the FO perspective, members' trust and loyalty can further strengthen the FO and its ability to aggregate effectively and reliably.
- **Household access to credit**: Few smallholder farmers have access to credit. Tanzania is an exception with 64 percent of P4P households reporting utilizing credit in 2009. This may be a result of FOs in Tanzania being SACCOs that are in the business of providing credit. Access to credit enhances a household's flexibility in marketing choices. With access to credit, a household may be able to choose to sell to a buyer that does not pay cash on the spot or to hold commodities into the lean season when prices are typically higher. As mentioned among the FO marketing outcomes, FOs may play a role in facilitating households' access to credit. The efforts of WFP and its partners to build relationships with financial institutions and establish warehouse receipt systems may also contribute to improved access to credit.
- **Quantities sold by the FO**: For farmers to choose to sell through the FO, the FO must be able to offer a market. The quantity the FO is able to sell is thus a critical facilitating factor in households' decisions to sell through the FO.

Choosing to sell more through an FO that earns its members' support by providing valuable services and a reliable market should ultimately lead to improved marketing outcomes for farmers. In the P4P context these outcomes may include higher prices or lower marketing cost (and thus higher net returns to the farmer). The P4P monitoring and evaluation system did not collect detailed data on marketing costs. The relevant indicator of improved marketing outcomes at the household level is thus higher prices.

Household Production

Better marketing outcomes should provide farmers the incentive and the means to invest in increasing productivity. The path to higher productivity begins with behavioral change (i.e., choosing to produce maize, allocating more area to maize production, investing in productivity-enhancing inputs and technologies) supported by favorable facilitating conditions, many of which are outcomes of FO capacity building. Relevant facilitators include:

- **Access to inputs**: Farmers' access to productivity-enhancing inputs may be constrained by access to input dealers, high prices, limited availability, or lack of knowledge of their use or benefits. FOs, governments, the private sector, and agricultural development organizations may all play a role in improving access to inputs and P4P countries have worked with each of these actors.
- **Access to credit**: In the context of production, access to credit is important as a facilitator of investment in productivity. Without access to credit, capital-poor households may not be able to purchase inputs, increase the area of land they cultivate, or invest in other practices that improve productivity (e.g., hired labor, mechanization). Credit need not be in the form of cash; it may also encompass in-kind schemes that advance inputs, machinery, or tools against future payment in crops.
- **Access to training in agricultural production practices**: As important as access to productivity-enhancing technologies and practices is the knowledge of how to use them appropriately. For example, farmers in El Salvador reported that the knowledge of when to plant and how and when to apply fertilizers and pesticides was perhaps more important to increasing productivity than access to the inputs themselves. WFP and its P4P partners have often supported access to inputs and the training required to use them correctly.

With these facilitating factors in place, anticipated behavioral changes include:

- **Households choosing to produce maize:** Maize is a primary staple in many P4P countries and, consequently, most households produce maize. In Tanzania, for example, 83 percent of surveyed households reported producing maize in 2009. There may, therefore, be little scope for increasing the percentage of households that cultivate maize in some countries.
- **Area allocated to maize production**: Allocating more land to maize production, either by changing cropping patterns or increasing the overall area of land a household cultivates, may also affect the quantity of maize produced.
- **Use of productivity-enhancing technologies and practices**: Improved access to inputs, recognition of their value in increasing productivity, access to credit, and market-driven incentives should lead to increasing investment in productivity-enhancing inputs and practices.

All other things being equal, these behavioral changes should increase yields, quantities produced, and quantities sold, the key household production indicators.

Household Welfare

Producing and selling larger quantities at higher prices will ultimately affect household welfare. Welfare is a broad concept with dimensions including income, wealth, nutrition, food security, and physical security to

name a few. The P4P proposal identified income as the primary household welfare measure. Because of the anticipated difficulty measuring relatively small changes in income, however, the P4P logframe identified several alternate welfare indicators. These include the household asset score (a simple summary of household assets), the value of household livestock (an important store of wealth in many cultures), and the food consumption score (an indicator of food security).

DATA AND METHODS

The impact assessment is based on a quasi-experimental design that compares outcomes for two groups of SACCOs and households; one group that is participating in P4P and a similar group that is not. Survey data collected from these two groups at several points in time track changes in anticipated outcomes during the implementation of P4P. The Tanzania country office commissioned surveys of P4P and non-P4P SACCOs every year of the five-year pilot and surveys of smallholder farmer members of the surveyed SACCOs in 2009 (baseline), 2011 (mid-term), and 2013 (final). Furthermore, the surveys tracked a panel of SACCOs and households, i.e., the same set of SACCOs and households in each survey.[19] Table 1 documents the size of the household sample. The sample of SACCOs consisted of 25 P4P and 25 non-P4P SACCOs and the dataset includes observations from each SACCO in every year. The 2010 SACCO survey results had to be discarded because of poor quality data. Therefore, the SACCO analysis incorporates only four years of data.

It was not feasible to randomly assign SACCOs to P4P and non-P4P groups (the best way to obtain truly comparable groups) and the Tanzania country office matched them loosely on similarity of size, marketing experience, location, and organizational capacity. The household survey targeted a random sample of households from each selected SACCO. Household sample sizes were roughly proportional to the number of SACCO members.

The surveys collected data on a variety of SACCO capacity and household production, marketing, and welfare indicators. For SACCOs these included data on services provided to members, storage capacity, marketing activity, and credit utilization, among others. The household surveys collected data on household characteristics; production; production practices; marketing activity; credit utilization; and income from crops, livestock, and off-farm sources, among others. The data collection instruments are available from WFP.

TABLE 1: HOUSEHOLD SAMPLE

	2009 (baseline)	2011	2013
Entire sample			
P4P households	402	410	382
Non-P4P households	410	399	369
Panel			
P4P households	321	321	321
Non-P4P households	343	343	343

The panel represents the subset of households for which data exist in all three years and is smaller than the overall sample because of attrition.

[19] Due to attrition, the size of the household panel (households interviewed in all three surveys) is smaller than the overall sample.

Data Analysis Methods

Analysis of the SACCO and household data employs a difference-n-differences (DiD) approach to estimate the causal effects of P4P on selected SACCO and household outcomes. The DiD estimator defines the impact of a program on a particular anticipated outcome as the relative changes in the average outcome measure over time between a "treatment" group affected by the program and a "control" group that is not affected, or:

$$Impact = \left(\bar{Y}_{1t_1} - \bar{Y}_{1t_0}\right) - \left(\bar{Y}_{0t_1} - \bar{Y}_{0t_0}\right) \quad (1)$$

where $\bar{Y}$ indicates the group mean of outcome measure Y; the subscripts *0* and *1* refer to control and treatment groups, respectively, and the subscript *t* refers to time with the subscripts 0 and 1 on *t* referring to pre- and post- program time periods respectively.

The non-parametric DiD estimator in equation (1) is appropriate only if the treatment and control groups are statistically equivalent, that is that differences are due only to chance. Statistical equivalence implies that the DiD impact estimate derived from equation (1) is due only to the treatment and not to other factors. Random assignment of experimental units (e.g., FOs or households) to treatment and control groups is the best way to ensure probabilistic equivalence. Except for Ghana, it was not possible to randomly assign FOs, or by implication, households, to P4P and non-P4P groups. Therefore, the simple estimator of equation (1) is not appropriate for Tanzania.

A generalization of the DiD estimator in a regression framework is more appropriate for cases where treatment and control groups are not equivalent. When the two groups are not statistically equivalent, the analysis needs to control for the differences to obtain reliable estimates of causal effects. One useful feature of the DiD estimator is that it completely controls for time-invariant differences between the two groups leaving only time-variant differences as possible confounders. The regression equivalent of the DiD estimator is:

$$Y_{it} = \alpha + \beta D_{it_0} + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (2)$$

where Y_{it} is the observed outcome for household *i* at time (survey) *t*, D_{it0} is a vector of indicators of whether household *i* is in the treatment group at time *t=0*, τ is a vector of indicators for each time period except *t=0*, D_{it} is an indicator of household *i* being in the treatment group for all $t \neq 0$, X_{it} is a set of control variables which may include interactions, and ε_{it} is the error term. The elements of the coefficient vector γ are the average impacts of the treatment on *Y* at time *t*.

With panel data the regression equation becomes:

$$Y_{it} - Y_{it-1} = \alpha + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (3)$$

where parameters are the same as those defined for equation (2).

Because Tanzania purchased much more maize than beans, the technical review panel that WFP convenes annually to guide P4P recommended in 2013 that the quantitative analysis of impacts focus on maize. Consequently, the impact assessment analysis considers only maize.

Comparability of P4P and Non-P4P Groups

The reliability of the DiD estimates of impact in the case of non-equivalent groups depends in part on the extent of their similarities and differences. Therefore, prior to assessing the impacts of P4P on SACCO capacity and farmers' productivity and welfare, the analysis examines the differences between the two groups. The SACCO and household comparisons rely on tests of the statistical significance of observed baseline differences between the two groups for a large number of indicators.

Comparability of SACCOs

Side-by-side tests of differences in means and proportions of 27 SACCO characteristics served to assess the baseline comparability of P4P and non-P4P SACCOs. Statistically significant differences between the two groups were:

- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to report having received external assistance to support agricultural production and marketing – 48 percent versus 12 percent for production assistance and 40 percent versus 8 percent for marketing assistance.
- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to provide production and marketing services – 9 percent versus 2 percent for production services and 15 percent versus 4 percent for marketing services. This result may well be related to the differences in access to external assistance.
- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to provide financing to their members between harvest and sale of commodities – 36 percent versus 8 percent.
- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to plan for production and marketing – 48 percent versus 20 percent.
- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to report access to storage – 30 percent versus 8 percent.
- P4P SACCOs were significantly **more likely** than non-P4P SACCOs to have sold under a contract – 12 percent (3 SACCOs) versus 0 percent. One of the three SACCOs that reported selling under contract is an AMCO (Wino) and the other two sell through a SACCOs network (Dunduliza).[20]

Table 17 in Annex A provides the full details of the tests for similarity between P4P and non-P4P SACCOs.

Comparability of Households

Side-by-side tests of differences in means and proportions of 75 baseline household characteristics found few significant differences. Statistically significant differences between the two groups were:

- The only statistically significant difference on the basis of household characteristics was that P4P households were significantly **less likely** than non-P4P households to be headed by a woman: 41 percent versus 49 percent.
- In terms of housing characteristics:
    - P4P households were significantly **less likely** than non-P4P households to have a concrete floor as opposed to dirt or wood – 56 percent versus 70 percent.
    - P4P households were significantly **less likely** than non-P4P households to have concrete brick walls as opposed to mud or mud brick – 84 percent versus 90 percent.
    - P4P households were significantly **less likely** than non-P4P households to have improved toilet facilities – 74 percent versus 82 percent.
- In terms of agricultural production:

[20] Tanzania P4P Story and intervention mapping data.

    - P4P households were slightly **more likely** than non-P4P households to cultivate maize – 95 percent versus 92 percent.
    - P4P households were significantly **more likely** than non-P4P households to report that their SACCO facilitated access to production inputs – 22 percent versus 15 percent.
    - P4P households were significantly **more likely** than non-P4P households to report producing a surplus of maize – 67 percent versus 60 percent.
- In terms of marketing activity:
    - P4P households were significantly **more likely** than non-P4P households to report selling maize through the SACCO – 13 percent versus 5 percent. They also reported selling a larger share of their surplus maize through the SACCO – 9 percent versus 3 percent.
    - Conversely, P4P households were significantly **less likely** than non-P4P households to report selling maize somewhere other than through the SACCO or at the farm gate – 82 percent versus 89 percent – and reported selling a smaller share of their surplus maize elsewhere – 74 percent versus 85 percent.
- P4P households were significantly **more likely** than non-P4P households to report obtaining a loan for a non-agricultural business – 23 percent versus 11 percent – and the average loan size was significantly larger – 242,738 shillings compared to 88,353 shillings.
- P4P households reported a significantly **higher** household asset score than non-P4P households – 9.00 compared to 8.68.
- P4P households reported spending significantly **more** than non-P4P households raising animals – 97,514 shillings compared to 60,489 shillings.
- P4P households reported spending significantly **more** than non-P4P annually on household items – 377,388 shillings compared to 321,224 shillings.

Table 18 in Annex A provides the full details of the tests for similarity between P4P and non-P4P households.

P4P IN TANZANIA

To determine the impact of the P4P "treatment" in Tanzania, it is necessary to know what the treatment was. The P4P development hypothesis implies that the treatment is merely WFP's commitment to buy from selected FOs. WFP's procurement would then catalyze the activities of other partners working to strengthen FOs and improve farmers' productivity. However, many P4P programs purposely selected FOs based in part on the presence of development partners working to build the capacities of the FOs. Furthermore, country programs often directly supported capacity building activities, e.g., conducted training, provided infrastructure and equipment. In Tanzania, in particular, the country office trained SACCOs and invested heavily in rehabilitating and equipping warehouses. In this context, participating in P4P implies a multi-faceted treatment that may vary across participating SACCOs.

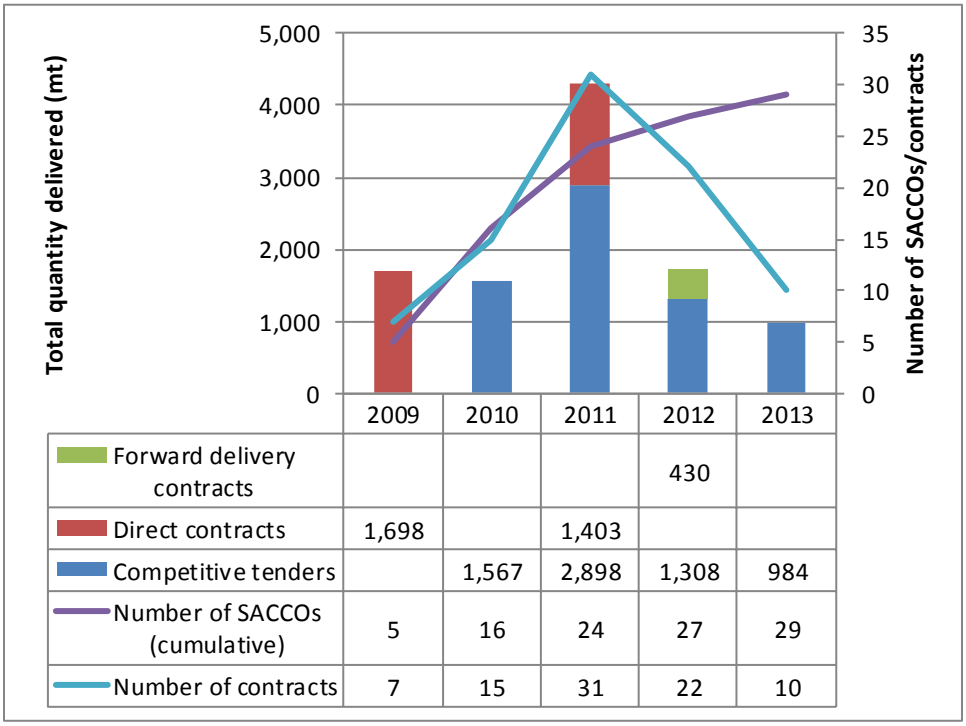
The remainder of this section documents characteristics of the P4P treatment for individual SACCOs in Tanzania in terms of WFP procurement, investments in infrastructure and equipment, and training. These data will define the dimensions and intensity of the P4P *treatment* applied to individual SACCOs and help identify the characteristics of the treatment that influenced particular outcomes. In the Tanzania context, the broad dimensions of the treatment are WFP procurement, investments (largely in infrastructure and equipment), and training. Because, in most cases, WFP's development partners were already working with participating FOs, coordinated their activities closely with WFP, and were often funded by WFP, the impact assessment considers their activities to be part of the P4P treatment rather than an outcome of the treatment.

WFP Procurement

The P4P development hypothesis implies that the size and consistency of procurement matters. WFP's commitment to purchase from a SACCO is expected to provide the SACCO the space to build capacity with a patient buyer. The stimulus should also be large enough to provide member farmers with the incentive to invest in increasing production. This implies a consistent level of procurement large enough to represent a meaningful sale volume for individual farmers.

Between P4P's inception in 2009 and May 2014, WFP purchased 1,463 mt of beans and 8,824 mt of maize from P4P SACCOs in Tanzania.[21] The quantities WFP procured varied throughout the course of the pilot, largely due to programmatic requirements external to the P4P program (Figure 6). WFP could determine the procurement modality; the number of SACCOs from which it purchased; the number of contracts awarded to each SACCO (excluding competitive tenders where WFP could not control the outcome); and by implication, the quantities contracted from each SACCO.[22]

FIGURE 6: WFP PROCUREMENT FROM P4P SACCOS BY YEAR AND MODALITY



	2009	2010	2011	2012	2013
Forward delivery contracts				430	
Direct contracts	1,698		1,403		
Competitive tenders		1,567	2,898	1,308	984
Number of SACCOs (cumulative)	5	16	24	27	29
Number of contracts	7	15	31	22	10

Source: WFP procurement records.

Figure 6 illustrates that, over the course of the five-year pilot WFP switched from relying exclusively on direct contracts to using only competitive tenders. By the end of the pilot, WFP had registered 29 SACCOs and other organizations (AMCOs, networks, associations) as WFP suppliers and contracted at least once from all of them. It had contracted in only one year from 6 (21 percent), in two years from 6 (21 percent), in three years from 11 (39 percent), and in four years from 5 (18 percent). Table 2 summarizes additional procurement details. These data suggest that WFP provided a reasonably consistent and meaningful procurement stimulus.

[21] Source: WFP procurement records. The most recent available data cover the period from inception (2009) to May 2014.
[22] With competitive tenders, the CO could control only the number of tenders it issued, and their size, but could not directly control the individual SACCOs that won tenders.

TABLE 2: PROCUREMENT DETAILS

	Maize	Beans	Total
Number of contracts	69	16	85
Average contract size (mt)	188	141	179
Number of contracts at least partially delivered	53	12	65
Average quantity delivered on contracts at least partially delivered (mt)	164	137	141
Average default rate (% defaulted)	35%	28%	34%

Table 24 and Table 20 in Annex B document quantities contracted by and delivered to WFP, respectively, by SACCO and year and clearly illustrates the characteristics of the procurement stimulus for individual SACCOs. Table 20 also documents a relatively high default rate (37 percent overall) which further emphasizes the low capacity of many SACCOs.

Investments in Infrastructure and Equipment

The Tanzania P4P program directly invested in improving warehousing capacity for P4P SACCOs. Chief among these investments was rehabilitating and constructing warehouses and furnishing them with scales, moisture analyzers, pallets, and other equipment necessary to aggregate, clean, store, and market high quality commodities.

During the 2009-2013 period, WFP provided the funding to construct 1 warehouse and to rehabilitate 20 others. In addition, it partially funded the rehabilitation of three warehouses and provided 8 rubhalls (temporary warehouses). According to data provided the by Tanzania country office,[23] all of the supported SACCOs had access to storage prior to P4P. These were most often community warehouses that were in poor condition and not owned by the SACCOs. In addition to rehabilitating many of the warehouses, WFP also helped SACCOs negotiate agreements with the communities to rent the facilities.[24]

Investments in warehouses do not appear to have changed access to storage (assuming that SACCOs could use community warehouses prior to P4P) or ownership status. However, it did substantially improve the quality of storage facilities and the overall capacity. Warehouse construction, rehabilitation, and providing temporary rubhalls increased the total storage capacity available to the 23 SACCOs from 7,500 mt to 8,500 mt and the average capacity from 300 to 340 mt.[25] Ten of the rehabilitated warehouses have met Tanzanian Warehouse Licensing Board criteria and are currently being registered as part of the Warehouse Receipt System. Only 6 of the SACCOs own the warehouses they use, 11 rent them, and 8 have other arrangements for using the warehouses.

WFP also directly provided (loaned) other equipment necessary to test, improve, and maintain commodity quality during storage; process grains; and prepare commodities for marketing. Table 3 summarizes WFP's investments in infrastructure and equipment during the P4P pilot.

Table 21 and Table 22 in Annex B document infrastructure and equipment investments for individual SACCOs.

[23] Tanzania intervention mapping data.
[24] Tanzania Follow-up Report. WFP/AERC. 2013.
[25] Tanzania intervention mapping data.

TABLE 3: INVESTMENTS IN INFRASTRUCTURE AND EQUIPMENT

Type of investment	Number of units	Number of SACCOs	Total value (USD)
Warehouse rehabilitation/construction	24	24	108,214
Rubhalls	8	6	154,760
Tarpaulins	28	26	62,496
Fumigation sheets	4	4	11,904
Weighing scales	27	26	27,567
Stitching machines	36	28	32,148
Generators	28	25	4,172
Pallets	1,040	23	41,600
Sampling Spears	19	19	38
Moisture analyzers	10	10	24,550
Fire extinguishers	22	21	15,12.5
Milling machines	1	1	2,633
Total value of investment			470,082

Sources: Tanzania intervention mapping data and investment schedules.

Training

Training is also an important element of capacity building for SACCOs and for farmers. WFP or its partners trained SACCOs and farmers in topics related to SACCO management, gender issues, post-harvest handling, production, and doing business with WFP. Partners provided training in agribusiness management, credit and finance, and production with no technical support from WFP. In all other topics, WFP played an active role in training.

WFP also either fully or partially funding all training activities. According to data provided by the Tanzania country office, WFP appears to have financially supported all of the training in 2009; topics included post-harvest handling and WFP procurement. In 2010, training expanded to cover all topics and partners played a large role in providing training and shared costs with WFP. Partners' large role in training continued in 2012 and 2013 but WFP appears to have covered all the costs.[26]

TABLE 4: SUMMARY OF TRAINING ACTIVITIES

Training topic	Number of FOs trained	Number of individuals trained	Trainer(s)	Funding
Agribusiness management	25	2,142	Partners	WFP & partners
Credit and finance	25	1,624	Partners	WFP & partners
Institutional capacity building	25	2,886	WFP & partners	WFP & partners
Gender	25	1,280	WFP & partners	WFP & partners
Monitoring and evaluation	25	1,962	WFP & partners	WFP & partners
Post harvest handling, storage, quality control	25	7,677	WFP & partners	WFP & partners
Production and productivity	25	9,111	Partners	WFP & partners
WFP procurement and payment procedures	25	4,258	WFP & partners	WFP & partners
Other	1	46	WFP & partners	WFP & partners

[26] Data from Tanzania CO intervention mapping exercise.

Source: Tanzania intervention mapping data.

Table 23 in Annex B documents training activities conducted with individual SACCOs.

IMPACT OF P4P ON SACCO CAPACITY

This section estimates changes in SACCO capacity that can be attributed to participating in P4P. The presentation is organized around the results framework of Figure 4, looking first at organizational capacity and then at intermediate outcomes. Each section presents evidence of changes in facilitating factors and links them to changes in anticipated results.

The analysis first compares trends in indicators between P4P and non-P4P SACCOs in a visual format that intuitively illustrates differential trends in outcomes. The visual presentation, however, does not control for other factors that may affect outcomes. Consequently, the second sub-section presents more rigorous DiD estimates of the impact of P4P on the indicators of SACCO capacity that control for differences between P4P and non-P4P SACCOs. The DiD analyses include variables to control for differences between P4P and non-P4P SACCOs. Table 5 summarizes the covariates used in the analysis of the impacts of P4P on SACCOs. **Error! Reference source not found.** in Annex **Error! Reference source not found.** describes e variables used in the analyses of SACCO impacts.

TABLE 5: COVARIATES USED IN ANALYSIS OF SACCO IMPACTS

Variable name	Variable description	Baseline values				
		P4P status	N	Mean	Median	Standard deviation
	Number of years since SACCO established	P4P	100	2.28	3.00	3.39
		Non-P4P	100	4.24	3.00	3.68
	Number of members at baseline	P4P	100	538	412	437
		Non-P4P	96	359	234	440
	Number of employees at baseline	P4P	100	8.32	9.00	1.72
		Non-P4P	100	8.48	9.00	1.71
	Indicator of receiving external assistance at baseline	P4P	100	0.96	1.00	0.20
		Non-P4P	100	0.96	1.00	0.20

Impact of P4P on Organizational Capacity

Organizational capacity refers to the human and physical capacity of an organization to effectively manage commodity aggregation, value addition, and marketing. WFP's procurement, its direct investments in rehabilitating and equipping warehouses, and the external assistance it brought to bear on the SACCOs significantly improved the facilitating conditions necessary to support improvements in organizational capacity. Indicators of organizational capacity relevant in the Tanzania context include services SACCOs are able to provide to members, including production training and access to inputs, and planning for production and marketing.

Visual Inspection

The results framework of Figure 4 suggests that access to post-harvest infrastructure, WFP's procurement, and other supply-side support are important factors facilitating improvements in organizational capacity. The intervention records provided by the Tanzania country office indicate that all P4P SACCOs received training in agribusiness management; credit and finance; institutional capacity building; gender; monitoring and evaluation; post-harvest handling; storage and quality control; production and productivity; and WFP procurement and payment procedures (Table 4). If they were effective, these trainings would have contributed directly to the SACCOs' capacities to provide many of the services. Furthermore, WFP's investments in warehouses and equipment directly built the capacities of 27 P4P SACCOs to provide quality and value addition services (Table 3). Participating in P4P has thus directly influenced SACCOs' ability to provide many of the services. The capacity to put knowledge into practice and use equipment is not necessarily part of the treatment although it may be driven, in part, by sales to WFP and the need to meet WFP's quantity and quality requirements.

WFP's commitment to provide a market for high quality commodities should have catalyzed supply-side support. Panels 1 and 2 of Figure 7 show changes in the types of external assistance SACCOs reported receiving over the course of the five-year pilot. Interestingly, almost all P4P and non-P4P SACCOs reported receiving external assistance in organizational strengthening and post-harvest management. At the time of the 2009 baseline, P4P SACCOs were significantly more likely than non-P4P SACCOs to have received external assistance only with production and marketing. All other baseline differences were not statistically significant.

Between 2009 and 2013, P4P SACCOs reported substantially greater growth than non-P4P SACCOs in the receipt of production, marketing, infrastructure, and input assistance. Some of this growth reflects WFP's direct investments in human and physical capacity but much of it is due to the activities of WFP's partners. In short, P4P appears to have catalyzed supply-side support to build important organizational capacities.

Finally, the consistency and size of WFP's procurement is also an important facilitating factor in building organizational capacity. The "WFP Procurement" section on page 15 summarizes WFP's procurement from P4P SACCOs and concludes that WFP provided a reasonably consistent and sizable procurement stimulus. Panel 3 of Figure 7 documents WFP's procurement during the P4P pilot.

The improved facilitating environment should have contributed to improved organizational capacity as measured a greater range of services offered to members, the ability to facilitate members' access to production inputs and provide production training to members, and greater use of planning for production and marketing.

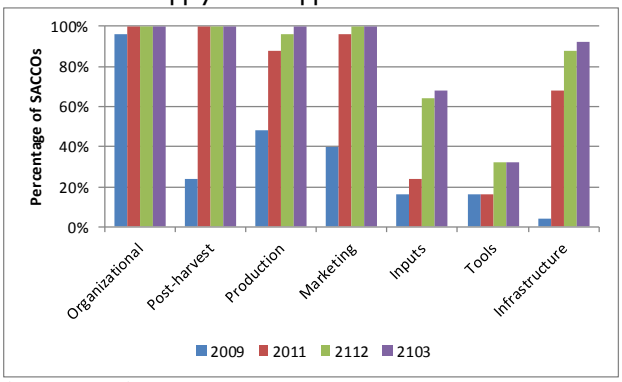
The FO survey asked whether SACCOs provided a range of 18 different services; too many to examine individually. The services fall into four categories; value addition, quality, production, and marketing.[27] The analysis aggregates the services into these four categories and defines the service capacity indicators as the percentage of the services within a category the SACCO provides. Panels 1 and 2 of Figure 8 illustrate trends in the average percentage of services offered by P4P and non-P4P SACCOs, respectively.

[27] The value addition category includes two services; small-scale food processing and milling. The quality category includes eight services; drying commodities, cleaning commodities, removing small/broken grains, removing discolored grains, use of storage facilities, use of cleaning facilities, use of drying equipment, and fumigation. Production includes five services; technical assistance in agricultural technologies and practices, supplying agricultural inputs, facilitating access to inputs, maize threshing/shelling, and draft power. Marketing includes the three services of transporting good to buyers/markets, weighing and bagging, and aggregating commodities for sale.

Figure 8 shows a substantial increase in the average percentage of quality and marketing services offered by P4P SACCOs with much smaller increases in production and value addition services. While non-P4P SACCOs exhibit some growth in each service category, it is nowhere near that of the P4P SACCOs.

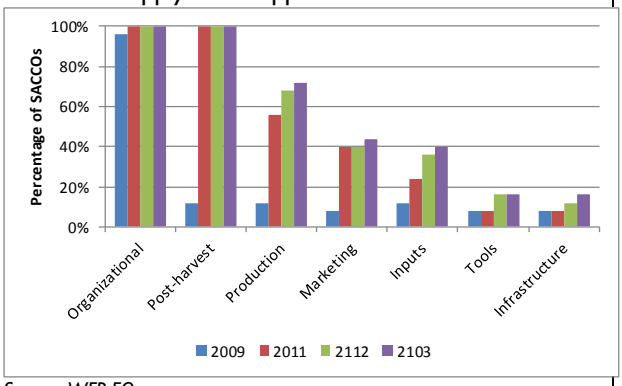
FIGURE 7: ORGANIZATIONAL CAPACITY FACILITATORS

Panel 1: Supply-Side Support to P4P SACCOs



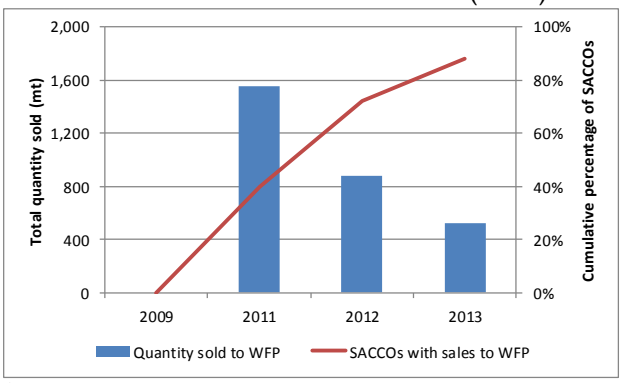
Source: WFP FO surveys.

Panel 2: Supply-Side Support to Non-P4P SACCOs



Source: WFP FO surveys.

Panel 3: WFP's Procurement Stimulus (Maize)



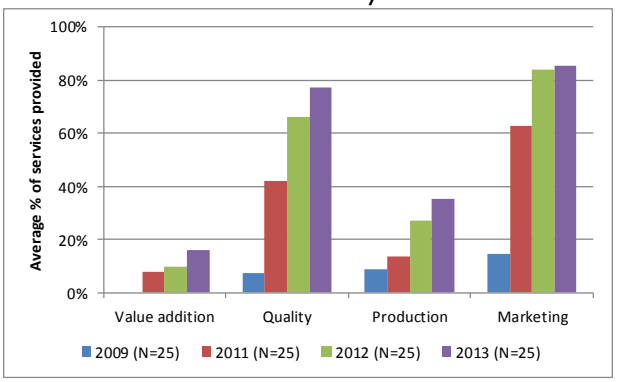
Source: WFP procurement records.

At the time of the baseline, P4P SACCOs offered a significantly greater percentage of production and marketing services than did non-P4P SACCOs (independent group t-test, $0.05>p<0.10$). Furthermore, growth in the percentage of quality and marketing services offered by P4P SACCOs (the two categories of services on which P4P focuses) significantly outstripped growth among non-P4P SACCOs in every time period (independent group t-test, $p <0.01$). Growth in production services was significantly greater among P4P than non-P4P SACCOs in 2012 and 2013.

The growth in the percentage of P4P SACCOs that reported facilitating access to inputs for members (either by providing them on credit or subsidizing their cost), providing production training, and planning for production and marketing also increased relative to non-P4P SACCOs suggesting that P4P had an impact on these indicators. All of these indicators are expressed in cumulative terms (i.e., once a SACCO reports having the capacity, it is assumed to have the capacity in all subsequent periods).

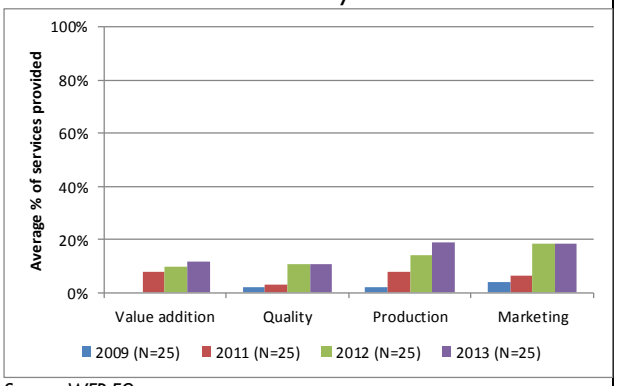
FIGURE 8: ORGANIZATIONAL CAPACITY INDICATORS

Panel 1: Services Provided by P4P SACCOs



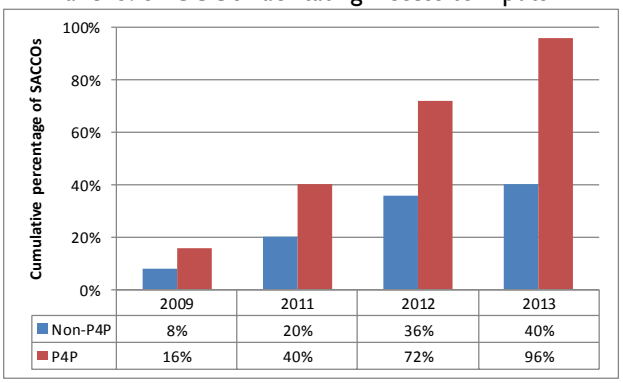
Source: WFP FO surveys.

Panel 2: Services Provided by Non-P4P SACCOs



Source: WFP FO surveys.

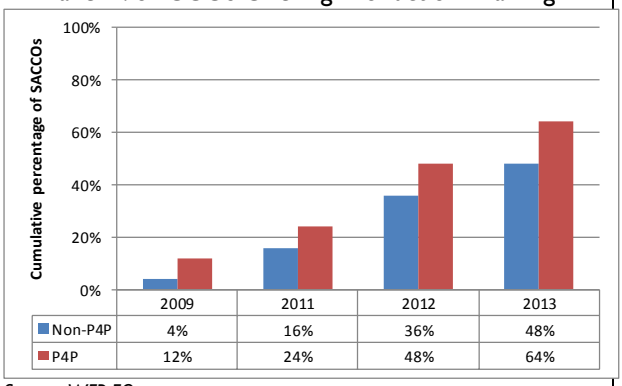
Panel 3: SACCOs Facilitating Access to Inputs



	2009	2011	2012	2013
Non-P4P	8%	20%	36%	40%
P4P	16%	40%	72%	96%

Source: WFP FO surveys.

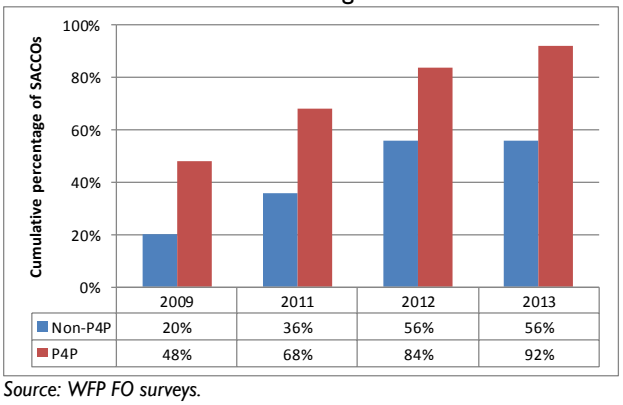
Panel 4: SACCOs Offering Production Training



	2009	2011	2012	2013
Non-P4P	4%	16%	36%	48%
P4P	12%	24%	48%	64%

Source: WFP FO surveys.

Panel 5: SACCOs Planning for Production and Marketing



	2009	2011	2012	2013
Non-P4P	20%	36%	56%	56%
P4P	48%	68%	84%	92%

Source: WFP FO surveys.

DiD Estimates of the Impact of P4P on Organizational Capacity

The visual inspection concluded that WFP had provided a reasonably consistent and sizeable procurement stimulus to P4P SACCOs while non-P4P SACCOs reported no sales. It also documented the substantial improvements in warehousing infrastructure and equipment directly attributable to WFP investments through

P4P. Finally, analysis of the data on external assistance provided to SACCOs found that P4P SACCOs access to assistance with infrastructure and inputs increased significantly relative to non-P4P SACCOs. The increase in assistance with infrastructure relates directly to WFP's investments in warehousing and is part of the P4P treatment. The increased assistance with inputs, however, is an outcome of participating in P4P. Thus, participating in P4P has directly improved the facilitating environment for SACCOs' organizational capacity outcomes.

Table 6 reports DiD estimates of the impact of participating in P4P on key organizational capacity indicators. The underlying data are from the panel of 25 P4P and 25 non-P4P SACCOs collected in 2009, 2011, 2012, and 2013. Estimated coefficients reflect the marginal impact of participating in P4P on the outcome of interest. A negative value does not necessarily mean that the value of the outcome declined, *it means it declined for P4P SACCOs relative to non-P4P SACCOs.*

TABLE 6: DID ESTIMATES OF THE IMPACT OF P4P ON SACCOS' ORGANIZATIONAL CAPACITY

Model	Impact (coefficient/p-value)				N	R^2
	2009-2011	2011-2012	2012-2013	2009-2013		
Percentage of value addition services provided (cumulative %)	0.0022 (0.9720)	0.0047 (0.8780)	0.0447 (0.2450)	0.0516 (0.4970)	147	0.0425
Percentage of quality services provided (cumulative %)	0.3631*** (0.0000)	0.1504* (0.1000)	0.1187*** (0.0050	0.6322*** (0.0000)	147	0.2558
Percentage of production services provided (cumulative %)	0.0154 (0.7540)	0.0637 (0.2050)	0.0570 (0.2880)	0.1361* (0.0740)	147	0.0491
Percentage of marketing services provided (cumulative %)	0.4416*** (0.0000)	0.0788 (0.3130)	0.0171 (0.5200)	0.5376**** (0.0000)	147	0.4075
Likelihood of facilitating access to inputs (cumulative %)	0.0935 (0.3620)	0.1318 (0.2950)	0.1768* (0.0800)	0.4020* (0.0620)	147	0.1181
Likelihood of providing production training (cumulative %)	0.0075 (0.9360)	0.0441 (0.7260)	0.0475 (0.6590)	0.0991 (0.5750)	147	0.0603
Likelihood of planning for production and marketing (%)	0.0242 (0.8910)	-0.1058 (0.5210)	0.3625** (0.0260)	0.2810 (0.1400)	147	0.1456

Numbers in parentheses are p-values.
** significant at p< 0.10*
*** significant at p< 0.05*
**** significant at p< 0.01*

The estimates in Table 6 show that participating in P4P significantly increased the average percentage of quality and marketing services provided by P4P SACCOs. Participating in P4P significantly increased the provision of quality services in each time period while the impact on marketing services was detectable as significant only when comparing the situation in 2009 to that in 2013. This result is consistent with expectations since WFP focused first on providing quality management infrastructure and equipment and training SACCOS in its use. All P4P SACCOs received this support within the first two years of the pilot. WFP's procurement, and thus SACCOs' direct engagement in marketing, evolved more slowly.

The training provided through P4P focused largely on marketing and quality so it is not surprising to see P4P SACCOs progressing more quickly towards acquiring these capacities than their non-P4P counterparts. In this context, changes in the provision of services could be viewed as part of the P4P treatment, i.e., direct outputs of participating in P4P. However, to the extent that sales to WFP and, importantly, others appear to coalesce the learning into actual service provision, it is an anticipated outcome of P4P as well.

P4P SACCOs were also significantly more likely than non-P4P SACCOs to begin facilitating members' access to inputs. As with marketing services, this impact did not emerge until the 2011-2013 time period.

Similarly, planning for production and marketing would be expected to move in tandem with marketing experience. The fact that it is a significant impact of P4P only in the final time period supports this interpretation.

Table 7 summarizes the statistically significant SACCO organizational capacity results.

TABLE 7: SUMMARY OF SACCO ORGANIZATIONAL CAPACITY RESULTS

Impact	Change relative to non-P4P SACCOs (percentage points)			
	2009-2011	2011-2012	2012-2013	2009-2013
Average percentage of eight quality services provided	36	15	12	63
Average percentage of three marketing services provided	44			54
Average percentage of five production services provided				14
Percentage of SACCOs facilitating members' access to inputs			18	40
Percentage of SACCOs planning for production and marketing			36	

Impact of P4P on SACCOs' Marketing Capacity

In Tanzania, WFP focused not only on building the capacities of P4P-supported SACCOs. It also had to build the capacities of organizations such as AMCOs, networks, and associations to act as marketing agents for the SACCOs which are legally prohibited from aggregating or selling agricultural commodities. A comparison of marketing capacities between P4P and non-P4P SACCOs therefore implicitly measures the combined impact of both levels of capacity building and the work WFP has done to make connections between SACCOs and marketing organizations. This section follows the format of the previous section by illustrating results in a visual format before presenting formal DiD estimates of impact.

Visual Inspection

Previous sections have already documented trends in WFP's procurement, a factor facilitating SACCO marketing outcomes. P4P and non-P4P both reported uneven trends in utilizing credit, another important facilitating factor (Figure 9). However, from 2011 onward, P4P SACCOs have seen more consistent growth in utilization of credit than non-P4P SACCOs and by 2013 P4P SACCOs appear to be much more likely than non-P4P SACCOs to have received loans.

Consistent with the development hypothesis, improvement in these facilitators appears to be associated with improvements in intermediate marketing outcomes. Panel 1 of Figure 10 shows substantial growth in total quantities sold, the number of SACCOs engaged in marketing, and the number of SACCOs selling to buyers other than WFP. It also shows a decreasing reliance on WFP as a market outlet, that is, the share of total quantity sold purchased by buyers other than WFP increases over time. Figure 10 does not show comparable sales figures for non-P4P SACCOs because none reported selling maize during the pilot period. P4P SACCOs also appear to have increased their capacity to facilitate financing to members by much greater margins than non-P4P SACCOs (Panel 2).

FIGURE 9: SACCOS' UTILIZATION OF CREDIT

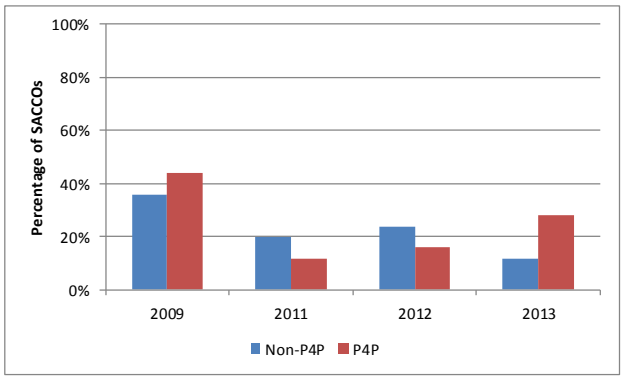
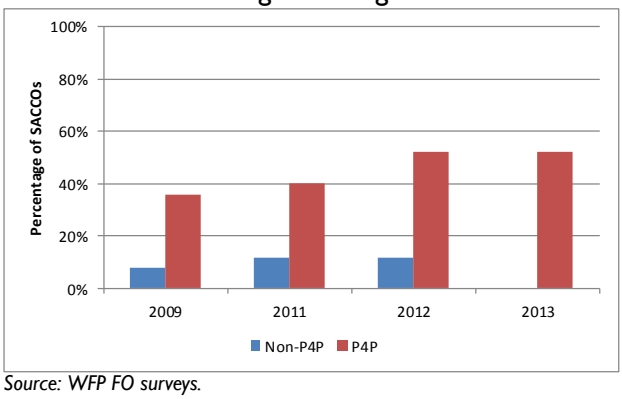


FIGURE 10: EVOLUTION OF SACCO MARKETING CAPACITY

Panel 1: P4P SACCOs' Marketing Activity

Source: WFP FO surveys.

Panel 2: Providing Financing to Members



Source: WFP FO surveys.

The data also suggest that P4P SACCOs sell more consistently than non-P4P SACCOs. The transition matrices of Figure 11 illustrate this dynamic. The percentage values in the table cells represent the percentage of cases where a SACCO moves from the row state in one period to the column state in the subsequent period. The numbers in parentheses are frequencies. Thus, 60 percent of P4P SACCOs that sold to buyers other than WFP in one period sold again in the immediately subsequent period. In the context of Tanzania's reliance on competitive tenders, this suggests that many P4P SACCOs developed the marketing capacity to consistently win competitive tenders. Forty percent of P4P SACCOs that did not sell to buyers other than WFP in one period did sell in the immediately subsequent period. The corresponding percentage among non-P4P SACCOs was 0 percent implying that sales to other buyers are one-off affairs.

The data also suggest that WFP provided a fairly consistent procurement stimulus. In 42 percent of cases when WFP bought from a SACCO, it did so again in the immediately subsequent period. And in 30 percent of cases when it did not buy from a particular SACCO, it purchased in the immediately subsequent period.

Visual inspection of the data also suggests that selling to WFP is weakly, if at all, associated with the capacity to sell to other buyers. Only half of the 18 SACCOS that sold to WFP ever reported sales to other buyers and only 2 sold to other buyers only after first selling to WFP.

FIGURE 11: CONSISTENCY OF MARKET ENGAGEMENT

Sales to other buyers: P4P

	Sales	No sales
Sales	60% (15)	40% (10)
No sales	40% (20)	60% (30)

Sales to other buyers: Non-P4P

	Sales	No sales
Sales	0% (0)	100% (3)
No sales	4% (3)	96% (69)

Sales to WFP: P4P

	Sales	No sales
Sales	42% (8)	58% (11)
No sales	30% (17)	70% (39)

Source: WFP FO surveys.
Note: The data in this figure reflect sales of maize and beans since non-P4P SACCOs reported no sales of maize.

SACCOs' ability to obtain prices that are higher than farmers can easily get on their own is another anticipated marketing outcome. All other things being equal, it is essential to a SACCO's ability to aggregate effectively and become a reliable supplier to buyers. The analysis draws on three primary sources for price information. In order of increasing reliability, it uses prices reported by respondents to the household survey, prices reported by respondents to the SACCOs survey, and prices obtained from WFP procurement records. Figure 12 illustrates differences in prices from several perspectives. Panel 1 shows the prices at which P4P SACCOs reported selling maize;[28] the price members received after the SACCO retained its share; the price WFP reported paying; and average annual maize prices obtain from the Food and Agriculture Organization's Global Information and Early Warning System.[29] Although the number of observations on sales by SACCOs is too small to support statistical tests, Panel 1 suggests several interesting conclusions:

- The average price SACCOs reported for sales to WFP matches almost exactly the (reliable) price data obtained from WFP procurement records.
- Prices associated with sales to WFP are higher than prices associated with sales to other buyers in 2011 and 2013. And even though SACCOs retain a larger share of revenue from sales to WFP, the share to farmers is larger than their share from sales to other buyers except in 2011. This suggests that, especially as SACCOs gained capacity, members of SACCOs that sold to WFP (P4P SACCOs) fared better than members of SACCOs that did not sell to WFP (non-P4P SACCOs).
- Prices are generally consistent with wholesale prices reported by FAO which also lends some credibility to the SACCO-reported data.

Panel 2 illustrates average prices reported by households by P4P status. Members of P4P SACCOs obtained significantly higher prices than members of non-P4P SACCOs in 2013. Panel 3 shows average prices reported by households separated by whether the household reported selling through the SACCO. The difference is statistically significant only in 2013. Taken together, the data presented in Figure 12 provide fairly compelling evidence that:

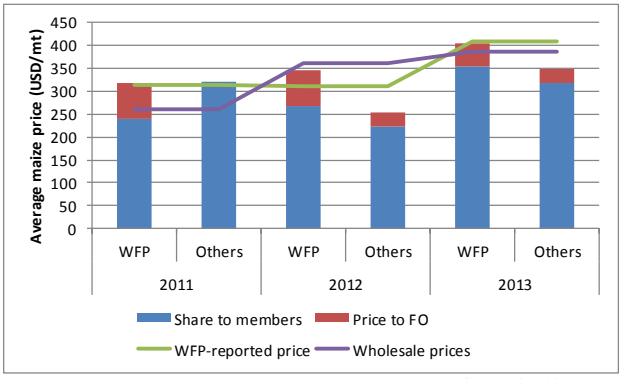
- SACCOs obtain higher prices selling to WFP than they do selling to other buyers.
- By 2013, P4P households were obtaining significantly higher prices than non-P4P households. Multiplying the USD 15/mt price differential between P4P and non-P4P households by the average quantity sold in 2013 (1.14 mt for P4P households and 1.16 mt for non-P4P households) suggests

[28] Non-P4P SACCOs reported no sales of maize.
[29] http://www.fao.org/giews/pricetool/

that P4P households earned, on average, about USD 17 more than non-P4P households from selling maize.

FIGURE 12: AVERAGE MAIZE PRICES

Panel 1: Average Maize Prices Reported by SACCOs



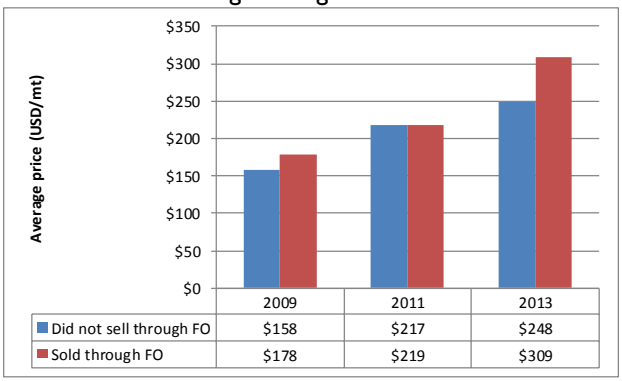
Source: WFP FO survey, WFP procurement records, and GIEWS(FAO).

Panel 2: Average Household Maize Prices by P4P Status

	2009	2011	2013
Non-P4P	$154	$216	$247
P4P	$159	$222	$262

Source: WFP household survey.

Panel 3: Average Household Maize Prices by Status of Selling Through the FO



	2009	2011	2013
Did not sell through FO	$158	$217	$248
Sold through FO	$178	$219	$309

Source: WFP household survey.

Table 8 presents DiD estimates of SACCO marketing outcomes. The estimates for the two indicators related to selling do not represent DiD estimates since comparisons with non-P4P SACCOs were not possible because they reported selling no maize. This implies that all marketing results for P4P SACCOs are entirely attributable to P4P. Reported results for SACCO marketing outcomes reflect the changes illustrated in Panel 1 of Figure 10. Statistically significant impacts on the likelihood of utilizing credit did not emerge until the period between 2012 and 2013 and P4P had no detectable impact on the likelihood that P4P SACCOs provided post-harvest financing to members.

TABLE 8: DID ESTIMATES OF THE IMPACT OF P4P ON SACCOS' MARKETING CAPACITY

Model	Impact (coefficient/p-value)				N	R^2
	2009-2011	2011-2012	2012-2013	2009-2013		
Likelihood of utilizing credit (%)	-0.1822 (0.2190)	0.0112 (0.9420)	0.2995** (0.0310)	0.1285 (0.4130)	147	0.0979
Likelihood of selling maize to buyers other than WFP (%)	0.0400	0.0800	0.1200	0.2400		
Average quantity of maize sold to buyers other than WFP (%)	27	25	121	172		
Likelihood of providing financing to members (%)	-0.0021 (0.9890)	0.1196 (0.3340)	0.1246 (0.3960)	0.2421* (0.0890)	147	0.0306

Numbers in parentheses are p-values.
** significant at p< 0.10*
*** significant at p< 0.05*
**** significant at p< 0.01*

Table 9 summarizes the statistically significant SACCO marketing capacity results.

TABLE 9: SUMMARY OF SACCO MARKETING CAPACITY RESULTS

Impact	Change relative to non-P4P SACCOs			
	2009-2011	2011-2012	2012-2013	2009-2013
Percentage of SACCOs utilizing credit (percentage points)			30	
Percentage of SACCOs selling to buyers other than WFP (percentage points)	4	8	12	24
Average quantity of maize sold to buyers other than WFP (mt)	27	25	121	172
Percentage of SACCOs providing financing to members (percentage points)				24

IMPACT OF P4P ON HOUSEHOLD PRODUCTION, MARKETING, AND WELFARE

The household analysis examines three broad categories of impacts aligned with the results framework of Figure 5; maize production, maize marketing, and household welfare. The sections on maize production and marketing present evidence of the impact of P4P on maize production and marketing "facilitators", behavioral change, and intermediate production and marketing outcomes. The household welfare section examines the combined effect of production and marketing on income and other measures of household wellbeing.

Each of the three main sections first presents the data in a graphical format that visually illustrates trends in the indicators over time for both P4P and non-P4P households and differences between the two groups. The analysis then presents DiD estimates derived from a regression model that incorporates covariates to control for factors other than participation in P4P that may influence the outcome measures differently for P4P and non-P4P households. Relevant covariates thus include factors that might be expected to differentially influence outcomes and which are exogenous to the treatment. Many of the candidate variables are not exogenous. For example, higher maize yields might indicate that a particular farmer is more likely to be using productivity-enhancing technologies or practices which are also anticipated outcomes of the treatment. For this reason, the regressions use baseline values for the selected covariates which are exogenous because they are measured prior to the treatment. Table 10 describes and summarizes baseline values for the covariates included in the analysis.

Not all of the covariates in Table 10 are expected to directly affect outcomes. For example, metal roofs are not likely to directly affect agricultural production. However, these covariates may well serve as proxies for unobservable factors that do influence production and P4P and non-P4P households reported significantly different values.

TABLE 10: COVARIATES IN HOUSEHOLD ANALYSIS

Variable name	Variable description	Baseline values				
		P4P status	N	Mean	Median	Standard deviation
Education	Indicator of HH head having at least a secondary education	Non-P4P	343	0.16	0.00	0.36
		P4P	321	0.14	0.00	0.35
Sex	Indicator of female HH head	Non-P4P	338	0.16	0.00	0.37
		P4P	315	0.15	0.00	0.35
Occupation	Indicator of HH head employed primarily in agriculture	Non-P4P	333	0.86	1.00	0.34
		P4P	312	0.89	1.00	0.31
Off-farm	Indicator of HH having income from off-farm source	Non-P4P	338	0.68	1.00	0.47
		P4P	317	0.69	1.00	0.46
Loans	Indicator of receiving loans for non-agricultural purposes	Non-P4P	343	0.26	0.00	0.44
		P4P	321	0.40	0.00	0.49
Leader	Indicator of HH member in FO leadership	Non-P4P	343	0.19	0.00	0.39
		P4P	321	0.15	0.00	0.35
Nfarming	Number of family members involved in farming	Non-P4P	343	2.52	2.00	1.44
		P4P	321	2.74	2.00	1.64
Labor	Indicator of employing hired labor in agriculture	Non-P4P	343	0.75	1.00	0.43
		P4P	321	0.76	1.00	0.43
Walls	Indicator of concrete or fired brick walls	Non-P4P	343	.090	1.00	.030
		P4P	321	0.83	1.00	0.37
Floor	Indicator of concrete floor	Non-P4P	343	0.70	1.00	0.46
		P4P	321	0.26	1.00	0.50
Toilet	Indicator of improved toilet facilities	Non-P4P	343	0.82	1.00	0.38
		P4P	321	0.74	1.00	0.44
Inputs	Indicator of FO facilitating access to inputs	Non-P4P	343	0.15	0.00	.036
		P4P	321	0.22	0.00	0.41
Surplus	Indicator of producing a surplus of maize	Non-P4P	322	0.60	1.00	0.49
		P4P	302	0.67	1.00	0.47
HHexp	Expenditures on household items	Non-P4P	343	321,224	237,256	315,659
		P4P	321	377,388	233,606	458,822

Location-specific characteristics such as weather, agricultural productivity, input availability, population, distance to urban centers, and transportation infrastructure might also influence agricultural production and marketing activity. To control for these factors, the covariate model included dummy variables for each of the ten regions containing surveyed SACCOs.[30] Table 11 summarizes selected characteristics of P4P operational regions extracted from the Tanzania P4P Story.[31]

[30] Factors relevant to production and marketing might be expected to vary within regions as well but, in the absence of readily accessible sub-national data, regional dummies strike a balance between more nuanced models using more granular location data and analytical tractability.
[31] Internal WFP document. Available from WFP.

TABLE 11: SELECTED CHARACTERISTICS OF P4P OPERATIONAL REGIONS

Region name	Number of P4P SACCOs/HH surveyed	Region characteristics
Kilimanjaro	2/18	Zone: Northern. P4P: Food-deficit. Proximate to WFP operations.
Manyara	4/43	Zone: Northern. P4P: Surplus-producing. Proximate to WFP operations. Limited production in 2009.
Arusha	2/8	Zone: Northern. P4P: Food-deficit. Proximate to WFP operations.
Kigoma	4/21	Zone: Lake. P4P: Surplus-producing. Proximate to WFP operations.
Kagera	4/81	Zone: Lake. P4P: Food-deficit. Proximate to WFP operations.
Dodoma	4/95	Zone: Central. P4P: Food-deficit. Proximate to WFP operations. Limited production in 2009.
Singida	2/12	Zone: Central. P4P: Food-deficit. Proximate to WFP operations. Limited production in 2009.
Rukwa	1/12	Zone: Southern Highlands. P4P: Surplus-producing. No WFP operations. Bumper crop in 2009.
Iringa	1/16	Zone: Southern Highlands. P4P: Surplus-producing. No WFP operations. Bumper crop in 2009.
Ruvuma	1/15	Zone: Southern Highlands. P4P: Surplus-producing. No WFP operations. Bumper crop in 2009. Targeted by AGRA for production assistance.

The P4P development hypothesis suggests that many of the anticipated household-level outcomes of P4P are contingent on selling through the SACCO. However, few surveyed households reported selling through the SACCOs. In fact, only 5 percent of non-P4P households and 22 percent of P4P households reported having sold through the SACCOs by 2013. In an attempt to isolate impacts for this group of households, a separate set of analyses estimated impacts for all household indicators using selling through the SACCOs as the treatment. Those analyses identified no significant impacts, perhaps because the numbers are very small, and the results are not reported here.

Impact of P4P on Household Maize Marketing

Following the outline of the results framework illustrated in Figure 5, this section first examines changes in the factors facilitating changes in household marketing behavior and then links them to observed changes in marketing decisions, i.e., the location and timing of sales. It then presents evidence of changes in facilitating factors for intermediate marketing outcomes and links them to observed changes in prices received for maize, the primary intermediate household marketing outcome.

Visual Inspection

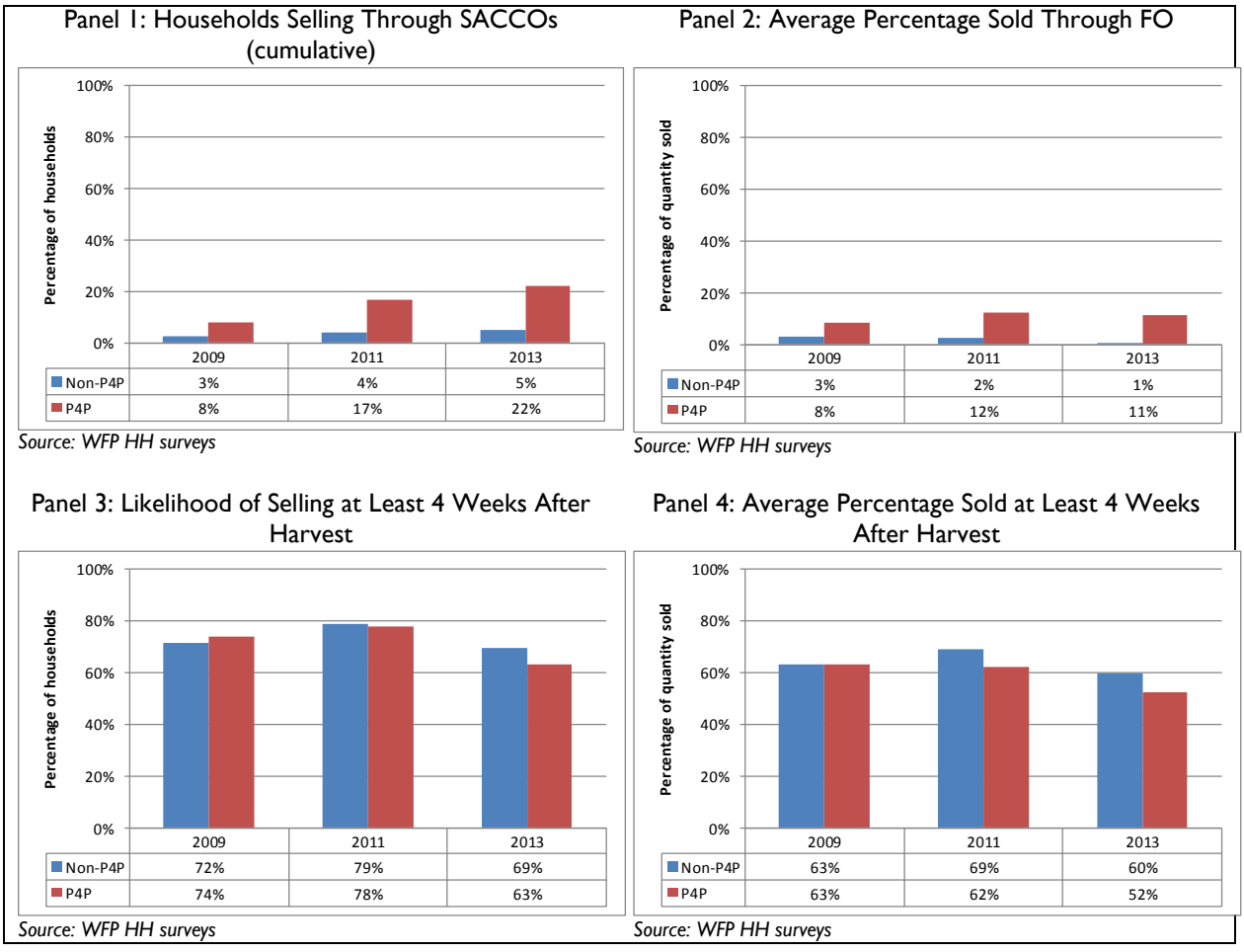
Visual inspection of the SACCO data suggest that P4P SACCOs increased the quantity of maize they sold relative to non-P4P SACCOs (Panel 1 of Figure 10); increased the percentage of production, marketing, and

quality services they provided to members relative to non-P4P SACCOs (Panels 1 and 2 of Figure 7), and were more likely than non-P4P SACCOs to provide post-harvest financing to members (Panel 3 of Figure 10). Thus P4P appears to have improved the conditions facilitating changes in household marketing choices, i.e., the location and timing of sales.

With respect to where households chose to sell their maize surpluses, P4P and non-P4P households appear to have followed different trends. Relatively few households in either group reported selling maize through the SACCO. However, the percentage of P4P households selling through the SACCO and the average percentage of their surplus they channeled through the SACCO increased over time compared to relative flat or declining trends among non-P4P households (Panels 1 and 2 of Figure 13). The differences between P4P and non-P4P households with respect to the percentage selling through the SACCO and the average percentage of marketed surplus sold through the SACCO were statistically significant in all three time periods.

Most P4P and non-P4P households reported selling at least maize four weeks or more after harvest (Panels 3 and 4 of Figure 13). Furthermore, they reported selling a majority of their surplus quantity four weeks or more after harvest. Differences between P4P and non-P4P households were not statistically significant in any time period for either indicator. P4P appears, therefore, to have encouraged more households to begin selling maize through the SACCO.

FIGURE 13: LOCATION AND TIMING OF MAIZE SALES



Households with a marketable surplus will generally find a way to sell the surplus. The percentage of households selling maize and the quantities sold are therefore more related to production than to marketing. Nevertheless, Figure 14 presents the household data on maize surpluses and sales as context for other marketing outcomes. With one exception, i.e., the decline in average quantities of maize sold by P4P households between 2011 and 2013, P4P and non-P4P households reported similar trends in these four marketing parameters. This decline corresponds to a drop in WFP procurement from 3,993 mt of maize from 19 SACCOs in 2011 to 984 mt from 6 SACCOs in 2013.[32]

FIGURE 14: MAIZE MARKETING PARAMETERS

DiD Estimates of the Impact of P4P on Household Maize Marketing

The facilitators of household maize marketing include the quantity of maize sold by the SACCO of which the household is a member (overall and to buyers other than WFP), the SACCO's provision of services, and the household's utilization of credit for agricultural purposes. The analysis of the impacts of P4P on SACCO's marketing capacity (Table 8) concluded that participating in P4P:

- Significantly increased the quantity of maize P4P SACCOs sold relative to non-P4P SACCOs (overall and to buyers other than WFP);
- Significantly increased the percentage of production, marketing, and quality services P4P SACCOs provided to their members relative to non-P4P SACCOs; and

[32] P4P procurement records.

- Significantly increased the percentage of P4P SACCOs that reported providing post-harvest financing to members relative to non-P4P SACCOs.

From the household perspective, the analysis reported in Table 14 concluded that P4P households were no more likely than non-P4P households to have utilized credit for agricultural purposes, even though a greater percentage of SACCOs reported providing post-harvest financing. Thus, participating in P4P appears to have significantly improved some aspects of the environment for facilitating household maize marketing.

The household-level behavioral changes and intermediate marketing outcomes attributable to participating in P4P have been modest. The DiD results reported in Table 12 show statistically significant impacts only for the likelihood of selling maize through the SACCO. In this instance, the percentage of P4P households that reported selling maize through the SACCO increased by 11 percentage points relative to non-P4P households.

TABLE 12: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Model	Impact (coefficient/p-value)			N	R^2
	2009-2011	2011-2013	2009-2013		
Likelihood of selling maize through the SACCO (cumulative % of households)	0.0648*** (0.0010)	0.0444** (0.0300)	0.1112*** (0.0000)	820	0.0767
Average percentage of marketed maize sold through the SACCO (%)	0.0499 (0.2760)	-0.0133 (0.7360)	0.0177 (0.6980)	432	0.0676
Likelihood of selling maize four weeks or more after harvest (%of households)	0.0272 (0.7640)	-0.0023 (0.9770)	-0.1414 (0.1460)	432	0.1044
Average percentage of marketed maize sold four weeks or more after harvest (%)	-0.0213 (0.8150)	0.0172 (0.8270)	-0.1297 (0.1470)	432	0.1207
Average maize prices to farmers (USD/mt)	18,805 (0.3900)	8,534 (0.7000)	-7,509 (0.7710)	438	0.1644

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

Table 13 summarizes the statistically significant household marketing results.

TABLE 13: SUMMARY OF HOUSEHOLD MARKETING RESULTS

Impact	Change relative to non-P4P SACCOs			
	2009-2011	2011-2012	2012-2013	2009-2013
Percentage of SACCOs utilizing credit (percentage points)			30	
Percentage of SACCOs selling to buyers other than WFP (percentage points)	4	8	12	24
Average quantity of maize sold to buyers other than WFP (mt)	27	25	121	172
Percentage of SACCOs providing financing to members (percentage points)				24

Impact of P4P on Household Maize Production

Maize is the primary staple crop in Tanzania. Across the three WFP household surveys, between 83 percent (2009) and 94 percent (2013) of P4P households reported cultivating maize. The factors that are likely to affect the average quantity of maize produced by households that cultivate maize include the land area allocated to maize production and maize yields (which may be affected by the use of productivity-enhancing technologies and practices such as certified seed or fertilizer). Weather is also likely to strongly influence maize production. In the absence of accessible subnational rainfall data, the regional dummy variables control, to some extent, for weather-related factors that influence production.

A country-specific parameter that is likely to affect the quantity produced is average cereal yields. Average yields capture external factors such as weather that can influence yields. The World Bank reported average cereal yields for Tanzania of 1,110 kg/ha in 2009 and 1,379 kg/ha in 2011.[33] Data from 2013 were not available but FAO, data on which the World Bank bases its estimates, forecast an average yield of 1,310 kg/ha for 2013.[34]

Visual Inspection

The results framework presented in Figure 5 defines a number of "facilitators" that might be expected to influence household production results. These include access to productivity-enhancing inputs and training and access to credit. Figure 15 illustrates changes in these facilitators over time for P4P and non-P4P households. Panels one through four present the household perspective while Panels five and six reflect results from the surveys of SACCOs.

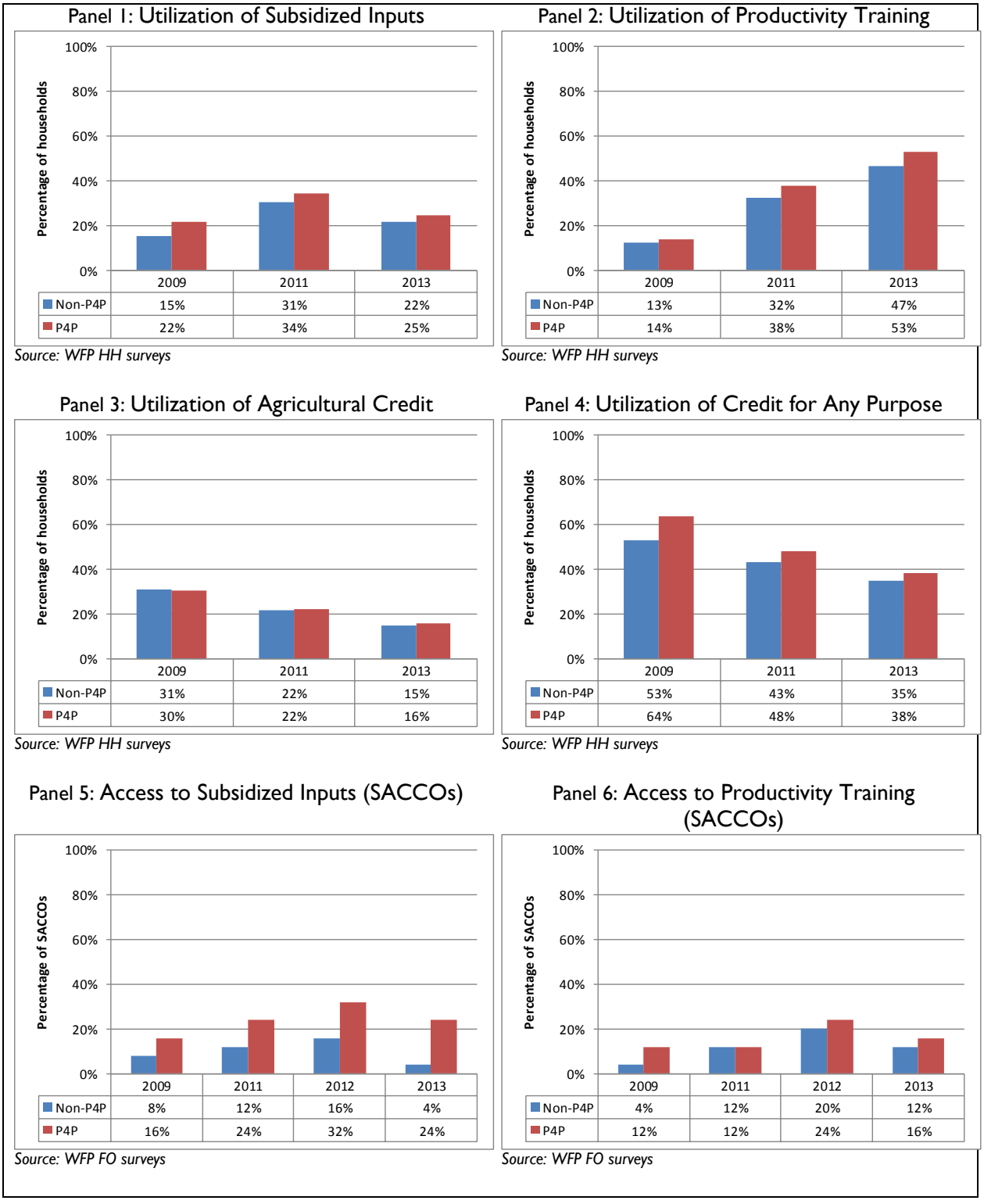
Households reported similar values and trends in the four primary production facilitators. In fact, the only statistically significant differences were:

- A significantly higher percentage of P4P than non-P4P households reported receiving free or subsidized inputs in 2009.
- A significantly higher percentage of P4P than non-P4P households reported utilizing credit for any purpose in 2009.
- A significantly higher percentage of P4P than non-P4P households reported participating in productivity training in 2013.

In summary, it appears that P4P and non-P4P households experienced similar trends in most production-facilitating factors with the possible exception of access to inputs and productivity training.

[33] Accessed at http://data.worldbank.org/indicator/AG.YLD.CREL.KG
[34] Accessed at http://www.fao.org/giews/countrybrief/country.jsp?code=TZA

FIGURE 15: MAIZE PRODUCTION FACILITATORS

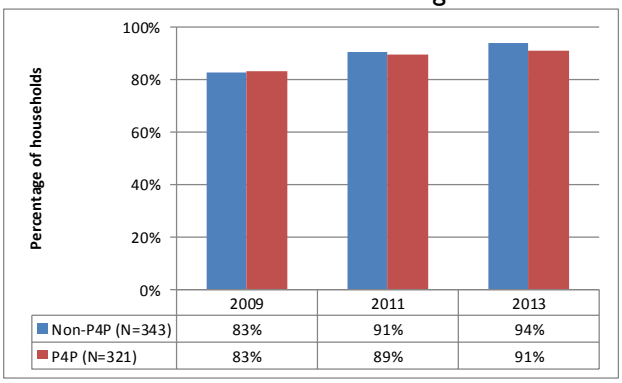


Improvement in the facilitating conditions should influence maize production. Figure 16 illustrates trends in household maize production parameters and differences between P4P and non-P4P households. At least on

visual inspection, P4P and non-P4P households reported very similar experiences with all of the indicators. They started at about the same point and reported similar changes in direction and magnitude over time. Based solely on visual inspection, there appear to be few obvious differences between P4P and non-P4P households in the evolution of maize production or the P4P-related factors that might explain production. Simple statistical tests confirm the visual inspection. P4P and non-P4P households were statistically similar (i.e., the differences were not statistically significant) in any of the three time periods.

FIGURE 16: MAIZE PRODUCTION PARAMETERS

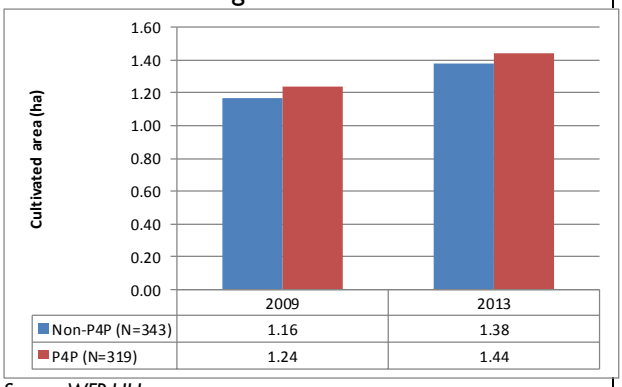
Panel 1: Households Cultivating Maize



	2009	2011	2013
Non-P4P (N=343)	83%	91%	94%
P4P (N=321)	83%	89%	91%

Source: WFP HH surveys

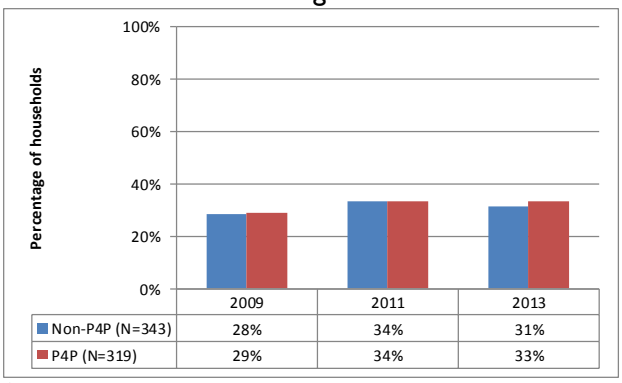
Panel 2: Average Area Planted to Maize



	2009	2013
Non-P4P (N=343)	1.16	1.38
P4P (N=319)	1.24	1.44

Source: WFP HH surveys
Area measures for 2011 are inconsistent with other periods

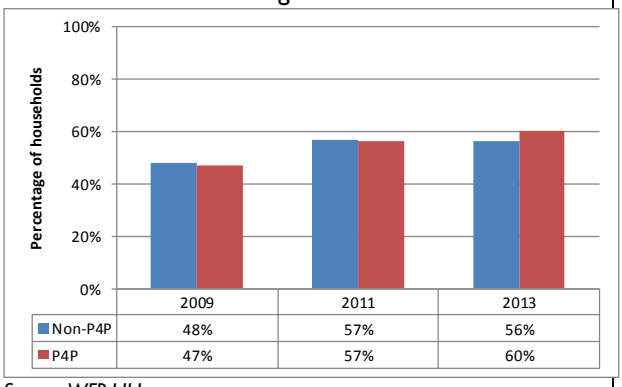
Panel 3: Households Using Certified Maize Seed



	2009	2011	2013
Non-P4P (N=343)	28%	34%	31%
P4P (N=319)	29%	34%	33%

Source: WFP HH surveys

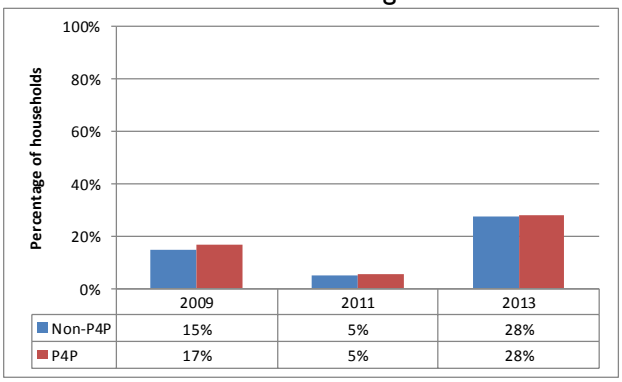
Panel 4: Percentage of Seed Certified



	2009	2011	2013
Non-P4P	48%	57%	56%
P4P	47%	57%	60%

Source: WFP HH surveys

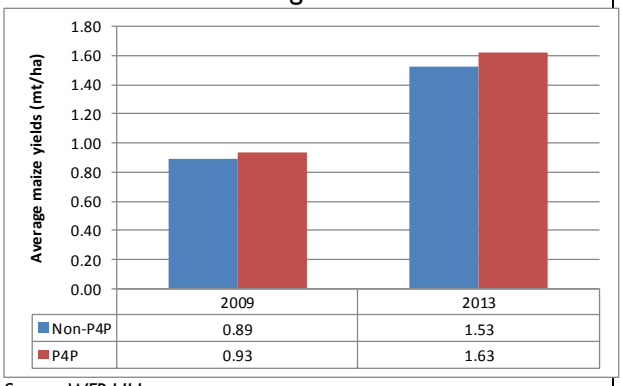
Panel 5: Households Using Fertilizer



	2009	2011	2013
Non-P4P	15%	5%	28%
P4P	17%	5%	28%

Source: WFP HH surveys

Panel 6: Average Maize Yields

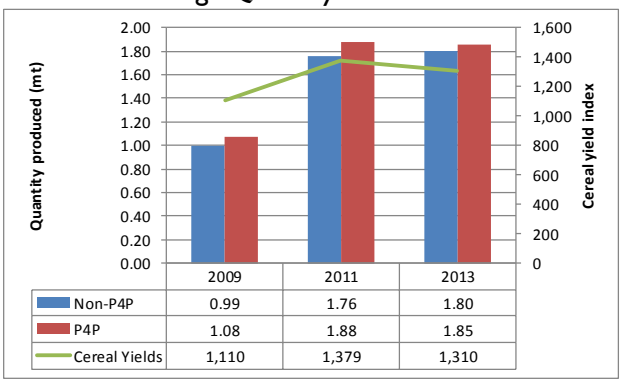


	2009	2013
Non-P4P	0.89	1.53
P4P	0.93	1.63

Source: WFP HH surveys

2011 data are not useable because inconsistent area measurements produced inconsistent imputed yields

Panel 7: Average Quantity of Maize Produced



Source: WFP HH surveys

DiD Estimates of the Impact of P4P on Maize Production

Visual inspection of the data suggests that P4P had little impact on the quantity of maize households produced or on the factors that may have affected maize production. Table 14 presents DiD estimates of the impact of participating in P4P on the maize production facilitators measured at the household level, i.e. utilization of inputs, training, and credit.

TABLE 14: DID ESTIMATES OF THE IMPACT OF P4P ON MAIZE PRODUCTION FACILITATORS

Model	Impact (coefficient/p-value)			N	R^2
	2009-2011	2011-2013	2009-2013		
Utilization of subsidized inputs (%) – all households	-0.0306 (0.1120)	-0.0210 (0.4860)	-0.0442 (0.3130)	1,163	0.1221
Utilization of productivity training (%) – all households	0.0620 (0.1780)	-0.0487 (0.3020)	0.0178 (0.6980)	1,163	0.0793
Utilization of agricultural credit (%) – all households	0.0438 (0.3170)	-0.0149 (0.7400)	0.0234 (0.6160)	1,163	0.0278
Utilization of credit for any purpose (%) – all households	-0.0581 (0.2030)	-0.0329 (0.4830)	-0.0849* (0.0860)	1,163	0.2422

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

With the exception of utilizing credit for any purpose, P4P households fared no better than non-P4P households in terms of changes in maize production facilitators. However the decline between 2009 and 2013 in utilizing general credit was significantly greater among P4P than non-P4P households.

The estimates presented in Table 6 reported results for two other household marketing facilitators, access to production inputs and production training through the SACCO. The analysis concluded that participation in P4P significantly increased the percentage of SACCOs facilitating access to inputs for members. However, it had no discernable effect on the percentage of SACCOs that provided production training.

Table 15 summarizes DiD estimates of the impact of P4P on household maize production and associated production parameters.

TABLE 15: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Model	Impact (coefficient/p-value)			N	R^2
	2009-2011	2011-2013	2009-2013		
Likelihood of cultivating maize (%) – all households	-0.0107 (0.7450)	0.0108 (0.7500)	0.0155 (0.6410)	1,163	0.1422
Average area planted to maize (ha) – cultivating households	2011 data are inconsistent		-0.0125 (0.9530)	564	0.1695
Likelihood of using certified maize seed (%) – cultivating households	-0.0099 (0.8090)	-0.0029 (0.9440)	0.0154 (0.7240)	1,162	0.0323
Average percentage of maize seed that was certified (%) – certified seed using households	-0.0339 (0.6310)	0.0274 (0.7100)	0.0007 (0.9930)	561	0.0191
Likelihood of using fertilizer (%) – cultivating households	-0.0089 (0.7710)	-0.0124 (0.6930)	-0.0301 (0.4060)	1,162	0.3489
Average maize yield (mt/ha) – producing households	2011 data are inconsistent		0.0193 (0.8550)	508	0.1211
Average quantity of maize produced (mt) – producing households	0.0840 (0.7390)	-0.0537 (0.8360)	-0.0111 (0.9650)	1,162	0.0756

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

Relevant findings from the DiD analysis include:

- P4P had no discernable impact on the quantity of maize produced or on the factors that may have affected maize production.
- Geographic location (represented by regional dummy variables in the covariate model) had a significant effect on changes in maize production and all of the production parameters. This is not surprising since region may reflect weather. However, it is somewhat surprising that the regional dummy variables seem to be most important in explaining variation in input use.
- The remaining variables had a limited and inconsistent influence on results.

Impact of P4P on Household Welfare

Welfare is a broad concept with dimensions including income, wealth, nutrition, food security, and physical security to name a few. The P4P proposal identified income as the primary household welfare measure. Because of the anticipated difficulty measuring small changes in income, however, the P4P logframe identified several alternate welfare indicators. These include the household asset score (a simple summary of household assets), the value of household livestock (an important store of wealth in many cultures), and the food consumption score (an indicator of food security). The analysis of the impacts of P4P on household welfare examines each of these indicators to provide a well-rounded picture of welfare change.

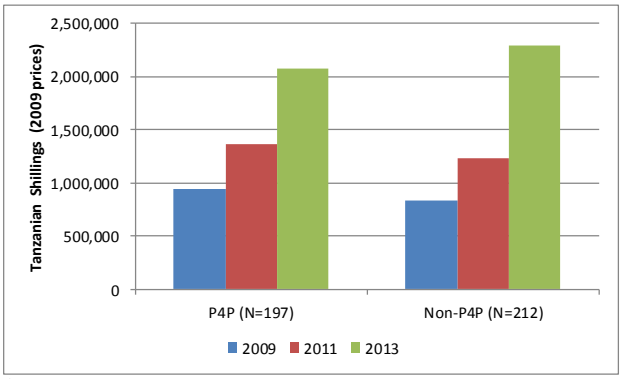
Visual Inspection

As with previous sections, the inquiry begins with illustrations of changes in income and welfare measures (Figure 17). On all four measures P4P and non-P4P households appear to have had largely similar experiences. Real income has increased steadily for both groups (Panel 1) and the share of total income

attributable to crops, livestock, and off-farm sources appears to have evolved in a similar manner (Panel 2). Panels 3 and 4 illustrate similar patterns of change in asset scores, real livestock value, and the food consumption score (Panels 3-5).

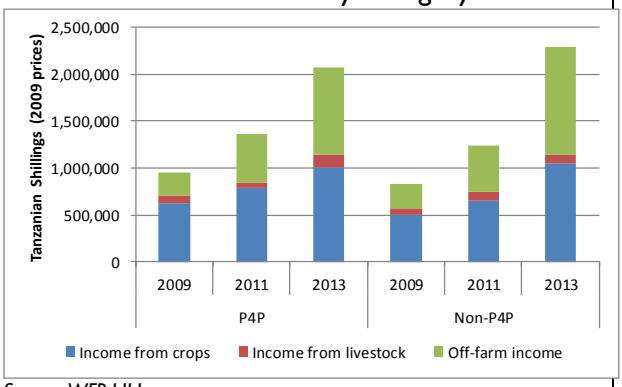
FIGURE 17: HOUSEHOLD WELFARE INDICATORS

Panel 1: Household Income



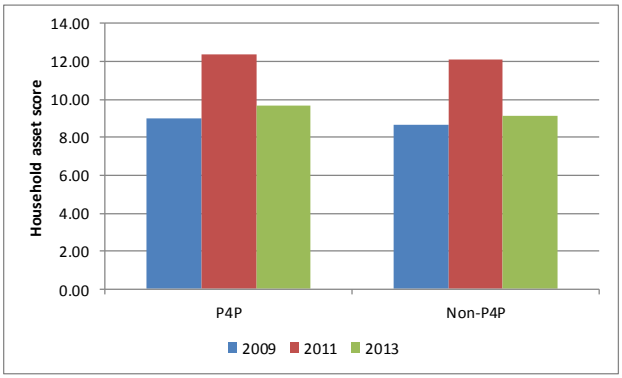
Source: WFP HH surveys

Panel 2: Income by Category



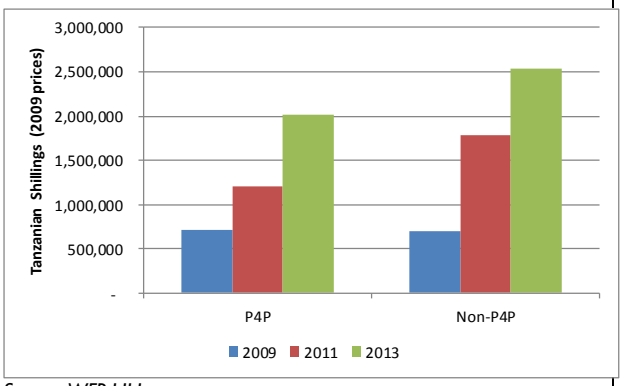
Source: WFP HH surveys

Panel 3: Household Asset Score



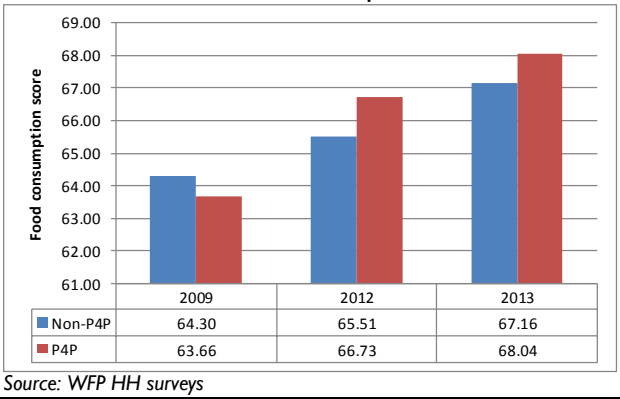
Source: WFP HH surveys

Panel 4: Livestock Value



Source: WFP HH surveys

Panel 5: Food Consumption Score



	2009	2012	2013
Non-P4P	64.30	65.51	67.16
P4P	63.66	66.73	68.04

Source: WFP HH surveys

The only statistically significant difference between P4P and non-P4P households was in the household asset score. P4P households had slightly (but significantly) higher scores than non-P4P households in 2009 and in 2013.

DiD Estimates of the Impact of P4P on Household Welfare

Table 16 reports DiD estimates of the impact of P4P on four household welfare indicators.

TABLE 16: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Model	Impact (coefficient/p-value)			N	Adjusted R^2
	2009-2011	2011-2013	2009-2013		
Household income (2009 Tanzanian Shillings)					
Non-parametric model	-45,396 (0.7970)	58,411 (0.7450)	-147,507 (0.4340)	1,328	0.0002
Covariate model	-4,601 (0.9800)	-223,681 (0.2370)	-260,894 (0.2030)	1,163	0.1459
Household asset score					
Non-parametric model	-0.0570 (0.7180)	0.2420 (0.1260)	0.1968 (0.2460)	1,326	0.7041
Covariate model	-0.0002 (0.9990)	0.2532 (0.1470)	0.1590 (0.3930)	1,162	0.7162
Value of livestock (2009 Tanzanian Shillings)					
Non-parametric model	-335,984 (0.2010)	-143,045 (0.5860)	-479,030 (0.1350)	1,234	-0.0002
Covariate model	-234,267 (0.4430)	-194,778 (0.5350)	-453,546 (0.2410)	1,082	0.0048
Food consumption score					
Non-parametric model	1.8690 (0.3040)	-0.3414 (0.8490)	1.5273 (0.4040)	1,327	-0.0003
Covariate model	1.4520 (0.4540)	-0.4133 (0.8360)	2.4713 (0.2200)	1,163	0.0489

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

CONCLUSIONS

SACCOs were not the ideal entry point for P4P because they focus on savings and credit and are legally prohibited from aggregating or marketing agricultural commodities. However, they were the only viable organizations WFP found that were supporting smallholder farmers in Tanzania. In spite of the legal difficulties, WFP targeted SACCOs while simultaneously building the capacities of parallel marketing organizations (AMCOs, networks, associations) to manage aggregation, warehouse management, and marketing on behalf of the SACCOs. Consequently, WFP began in Tanzania working with FOs that had limited to no marketing experience or capacity. In fact, none of the 25 P4P and 25 non-P4P SACCOs surveyed reported any experience selling maize in the two years prior to the 2009 baseline.

At the production level, Tanzania initially implemented P4P in eight regions[35] proximate to WFP operations and the surveyed SACCOs are all in these regions. Only two are in the major maize production areas (Manyara and Kigoma) while the remaining six are often in deficit. [36] Therefore, production capacity was also

[35] Kilimanjaro, Manyara, Arusha, Kigoma, Kagera, Dodoma, Singida, and Tabora.
[36] http://www.fao.org/fileadmin/templates/mafap/documents/technical_notes/URT/TANZANIA_Technical_Note_MAIZE_EN_Oct2013.pdf

lower than the national average for many P4P households. Furthermore, the primary regions in which P4P operates suffered from drought in 2009 which probably depressed production in 2009 relative to other years.[37] Distances, poor transportation infrastructure, and poorly integrated markets also hamper the flow of food from surplus to deficit areas and the distribution of agricultural inputs.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 4and Figure 5. The remainder of this section frames the conclusions in the context of the results framework. It presents results in the sequence in which they are likely to occur; SACCO capacity, household marketing, household production, and household welfare.

Impact of P4P on SACCO Capacity

Figure 4 summarizes anticipated results and facilitators of SACCO capacity and serves to frame the conclusions presented in this section.

Although the SACCOs selected to participate in P4P represented smallholder farmers, they were not marketing organizations. Consequently, they lacked the physical infrastructure (warehouses and equipment) necessary to manage aggregation and marketing. Even though 30 percent of P4P SACCOs reported having access to storage in the 2009 baseline survey, WFP's assessment found that these were largely dilapidated community-owned sheds unsuitable for effectively managing aggregation and quality.

The services P4P SACCOs reported providing their members also reflected SACCOs' limited capacities to support agricultural production, value addition, and marketing. In fact, in 2009, 60 percent of the P4P SACCOs reported providing no agricultural services to their members. Those that did provide services appear to have concentrated on supporting agricultural production (e.g., training and facilitating access to inputs), marketing (i.e., weighing and bagging, connecting farmers to buyers), and storage (i.e., warehousing and fumigation).[38]

At the time of the 2009 baseline, the development community was supporting P4P and non-P4P SACCOs but the assistance focused largely on organizational strengthening and management (i.e., record keeping,

[37] Tanzania P4P Story.
[38] SACCOs that reported supporting storage and marketing probably did so in conjunction with an AMCO or other marketing organization.

FIGURE 18: SUMMARY OF IMPACT OF P4P ON SACCO CAPACITY

Maize Marketing

	Indicators	Results attributable to P4P		Facilitators	Changes attributable to P4P
Organizational capacity	Planning	↑	Significant positive impact on P4P SACCOs planning for production and marketing.	Infrastructure	↑ Improved quality of warehouse facilities and access to equipment
	Services	↑	Significant positive impact on P4P SACCOs provision of production, marketing, and quality services.	rocurement	↑ Relatively consistent and sizable procurement
	Inputs	↑	Significant positive impact on P4P SACCOs facilitating members' access to inputs.	Supply-side support	↑ Increased supply-side support for infrastructure, production, marketing, and inputs relative to non-P4P SACCOs
	Training	→	No significant impact on productivity training provided to members relative to non-P4P SACCOs		
Marketing capacity outcomes	Sales	↑	Significant positive impact on total quantity of maize sold.	Procurement	↑ Relatively consistent and sizable procurement
	Market diversity	↑	Significant positive impact on quantity sold to buyers other than WFP.		
	Financing for members	↑	Significant positive impact on facilitating post-harvest financing for members.	Access to credit	↑ Greater access to credit in 2013 relative to non-P4P SACCOs
	Prices	↑	Several sources of evidence suggest that by 2013, P4P households obtained higher average prices for maize than non-P4P households and that the margin was larger for households that sold through the SACCO.		
Impacts	Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)				

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

financial management, group management, and business planning). Ninety-six percent of surveyed SACCOs reported having received such assistance. Few SACCOs reported receiving other types of assistance although P4P SACCOs were significantly more likely than non-P4P SACCOs to have received assistance with agricultural production (48 percent versus 12 percent) and marketing (40 percent versus 8 percent).

In response to these limitations, WFP initially focused, with the help of partners, on strengthening marketing infrastructure and skills, and preparing SACCOs to sell to WFP. By the end of 2010, WFP had directly rehabilitated 23 warehouses, 10 of which were ultimately licensed with the Tanzania Warehouse Licensing Board to be used as WRS warehouses. To further build organizational capacity, WFP also provided (loaned) warehousing equipment (tarps, fumigation sheets, scales, stitching machines, generators, pallets, spears, moisture analyzers, first extinguishers, and milling machines) to 29 SACCOs and trained SACCOs in their use.

WFP and its partners also trained all P4P-supported SACCOs in agribusiness management; credit and finance; institutional capacity building; gender sensitivity; monitoring and evaluation; post-harvest handling, storage, and quality control; production and productivity; and WFP procurement procedures. As a consequence, the percentage of P4P SACCOs reporting receiving external assistance with production, marketing, inputs, and infrastructure increased by greater margins than among non-P4P SACCOs. To the extent that WFP did not provide this assistance directly, it reflects supply-side support catalyzed by WFP's commitment to buy from the SACCOs.

These direct investments and training put in place many of the facilitating factors necessary to support organizational capacity building. The other crucial facilitator is WFP's procurement stimulus. By the end of the pilot, WFP had registered 27 SACCOs and other organizations (AMCOs, networks, associations) as WFP suppliers and had purchased at least once from all of them. It had purchased in only one year from 7 (26 percent), in two years from 7 (26 percent), in three years from 10 (37 percent), and in four years from 3 (11 percent). On average, SACCOs that sold to WFP in any given year received contracts for 223 mt. WFP appears to have provided a reasonably consistent and sizable procurement stimulus in Tanzania.

These investments in the facilitators of organizational capacity quickly paid dividends in measurable indicators of SACCO capacity. Specifically:

- The availability of storage infrastructure and equipment coupled with training quickly led to large increases in the number of production, marketing, and quality services P4P SACCOs were able to provide to their members. P4P is responsible for an increase of 63 percentage points in the average percentage of quality services offered by P4P SACCOs, a 14 percentage point increase in production services, and a 54 percentage point increase in marketing services.
- The percentage of P4P SACCOs planning for production and marketing jumped from 48 percent to 92 percent between 2009 and 2013 compared to a change from 20 percent to 56 percent among non-P4P SACCOs. A 10 point increase in the percentage of P4P SACCOs planning for production and marketing between 2011 and 2013 can be attributed to P4P.
- The percentage of P4P SACCOs able to facilitate members' access to inputs increased from 16 percent in 2009 to 96 percent in 2013. Relative to non-P4P SACCOs, a 24 percentage point increase is attributable to P4P.

- The percentage of P4P SACCOs providing production training to members increased from 12 percent in 2009 to 64 percent in 2013. However, non-P4P SACCOs experienced similar growth so this aspect of improved organizational capacity is not attributable to P4P.

The impact of P4P on sustainable market access for SACCOs is still an open question. One SACCOs network (Kaderes) has "graduated" from P4P and is now eligible to sell to WFP through its normal competitive tendering process. While the summary statistics suggest that the other P4P SACCOs increasingly engaged with staples markets, by 2013 only 24 percent (6 SACCOs) reported ever having sold to buyers other than WFP. The contracts WFP helped negotiate between 17 P4P SACCOs and the National Food Reserve Agency (NFRA) for 3,560 mt of maize (sales not reflected in the survey data) in 2013 will change this picture substantially.

The Tanzania P4P story and intervention details reveal several barriers SACCOs have faced building their marketing capacity. These include reliable access to warehouses and weak leadership and lack of member trust in leaders. Only 6 of the 25 surveyed SACCOs own their warehouses and the WFP country office has documented at least three instances where the warehouse used by a P4P SACCO was leased to other businesses.

Impact of P4P on Household Maize Marketing

The positive impacts of P4P on SACCO capacity established many of the facilitating conditions necessary to support household maize marketing. In particular, significant increases in quantities sold by P4P SACCOs, an expanded range of services offered by the SACCOs, and increasing market diversity should eventually influence household marketing choices, particularly the choice to sell through the SACCO (Figure 19).

Participating in P4P has significantly affected members' marketing behavior. Members of P4P-supported SACCOs were significantly more likely than members of non-P4P SACCOs to begin selling maize through the SACCO. In fact, between 2009 and 2013 the percentage of P4P SACCO members that reported ever selling maize through the SACCO increased significantly from 8 percent to 22 percent. Extrapolated to the entire reported membership of P4P-supported SACCOs, this implies that the total number of SACCO members selling through the SACCOs increased by 169 percent, from 1,001 in 2009 to 2,639 in 2013. This result reflects expanded market choices (households previously reported selling at the farm gate and in local markets) and increasing engagement with more diverse markets. It also indicates a level of trust in the SACCOs.

Prior to P4P, a majority of households reported selling at least part of their surplus maize at least four weeks after harvest. Between 2009 and 2013, the percentage fell for both P4P and non-P4P households. However, it fell by significantly more among P4P than non-P4P households – an unanticipated "impact" of P4P. The result is difficult to interpret; it is not correlated with selling through the SACCO or with the SACCO selling to WFP.

An anticipated household level outcome is that members of P4P SACCOs will receive higher prices for their maize than members of non-P4P SACCOs, presumably because they sell through a SACCO with better marketing capacity and access to quality conscious buyers. This is a particularly important outcome since increased income from staple commodities is expected to drive increases in production and higher household incomes. Data on prices from the SACCO survey are very thin and data from the household survey very variable. However, both of these

FIGURE 19: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Maize Marketing						
	Indicators	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Selling through the SACCO	↑	P4P households were significantly more likely than non-P4P households to begin selling maize through the SACCO	Quantity sold by SACCO	↑	Significant increase in total quantity of maize sold relative to non-P4P SACCOs
				Quality and marketing services available from SACCO	↑	Significantly more P4P SACCOs providing production, marketing, and quality services relative to non-P4P SACCOs
	Selling more than 4 weeks after harvest	↓	By 2013, P4P households were significantly less likely than non-P4P households to report selling at least 4 weeks after harvest. Furthermore, those that sold at least 4 weeks after harvest reported selling a significantly smaller percentage of their surplus at that time.	Access to credit	→ ↑	P4P households were no more likely than non-P4P households to utilize credit for agricultural purposes. By 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members.
Household marketing outcomes	Prices	↑	Several sources of evidence suggest that by 2013, P4P households obtained higher average prices for maize than non-P4P households and that the margin was larger for households that sold through the SACCO.	Quantity sold SACCO	↑	Significant increase in total quantity of maize sold relative to non-P4P SACCOs
				Market diversity	↑	Significant increase in quantity sold to buyers other than WFP relative to non-P4P SACCOs

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

sources, triangulated with more reliable data from WFP procurement records,[39] suggest that P4P households obtained higher average prices for their maize than non-P4P households. Starting from a point of receiving statistically equivalent prices in 2009, by 2013, P4P households reported receiving an average of 8 percent more (USD 15/mt) for maize than non-P4P households and households that reported selling through the SACCO reported receiving an average of 24 percent more (USD 60/mt) than those who sold elsewhere. Neither of these differences, however, can be attributed to participation in P4P. This is not necessarily because P4P is not responsible for the change but could be that the data are too thin and variable to statistically attribute the change to P4P.

Impact of P4P on Household Maize Production

The P4P development hypothesis suggests that outcomes in household maize marketing lead to production outcomes. For example, higher prices obtained from selling maize through the SACCOs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, by 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members and to facilitate access to inputs. Specifically, between 2009 and 2013, the percentage of P4P SACCOs that reported providing financing to members between harvest and sale increased from 36 percent to 52 percent, with 24 percentage points attributable to participating in P4P. With respect to inputs, 16 percent of P4P SACCOs reported facilitating members' access to inputs in 2009. By 2013, 96 percent reported having helped members obtain inputs, an increase of 80 percentage points. The impact of participating in P4P was a 48 point increase in the percentage of P4P SACCOs facilitating access to inputs for members.

P4P households experienced some improvement in the factors facilitating maize production results and have changed their production behavior as a result. In particular:

- The percentage of P4P households planting maize increased from 83 percent to 94 percent between 2009 and 2013;
- The average area planted to maize increased by 0.20 ha (16 percent);
- The number of households using certified seed increased by 4 percentage points, from 29 percent to 33 percent, and the average share of maize seed households used that was certified increased by 5 percentage points, from 47 percent to 60 percent; and
- The number of households using fertilizer increased from 17 percent to 28 percent.

These behavioral changes led to improved production results. Specifically:

- Average maize yields increased 75 percent, from 0.93 mt/ha to 1.63 mt/ha;[40]
- The average quantity of maize produced increased by 71 percent, from 1.08 mt to 1.85 mt; and
- The average quantity of maize sold increased by 96 percent, from 0.58 mt to 1.14 mt.

[39] Although the price data in the WFP procurement records are more reliable than the survey data, they may also reflect concessions made to facilitate sales from low-capacity FOs.
[40] The yield estimates reflect averages over regions and seasons.

However, non-P4P households reported similar outcomes and the differences between P4P and non-P4P households were not statistically significant. These substantial changes in agricultural productivity cannot, therefore, be attributed to participating in P4P.

FIGURE 20: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Maize Production						
	Anticipated Results	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Planting maize	→	P4P households were no more likely than non-P4P households to change their maize planting behavior.	Access to inputs/credit	↑	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, by 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members and to facilitate access to inputs.
	Area allocated to maize	→	P4P households were no more likely than non-P4P households to change the area they allocated to maize production.	Production training	→	P4P households were no more likely than non-P4P households to report receiving production training.
	Use of inputs	→	P4P households were no more likely than non-P4P households to change their use of certified seed (either to begin using it or to change the percentage they used) of to change their use of fertilizer.			
Intermediate outcomes	Yields	→	P4P households were no more likely than non-P4P households to increase maize yields.	Access to inputs/credit	↑	P4P households were no more likely than non-P4P households to report improved access to inputs or utilizing credit for agricultural purposes. However, by 2013, P4P SACCOs were significantly more likely than non-P4P SACCOs to report providing post-harvest financing to members and to facilitate access to inputs.
	Quantity produced	→	P4P households were no more likely than non-P4P households to increase the quantity of maize they produced.			
	Quantity sold	→	P4P households were no more likely than non-P4P households to sell larger quantities of maize.			

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2013 than in 2009 by almost any measure of welfare.

- Real incomes increased by 88 percent;
- The average household asset score increased by 7 percent;
- The real value of household livestock increased by 143 percent;
- The food consumption score increased by 7 percent; and
- The quality of the housing stock improved
    - Three percent of households replace thatch roofs with metal;
    - The percentage of households with dirt floors fell from 55 percent to 46 percent while the percentage with concrete floors increased from 43 percent to 51 percent; and
    - The percentage of households with mud or mud-brick walls fell from 83 percent to 71 percent with a corresponding increase in concrete walls.

However, non-P4P households experienced similar improvements which rendered none of these changes attributable to participating in P4P.

ANNEXES

Annex A: Comparison of P4P and Non-P4P SACCOs and Households

TABLE 17: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P SACCOS

SACCO characteristic	P4P	Non-P4P	p-value of difference
Indicator of receiving credit in past two years	0.00	0.60	0.0000
Indicator of receiving production assistance	0.48	0.12	0.0055
Indicator of receiving marketing assistance	0.40	0.08	0.0081
Indicator of providing financing to members	0.36	0.08	0.0169
Indicator of planning for production and marketing	0.48	0.20	0.0366
Indicator of access to storage	0.30	0.08	0.0467
Indicator of experience with contract sales	0.12	0.00	0.0740
Number of members	538.00	359.00	0.1688
Indicator of providing marketing services	0.15	0.04	0.1948
Indicator of providing any services	0.36	0.20	0.2077
Maximum quantity of maize ever sold in one sale (mt)	453.00	0.00	0.2240
Indicator of receiving post harvest assistance	0.24	0.12	0.2695
Indicator of lowest level FO	0.04	0.00	0.3124
Indicator of using price information	0.04	0.00	0.3124
Indicator of providing production services	0.09	0.02	0.3250
Indicator of receiving assistance for tools	0.16	0.08	0.3481
Indicator of providing quality services	0.08	0.02	0.3606
Indicator of mid-level FO	0.40	0.28	0.3705
Percentages smallholder farmer members	0.77	0.59	0.3737
Indicator of receiving assistance for infrastructure	0.04	0.08	0.5515
Indicator of receiving assistance for inputs	0.16	0.12	0.6836
Number of full-time employees	8.32	8.48	0.7468
Percentage of female members	0.59	0.57	0.8574
Number of years since formation	4.28	4.24	0.9688
Indicator of receiving loans	0.84	0.84	1.0000
Indicator of receiving organizational assistance	0.96	0.96	1.0000
Indicator of receiving any assistance	0.96	0.96	1.0000

TABLE 18: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P HOUSEHOLDS

SACCO characteristic	P4P	Non-P4P	p-value of difference
Number of individuals in household	6.41	6.36	0.7986
Indicator of using certified maize seed	0.29	0.28	0.8440
Indicator of using certified seed on crops other than maize	0.15	0.13	0.4289
Indicator of using certified seed on any crop	0.34	0.34	0.9031
Area of land owned (ha)	2.57	2.19	0.1408
Area allocated to maize (ha)	1.24	1.16	0.2223
Area allocated to crops other than maize (ha)	2.09	2.27	0.3489
Total cultivated area (ha)	3.33	3.43	0.6399
Average maize yield (mt/ha)	0.93	0.89	0.6030
Average quantity of maize harvested (mt)	1.07	0.99	0.4928
Average quantity of crops other than maize harvested (mt)	1.88	1.65	0.3382
Average quantity of all crops harvested (mt)	2.95	2.64	0.2435
Quantity of maize sold (mt)	0.50	0.43	0.3472
Quantity of crops other than maize sold (mt)	1.06	1.77	0.2518
Quantity of all crops sold (mt)	1.56	2.20	0.3190
Size of maize surplus (mt)	0.82	0.75	0.5143
Average percentage of maize sold within 4 weeks of harvest (%)	0.38	0.37	0.8158
Average percentage of maize sold 4 weeks after harvest (%)	0.62	0.63	0.8158
Average quantity of maize sold within 4 weeks of harvest (mt)	0.21	0.26	0.4086
Average quantity of maize sold 4 weeks after harvest (mt)	0.69	0.63	0.6873
Average percentage of maize sold through FO (%)	0.09	0.03	0.0347
Average percentage of maize sold elsewhere (%)	0.74	0.85	0.0159
Average percentage of maize sold at the farm gate (%)	0.17	0.12	0.1848
Average quantity of maize sold through FO (mt)	0.06	0.05	0.9146
Average quantity of maize sold elsewhere (mt)	0.08	0.07	0.8754
Average quantity of maize sold at the farm gate (mt)	0.77	0.77	0.9808
Value of loans received for agricultural purposes (2009 Tanzanian Shillings)	77,483	65,255	0.4767
Value of loans received for non-agricultural business (2009 Tanzanian Shillings)	242,738	88,353	0.0341
Value of loans received for any purpose (2009 Tanzanian Shillings)	377,797	244,135	0.1066
Average food consumption score	63.66	64.30	0.6808
Average food consumption rank	2.92	2.92	0.7630
Average household asset score	9.00	8.68	0.0481
Value of livestock assets (2009 Tanzanian Shillings)	612,859	494,325	0.3319
Average annual household income (2009 Tanzanian Shillings)	1,077,216	922,194	0.1149
Average annual income from farming (2009 Tanzanian Shillings)	704,853	584,865	0.1443

SACCO characteristic	P4P	Non-P4P	p-value of difference
Average annual off-farm income (2009 Tanzanian Shillings)	372,362	337,329	0.4831
Net value of crops produced (2009 Tanzanian Shillings)	585,057	519,680	0.3457
Net value of crops consumed (2009 Tanzanian Shillings)	380,475	342,469	0.5112
Net value of crops sold (2009 Tanzanian Shillings)	215,981	195,030	0.5552
Net value of staples sold (2009 Tanzanian Shillings)	75,550	57,019	0.2135
Net income from livestock (2009 Tanzanian Shillings)	119,797	65,184	0.1729
Income from livestock sales (2009 Tanzanian Shillings)	27,017	24,948	0.8646
Value of livestock consumed (2009 Tanzanian Shillings)	11,712	4,177	0.2291
Income from livestock products and services (2009 Tanzanian Shillings)	81,067	36,059	0.1793
Annual cost of keeping livestock (2009 Tanzanian Shillings)	97,514	60,489	0.0943
Percentage of household income from off-farm sources	6.51	0.58	0.3166
Annual expenditure (2009 Tanzanian Shillings)	2,874,319	2,705,956	0.6621
Annual expenditure on household items (2009 Tanzanian Shillings)	377,388	321,224	0.0651
Annual expenditure on food (2009 Tanzanian Shillings)	875,980	852,665	0.6476
Annual expenditure on other items (2009 Tanzanian Shillings)	1,561,736	1,506,668	0.8807
Annual expenditure on rent (2009 Tanzanian Shillings)	59,215	25,399	0.1310
Annual crop production expenses (2009 Tanzanian Shillings)	207,569	261,920	0.1222
Indicator of female household head	0.41	0.49	0.0509
Indicator of metal roof on house	0.13	0.17	0.1063
Indicator of concrete floor in house	0.56	0.70	0.0002
Indicator of concrete or fired brick walls on house	0.84	0.90	0.0082
Indicator of improved toilet facilities in house	0.74	0.83	0.0088
Indicator of household access to improved water source	0.59	0.62	0.3137
Indicator of using fertilizer	0.17	0.15	0.4905
Indicator of access to inputs on credit or subsidized	0.22	0.15	0.0352
Indicator of irrigating maize	0.03	0.02	0.2514
Indicator of planting maize	0.95	0.92	0.0988
Indicator of planting crops other than maize	0.84	0.88	0.1441
Indicator of producing a surplus of maize	0.67	0.60	0.0493
Indicator of selling maize within 4 weeks of harvest	0.50	0.52	0.7550
Indicator of selling maize 4 weeks after harvest	0.72	0.72	0.9161
Indicator of selling maize through the SACCO	0.13	0.05	0.0160
Indicator of selling maize at the farm gate	0.25	0.19	0.2366
Indicator of selling maize elsewhere	0.82	0.89	0.1021
Indicator of receiving loans for agriculture	0.30	0.31	0.8480
Indicator of receiving loans for non-agricultural business	0.23	0.11	0.0000
Indicator of receiving loans for any purpose	0.64	0.53	0.0062

SACCO characteristic	P4P	Non-P4P	p-value of difference
Indicator of obtaining crop price information through SACCO	0.17	0.12	0.1128
Indicator of using crop price information	0.96	0.98	0.2063
Indicator of finding price information from SACCO useful	0.13	0.11	0.4915

Annex B: P4P Treatment Details

TABLE 19: QUANTITIES CONTRACTED BY WFP BY SACCO AND YEAR

Organization type	FO name	Quantity contracted (mt)					Years w/ contracts	Average contract size (mt)
		2009	2010	2011	2012	2013		
SACCO	Mkombozi Soko kuu Saccos		227	379	300	250	4	289
SACCO	Kwamtoro Saccos		100	110	60	120	4	97
SACCO	Ibumila Saccos	300		128	96	148	4	168
Network	KADERES PEASANTS DEVELOPMENT	150	374	112	Graduated		3	212
SACCO	Kandaga Saccos	50	70	30			3	50
SACCO	Gallapo Saccos			277	60	100	3	146
SACCO	Usomama Saccos		200	454	456		3	370
Network	DUNDULIZA COMPANY LTD	200		267	570		3	345
SACCO	Laela Saccos	1,350		200	196		3	582
SACCO	NKWERWA TALANTA SACCOS LTD		36	150	482		3	223
SACCO	UMOJA WA SACCOS ZA WAKULIMA KILIMANJARO		280	280	243		3	268
SACCO	Mbulumbulu KKKT Saccos		200	200	60		3	153
Association	CEREAL GROWERS ORGANISATION OF KONGWA			285	157	220	3	220
SACCO	Jipemoyo Saccos			300	60		2	180
SACCO	Didihama Saccos		400		60		2	230
SACCO	Mkombozi Mrijo Saccos		50	400			2	225
SACCO	Mahhahhha Saccos				60	100	2	80
SACCO	Jikuzeni Kware				107	133	2	120
SACCO	Kituntu Saccos				220	329	2	275
AMCO	Wino Saccos		200	397			2	299
SACCO	Kibaigwa Saccos			120			1	120
SACCO	Umoja Saccos			200			1	200
SACCO	Meqbami Saccos		200				1	200
SACCO	UPENDO SACCOS LIMITED			502			1	502
SACCO	Muhangu Saccos				60		1	60
SACCO	Jitegemee Saccos			50			1	50
SACCO	Kiosa Saccos					165	1	165
Totals		2,050	2,337	4,840	3,246	1,564		216

Source: WFP procurement records through May 2014.
Note: Shaded cells represent years in which an FO was not participating in P4P.
a. Kaderes became a regular (i..e., non-P4P) supplier to WFP starting in 2012.

TABLE 20: QUANTITIES RECEIVED BY WFP BY SACCO AND YEAR

Organization type	FO name	Quantity contracted (mt)					Total default quantity	Average default rate
		2009	2010	2011	2012	2013		
SACCO	Kwamtoro Saccos		100	110	60	120	0	0%
SACCO	Ibumila Saccos	300		128	96	148	0	0%
Network	KADERES PEASANTS DEVELOPMENT	150	374	112	Graduated		0	0%
SACCO	Kandaga Saccos	0	0	0			150	100%
SACCO	Gallapo Saccos			0	60	100	277	44%
SACCO	Usomama Saccos		200	334	246		330	24%
Network	DUNDULIZA COMPANY LTD	129		267	194		447	43%
SACCO	Laela Saccos	1,119		200	24		404	23%
SACCO	NKWERWA TALANTA SACCOS LTD		36	150	212		270	40%
SACCO	UMOJA WA SACCOS ZA WAKULIMA KILIMANJARO		280	280	137		106	12%
SACCO	Mbulumbulu KKKT Saccos		200	67.8	7.5		185	40%
Association	CEREAL GROWERS ORGANISATION OF KONGWA			285	60	220	97	11%
SACCO	Jipemoyo Saccos			200	32		128	59%
SACCO	Didihama Saccos		100		0		360	78%
SACCO	Mkombozi Mrijo Saccos		277	378	300	0	650	40%
SACCO	Mahhahhha Saccos				60	100	0	48%
SACCO	Jikuzeni Kware				0	133	106	39%
SACCO	Kituntu Saccos				220	164	165	30%
AMCO	Wino Saccos		0	201			396	66%
SACCO	Kibaigwa Saccos			120			0	65%
SACCO	Umoja Saccos			60			140	70%
SACCO	Meqbami Saccos		0				200	100%
SACCO	UPENDO SACCOS LIMITED			211			291	58%
SACCO	Muhangu Saccos				30		30	11%
SACCO	Jitegemee Saccos			27			23	23%
SACCO	Kiosa Saccos					0	0	0%
Totals		1,698	1,567	4,300	1,738	984		37%

Source: WFP procurement records through May 2014.
Note: Shaded cells represent years in which an FO was not participating in P4P.
a. Kaderes became a regular (i..e., non-P4P) supplier to WFP starting in 2012.

TABLE 21: INVESTMENTS IN WAREHOUSE REHABILITATION AND CONSTRUCTION (2009-2010)

FO Name	Rehab/const (2009-2010)			Terms of use	Capacity by year (mt)				
	Rehab/ Const	Capacity (mt)	WFP funding		2009	2010	2011	2012	2013
Jikuzeni Kware	Rehab	150	Full	Own	100	100	100	500	500
Jitegemee Saccos	Rehab	300	Full	Own	400	400	400	400	400
Usomama Saccos	Rehab	300	Full	Rent	300	300	300	700	700
Gallapo Saccos	Rehab	300	Full	Rent	300	300	300	300	300
Meqbami Saccos	Rehab	300	Full	Rent	300	300	300	300	300
Didihama Saccos	Rehab	300	Full	Own	300	300	300	300	300
Mbulumbulu KKKT Sacc	Rehab	300	Full	Rent	300	300	300	300	300
Mahhahhha Saccos	Rehab	300	Full	Own	300	300	300	300	300
Upendo	Rehab	300							
Rusesa Saccos	Rehab	300	Full	Other	300	300	300	300	300
Umoja Saccos	Rehab	300	Full	Rent	300	300	300	300	300
Wanyamu Saccos	Const	300	Full	Rent	300	300	300	300	300
Kiosa Saccos	Rehab	500	Partial	Other	300	300	300	300	300
Kaisho Saccos	Rehab	500	Partial	Other	300	300	300	300	300
Kituntu Saccos	Rehab	500	Partial	Other	300	300	300	300	300
Kibaigwa Saccos	Rehab	450	Full	Rent	200	200	200	200	200
Mkombozi Soko kuu Sa	Rehab	400	Full	Other	400	400	400	400	400
Mkombozi Mrijo Sacco	Rehab	300	Full	Other	300	300	300	300	300
Kwamtoro Saccos	Rehab	300	Full	Rent	300	300	300	300	300
Jipemoyo Saccos	Rehab	150	Full	Rent	200	200	200	200	200
Muhangu Saccos	Rehab	150	Full	Own	100	100	100	100	300
Ibumila Saccos	Rehab	300	Full	Rent	300	300	300	300	300
Laela Saccos	Rehab	400	Full	Rent	400	400	400	400	400
Wino Saccos	Rehab	1,000	Full	Own	1,000	1,000	1,000	1,000	1,000

Source: Tanzania CO intervention mapping data.

TABLE 22: INVESTMENTS IN EQUIPMENT

FO Name	Number of units of equipment distributed									
	Tarps	Fumigation sheets	Scales	Stitching machines	Generators	Pallets	Spears	Moisture analyzers	Fire exting.	Milling machines
Jikuzeni Kware	1	0	1	1	1	30	1	0	1	0
Jitegemee Saccos	1	0	1	1	1	30	1	1	1	0
Usomama Saccos	1	0	1	1	1	30	1	0	1	0
Gallapo Saccos	1	0	1	1	1	30	1	0	1	0
Meqbami Saccos	1	0	1	1	1	30	1	0	1	0
Didihama Saccos	1	0	1	1	1	30	1	0	1	0
Mbulumbulu KKKT Saccos	1	0	1	1	0	30	1	0	1	0
Mahhahhha Saccos	1	0	1	1	1	30	1	0	1	0
Kandaga Saccos	0	0	0	0	0	0	0	0	0	0
Upendo	0	1	1	2	1	45	0	0	1	1
Rusesa Saccos	1	0	1	1	1	44	0	0	1	0
Umoja Saccos	1	0	1	1	1	44	0	0	1	0
Wanyamu Saccos	1	0	1	1	0	45	0	0	1	0
Nyakisasa	0	0	0	0	0	0	0	0	0	0
Kumubuga	0	0	0	0	0	0	0	0	0	0
Chakanya Saccos	1	0	1	1	1	35	1	0	0	0
Kiosa Saccos	1	0	1	1	1	60	1	1	1	0
Kaisho Saccos	1	0	1	1	1	61	1	0	1	0
Kituntu Saccos	1	0	1	2	2	36	1	1	1	0
Kibaigwa Saccos	0	0	0	0	0	30	1	0	0	0
Cereal Growers Assoc.	1	1	1	2	1	0	0	0	0	0
Mkombozi Soko kuu Saccos	1	0	1	1	1	30	1	1	1	0
Mkombozi Mrijo Sacco	1	0	1	1	1	30	1	0	0	0
Kwamtoro Saccos	1	0	1	1	1	30	1	1	2	0
Jipemoyo Saccos	1	0	1	1	1	30	1	1	1	0
Muhangu Saccos	1	0	1	1	1	30	1	1	0	0
Mwongozo	0	0	0	0	0	0	0	0	0	0
Tujikomboe	0	0	0	0	0	0	0	0	0	0
Ibumila Saccos	1	0	1	1	1	0	0	1	1	0
Laela Saccos	1	0	0	1	0	0	0	0	1	0
Wino Saccos	1	0	0	1	1	0	0	0	1	0

FO Name	Number of units of equipment distributed									
	Tarps	Fumigation sheets	Scales	Stitching machines	Generators	Pallets	Spears	Moisture analyzers	Fire exting.	Milling machines
KADERES	1	1	1	4	1	250	1	1	0	0
Nkwerwa Talanta	0	0	2	2	2	0	0	0	0	0
USAWA	3	1	1	2	2	0	0	1	0	0
Number of FOs	26	4	26	28	25	23	19	10	6	21
Number of units	28	4	27	36	28	1,040	19	10	8	22
Total investment (USD)	62,496	11,904	27,567	32,148	4,172	41,600	38	24,550	154,760	1,513

Source: Tanzania CO investment schedule.

TABLE 23: NUMBER OF INDIVIDUALS TRAINED BY FO AND TOPIC

FO Name	Agribusiness mgmt	Credit	Institutional capacity building	Gender	M&E	Post-harvest handling	Production	WFP procurement	Other
Jikuzeni Kware	138	70	236	56	108	118	371	333	0
Jitegemee Saccos	132	68	232	56	106	116	365	320	0
Usomama Saccos	135	68	241	52	108	119	370	323	0
Gallapo Saccos	135	68	241	52	108	119	370	323	0
Meqbami Saccos	117	65	235	51	96	101	359	295	0
Didihama Saccos	127	64	231	51	100	111	362	309	0
Mbulumbulu KKKT Saccos	132	64	230	50	102	112	365	322	0
Mahhahhha Saccos	132	64	230	50	102	106	365	316	0
Jipemoyo Saccos	86	86	68	50	104	941	900	127	0
Muhangu Saccos	77	77	97	41	97	1,009	963	123	0
Kibaigwa Saccos	87	87	79	61	87	932	891	128	0
Kwamtoro Saccos	100	100	66	50	100	1,004	958	146	0
Mkombozi Soko kuu Saccos	111	111	79	63	111	1,017	969	167	0
Mkombozi Mrijo Sacco	87	87	75	51	87	963	957	117	0
Wanyamu Saccos	51	50	51	51	51	76	51	76	0
Kiosa Saccos	46	46	46	46	46	85	46	85	46
Kaisho Saccos	51	51	51	51	51	96	51	96	0
Chakanya Saccos	44	44	44	44	44	65	44	65	0
Rusesa Saccos	50	50	50	50	50	81	50	81	0
Umoja Saccos	51	51	51	51	51	77	51	77	0
Kituntu Saccos	51	51	51	51	51	92	51	92	0
Kandaga Saccos	52	52	52	52	52	75	52	75	0
Wino Saccos	50	50	50	50	50	95	50	95	0
Laela Saccos	50	50	50	50	50	88	50	88	0
Ibumila Saccos	50	50	50	50	50	79	50	79	0
Number of individuals[a]	**2,142**	**1,624**	**2,886**	**1,280**	**1,962**	**7,677**	**9,111**	**4,258**	**46**
Number of FOs	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**1**

Source: Tanzania CO intervention mapping data.

a. Counts of the number of individuals trained probably include substantial double, or more, counting since individuals may have attended several trainings but training records did not identify individuals.

TABLE 24: WFP PROCUREMENT BY MODALITY

Contract year	Procurement modality									Total (all modalities)		
	Competitive tenders			Direct contracts			Forward contracts					
	Beans	Maize	Total	Beans	Maize	Total	Beans	Maize	Total	Beans	Maize	Total
2009	0	0	0	150	1,548	1,698	0	0	0	150	1,548	**1,698**
2010	410	1,157	1,567	0	0	0	0	0	0	410	1,157	**1,567**
2011	76	2,822	2,898	232	1,170	1,403	0	0	0	308	3,993	**4,300**
2012	432	877	1,308	0	0	0	0	430	430	432	1,306	**1,738**
2013	164	820	984	0	0	0	0	0	0	164	820	**984**
Total	**1,081**	**5,676**	**6,757**	**382**	**2,718**	**3,100**	**0**	**430**	**430**	**1,463**	**8,824**	**10,287**

Source: WFP procurement records.

Photo front cover: WFP

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P4P on Twitter: @WFP_P4P

20 P4P pilot countries
Asia: Afghanistan
Africa: Burkina Faso, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Liberia, Malawi, Mali, Mozambique, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, Zambia
Latin America: El Salvador, Guatemala, Honduras, Nicaragua

The Impact of P4P on FOs and Smallholder Farmers in El Salvador

September 2014

Author: Douglas Krieger

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ACRONYMS

DiD	Difference in Differences
FO	Farmers' Organization
ha	hectares
LRP	Local and Regional Procurement
mt	metric tonnes
P4P	Purchase for Progress
USD	United States Dollars
WFP	World Food Programme

EXECUTIVE SUMMARY

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[1] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[2]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to be active market participants lies at the center of all the strategies and WFP buys directly from FOs in almost all the countries. When the opportunities existed, some countries overlaid supporting structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors onto the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to engage their members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

P4P in El Salvador

El Salvador's Country Implementation Plan identified limited and inappropriate use of inputs as a key factor constraining smallholder productivity, limited access to credit as the primary barrier to accessing inputs, and ineffective extension services as a cause of inappropriate input use. To address these constraints El Salvador's P4P programme works with its partners to develop crop- and region-specific input packages (seed, fertilizer, pesticides, and technical assistance), improve the capacity of the extension services to train farmers in the appropriate use of the packages, and facilitate access to credit to finance purchase of the packages.

[1] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.
[2] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

Assessing the Impact of P4P

The analysis in this report concludes that, by almost any objective measure, P4P-supported FOs and farmers are substantially better off at the end of the P4P pilot than at the beginning. For example, the 13 P4P-supported FOs reported receiving more external assistance in 2014 than in 2009, are able to offer a greater range of services to their members, and are more engaged in markets. At the household level, more P4P farmers have access to productivity-enhancing inputs, maize yields have improved, a greater percentage of households are producing larger surpluses of maize, and incomes and wealth have increased.

Trends in FO capacity and household production and welfare, however, do not constitute evidence that the observed changes are caused by participating in P4P. To credibly attribute changes to P4P it is necessary to compare these outcomes to those that *would have occurred had these same FOs and households not participated in P4P*. This report applies appropriate analytical techniques to the data to estimate the causal effects of P4P on key indicators of FO capacity and smallholder farmers' production and marketing of staple commodities and on their household income.

Data and Methods

The impact assessment analysis for FOs draws on the survey data collected from a panel of 13 P4P-supported FOs and 7 non-P4P FOs and WFP's detailed procurement data. The El Salvador country office collected data from FOs in 2009, 2012, and 2014. The household analysis draws on surveys of random samples of farmer members of both P4P and non-P4P FOs conducted at the baseline, midpoint, and final periods of the pilot (2009, 2012, and 2014). El Salvador experienced a very high attrition rate in the household sample between the 2009 baseline and the 2012 follow-up surveys. The survey contractor was not able to locate 67 percent of the P4P households interviewed during the baseline and failed to locate 59 percent of the non-P4P sample. The high attrition rate substantially reduced the size of the household panel and may also have introduced an unknown bias into the results. The analysis uses a stratification approach to correct for the attrition. The size of the panel, however, limits the power of hypothesis tests for the household analysis.

The very small number of observations on FOs precludes involved statistical analysis. The analysis of the causal effect of P4P on FOs therefore uses a simple non-parametric difference-in-differences (DiD) approach that does not control for differences between P4P and non-P4P FOs. The household impact assessment analysis also uses a DiD approach to estimate the causal effects of participating in P4P on household production, marketing, and welfare indicators. The larger size of the household sample, however, supports a regression-based estimation approach that controls for factors other than P4P that may have influenced household outcomes. Both analyses rely on comparing outcomes for P4P groups with those of non-P4P groups which represent the counterfactual of not having participated in P4P.

Finding and Conclusions

El Salvador initially purchased from first-level FOs that appeared, in the baseline survey, to be relatively low-capacity organizations. None of the P4P or non-P4P FOs reported selling maize prior to the 2009 baseline survey and only 2 of 13 (15 percent) P4P FOs reported having access to long-term storage facilities.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 5 and Figure 6. The remainder of this section frames the conclusions in the context of

the results framework. It presents results in the sequence in which they are likely to occur; FO organizational capacity, FO marketing capacity, household marketing, household production, and household welfare.

In the results framework figures in this section, facilitating conditions are not necessarily outcomes of P4P, they merely represent conditions that may facilitate or enhance the potential for positive outcomes. The results framework figures therefore indicate whether the facilitating conditions are positive (+) or negative (-); attribution to P4P is not important. The columns of results attributable to P4P, however, indicate whether the facilitating conditions and participation in P4P caused a statistically significant change in the outcome indicator relative to non-P4P FOs and households.

Impact of P4P on FO Capacity

Figure 18 summarizes changes in facilitating conditions and anticipated results for FO capacity and serves to frame the conclusions presented in this section.

The facilitating conditions supporting increased FO organizational capacity generally improved over the course of the P4P pilot. The percentage of FOs reporting access to long-term storage facilities increased from 15 percent to 75 percent. P4P FOs also reported substantial improvements in access to supply-side support. By the end of the P4P pilot, 100 percent of P4P FOs reported receiving supply-side support for organizational strengthening, post-harvest handling, production, marketing, and inputs. The greatest changes were a 62 percentage point increase in the percentage of FOs receiving marketing support, a 54 percentage point increase in support for infrastructure, and a 38 percentage point increase in post-harvest handling support. The increases in post-harvest management, inputs, infrastructure, production, and marketing align with the particular areas on which the El Salvador P4P program focused.

WFP's procurement stimulus was relatively sizeable with the minimum quantity purchased from an FO in a given year at 40 mt, a maximum of 1,057 mt, and a mean of 342 mt.[3] However, procurement was inconsistent; WFP purchased in more than one year from only 3 of 10 P4P FOs registered as WFP suppliers.

The improvements in the facilitating environment prompted significant impacts in indicators of FO organizational capacity. In particular:

- Participating in P4P substantially increased P4P FOs' capacities to provide services to members relative to non-P4P FOs. The percentage of quality services offered increased by 49 percentage points, production services by 34 percentage points, and marketing services by 29 percentage points.
- Relative to non-P4P FOs, the percentage of P4P FOs facilitating members' access to inputs increased by 54 percentage points.
- The percentage of P4P FOs providing production training to members increased by 40 percentage points relative to non-P4P FOs.

The facilitating environment for marketing outcomes also generally improved for P4P FOs. The percentage of P4P FOs utilizing credit doubled from 31 percent to 62 percent between 2009 and 2014. WFP's procurement, although very inconsistent, was sizeable. These facilitating factors led to substantial increases in FO marketing capacity indicators. Although the indicator values increased substantially, only one could be attributed to P4P, probably because of the number of observations was too small to identify them as causal effects.

[3] WFP procurement records through May 2013.

FIGURE 1: SUMMARY OF IMPACT OF P4P ON FO CAPACITY

Maize Marketing

	Indicators	Results attributable to P4P		Facilitators	Status	
Organizational capacity	Planning	→	Percentage of P4P FOs planning for production and marketing increased by 32% relative to non-P4P but difference not statistically significant.	Infrastructure	+	Revolving loans and direct support from WFP contributed to increasing access to storage. P4P FOs reporting access to storage increased from 15% to 75%.
	Services	↑	Statistically significant increases in percentage of quality services (49%), production services (34%), and marketing services (29%) provided by P4P FOs relative to non-P4P FOs.	Procurement	-	Sizeable but inconsistent procurement stimulus
	Inputs	↑	54% increase in percentage of P4P FOs facilitating members' access to inputs relative to non-P4P FOs.	Supply-side support	+	Substantial increase in supply-side support for marketing (62% increase), infrastructure (54% increase), and post-harvest handling (38% increase)
	Training	↑	40% increase in percentage of P4P FOs providing production training to members relative to non-P4P FOs.			
Marketing capacity outcomes	Sales	↑	The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points relative to non-P4P FOs and average quantities sold increased by 262 mt.	Procurement	-	Sizeable but inconsistent procurement stimulus
	Market diversity	→	32 percentage point increase in percentage of P4P FOs selling to buyers other than WFP but not statistically different from non-P4P FOs.	Access to credit	+	Percentage of FOs utilizing credit doubled – from 31% to 62%.
	Financing for members	→	15 percentage point increase in percentage of P4P FOs providing post-harvest financing to members but not statistically different from non-P4P FOs.			
	Prices	↑	Price data at the FO level was too thin for inferences. However, P4P households reported receiving significantly higher prices than non-P4P households in 2012 (12% higher), the year when WFP purchased the most and from the greatest number of FOs.			
Impacts	Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)					

Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

Specific marketing outcomes included:

- The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points relative to non-P4P FOs and average quantities sold increased by 262 mt.
- The percentage of P4P FOs reporting selling to buyers other than WFP rose from 0 percent to 54 percent – a 54 percentage point increase. However, probably because of the small number of observations, the result was not statistically significant relative to non-P4P FOs.
- Price data at the FO level was too thin for inferences. However, P4P households reported receiving significantly higher prices than non-P4P households in 2012 (12 percent higher), the year when WFP purchased the most and from the largest number of FOs.

Impact of P4P on Household Maize Marketing

The conditions facilitating change in household maize marketing behavior improved across the board in El Salvador during the P4P pilot (Figure 19). The percentage of P4P FOs selling maize increased as did the average quantities sold. The percentage of quality and marketing services available from the FO increased: quality services by 49 percentage points and marketing services by 29 percentage points. The percentage of P4P households using credit for agricultural and other purposes increased between 2009 and 2012; by 6 percentage points for agricultural loans and 8 percentage points for non-agricultural loans.

The improved facilitating conditions led to changes in household maize marketing behavior. Specifically:

- The percentage of P4P households that reported selling through the FO at some point during the pilot increased by 21 percentage points relative to non-P4P households and the average percentage of surpluses sold through the FO increased by 19 percentage points relative to non-P4P households.
- A 12 percentage point increase in the percentage of P4P households selling four weeks or more after harvest relative to non-P4P households was not statistically significant. However, the 13 percentage point increase, relative to non-P4P households, in the average percentage of maize surpluses sold was.

These behavioral changes, primarily the choice to sell through the FO in a year when WFP procurement was high, led to P4P households receiving significantly higher prices for maize than non-P4P households. The difference between the USD 396 reported by P4P households and the USD 355 obtained by non-P4P households represents an 11 percent higher price associated with being a member of a P4P FO.

Impact of P4P on Household Maize Production

The P4P development hypothesis suggests that positive outcomes in household maize marketing lead to positive production outcomes. For example, higher prices obtained from selling maize through the FOs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. Specific changes in production facilitating conditions (documented in Figure 20) include:

- The percentage of P4P households reporting receiving subsidized inputs through their FO increased by 7 percentage point.
- The percentage of P4P households using credit for agricultural purposes increased by 6 percentage points between 2009 and 2012.
- The percentage of P4P households receiving production training increased by 23 percentage points.

FIGURE 2: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Maize Marketing							
	Indicators	**Results attributable to P4P**			**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Selling through the FO	↑	29 percentage point increase in percentage of households selling through the FO at any time during the pilot relative to non-P4P FOs.		Quantity sold by FO	+	The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points and average quantities sold increased by 262 mt.
					Quality and marketing services available from FO	+	Statistically significant increases in percentage of quality services (49%) and marketing services (29%) offered by P4P FOs.
	Selling more than 4 weeks after harvest	↑	Small but not statistically significant increase in percentage of P4P households selling maize 4 weeks or more after harvest relative to non-P4P households. Significant 13 percentage point increase in average percentage of surplus sold 4 weeks or more after harvest.		Access to credit	+	Slight increases in percentage of households utilizing credit for agriculture (up 6 percentage points) or for other purposes (up 8 percentage points).
Household marketing outcomes	Prices	→	Price data at the FO level was too thin for inferences. However, P4P households reported receiving significantly higher prices than non-P4P households in 2012 (12% higher), the year when WFP purchased the most and from the greatest number of FOs.		Quantity sold by FO	+	The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points and average quantities sold increased by 262 mt.

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
\+ Favorable conditions/change.
\- Unfavorable conditions/change.

The positive facilitating environment coupled with a P4P program that provided customized technical packages of inputs and the training to use them correctly prompted P4P households to change their maize production behavior relative to non-P4P households. In particular:

- The percentage of P4P households choosing to cultivate maize increased by 19 percentage points relative to non-P4P households.
- P4P households allocated an average of 0.29 ha more to maize production than non-P4P households.
- The percentage of P4P households using certified maize seed increased by 18 percentage points relative to non-P4P households and the average percentage of maize seed used that was certified increased by 27 percentage points relative to non-P4P households.

Consistent with the increased focus on maize production and the increased use of certified seed, P4P households reported a significant increase in maize production parameters. Specifically:

- P4P households' maize yields increased by 0.87 mt/ha relative to non-P4P households.
- The average quantity of maize produced by P4P households was 1.08 mt higher than it would have been had the households not participated in P4P.
- P4P households reported selling an average of 2.42 mt more maize than non-P4P households.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2014 than in 2009 by almost any measure of welfare.

- Average real incomes increased by 45 percent, from USD 870 in 2009 to USD 1,264 in 2014;
- The average household asset score increased from 12.30 in 2009 to 12.85 in 2014, an increase of 4 percent;
- The average real value of household livestock increased by 78 percent, from USD 435 to USD 774; and
- The average food consumption score increased by 9 percent, from 81.34 in 2009 to 85.22 in 2014.

However, non-P4P households experienced similar improvements and none of the changes observed with P4P households were significantly different from those experienced by non-P4P households.

FIGURE 3: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Maize Production						
	Anticipated Results	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Planting maize	↑	Significant 19 percentage point increase in likelihood that P4P households plant maize relative to non-P4P households.	Access to inputs/credit	+	7 percentage point increase in percentage of P4P households receiving subsidized inputs through the FO. 6 percentage point increase in percentage of households receiving credit for agricultural purposes between 2009 and 2012.
	Area allocated to maize	↑	Significant 0.29 ha increase in average area allocated to maize production by P4P households relative to non-P4P households.			
	Use of inputs	↑	The percentage of P4P households using certified maize seed increased by 18 percentage points relative to non-P4P households and the average percentage of maize seed used that was certified increased by 27 percentage points relative to non-P4P households.	Production training	+	23 percentage point increase in percentage of P4P households receiving production training.
Intermediate outcomes	Yields	↑	Significant 0.87 mt/ha increase in maize yields relative to non-P4P households.	Access to inputs/credit	+	7 percentage point increase in percentage of P4P households receiving subsidized inputs through the FO. 6 percentage point increase in percentage of households receiving credit for agricultural purposes between 2009 and 2012.
	Quantity produced	↑	Significant 1.08 mt increase in quantity of maize produced relative to non-P4P households.			
	Quantity sold	↑	Significant 2.42 mt increase in quantity of maize sold relative to non-P4P households.			

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
+ Favorable conditions/change.
- Unfavorable conditions/change.

INTRODUCTION

The World Food Programme's (WFP) five-year Purchase for Progress (P4P) pilot initiative tests innovative approaches for linking some of the world's poorest farmers to formal commodity markets. If successful, P4P will transform smallholder low-income farmers from subsistence farming to business-oriented producers capable of delivering consistent surpluses to private sector buyers, government institutions, and international organizations. Remunerative participation in commodity markets should provide smallholder farmers the incentive and the means to invest in agricultural production thereby increasing their incomes and improving their wellbeing.

To accomplish this goal, WFP has committed about ten percent of its local and regional procurement (LRP) in 20 countries[4] to testing alternative approaches for procuring in a manner that more directly benefits smallholder low-income farmers. This commitment represents a substantial demand. In 2012, WFP purchased almost a half-million mt of food from the 20 pilot countries, transferring almost USD 204 million into the local economies.[5]

Each of the 20 P4P pilot countries developed its own strategy for engaging with smallholder farmers, taking into account the local environment, opportunities, and constraints. Building the capacities of smallholder farmers' organizations (FOs) to be active market participants lies at the center of all the strategies and WFP buys directly from FOs in almost all the countries. When the opportunities existed, some countries overlaid supporting structured market platforms (commodity exchanges and warehouse receipt systems), small and medium traders, and food processors onto the basic FO-centric model.

The P4P hypothesis describes a development progression that begins with building the capacities of FOs to aggregate commodities, add value (e.g., achieve WFP quality standards), and identify and sustainably access markets. To gain these capacities, FOs will necessarily need to engage their members; providing them with technical and financial services to support production and marketing, building trust and ownership, and promoting a business-oriented approach to farming. The progress individual countries are able to make along this progression will depend on the baseline capacities they find among FOs and smallholder farmers, the approach they take to capacity building, and characteristics of the enabling environment (e.g., partner support and policy).

DATA AND METHODS

The impact assessment is based on a quasi-experimental design that compares outcomes for two groups of FOs and households; one group that is participating in P4P and a group that is not. Participation at the FO level means that WFP has committed to buying from the FO. At the household level, participation means that the household is a member of a P4PP-supported FO. Comparison FOs were selected to be as similar to P4P FOs as practical in terms of FO capacity indicators and factors that could affect marketing and agricultural production. Survey data collected from these two groups at various points in time track changes in anticipated outcomes throughout the P4P implementation period. The El Salvador country office commissioned surveys of all P4P FOs and a sample of non-P4P FOs every year of the five-year pilot. It also

[4] Afghanistan, Burkina Faso, Democratic Republic of Congo, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Liberia, Malawi, Mali, Mozambique, Nicaragua, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, and Zambia.
[5] WPF. (2012). Food Procurement Annual Report 2012. Rome. Accessed at: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp255336.pdf

surveyed a panel of randomly selected members of the surveyed P4P and non-P4P FOs in year 1, the baseline, year 3, and year 5.[6] Table 1 and Table 2 summarize the FO and household samples, respectively. The attrition rate in the household sample was very high, particularly between the baseline and first follow-up surveys. In particular, only 115 of the 349 P4P households that participated in the baseline survey provided data in the 2012 follow-up survey, an attrition rate of 67 percent. The attrition rate among non-P4P households during the same time period was 59 percent (only 126 of 308 households that participated in the baseline responded to the first follow-up survey).[7] Consequently, the size of the household panel is relatively small.

The surveys collected data on a variety of FO capacity and household production, marketing, and welfare indicators. For FOs these included data on services provided to members, storage capacity, marketing activity, and credit utilization, among others. The household surveys collected data on household characteristics; production; production practices; marketing activity; credit utilization; and income from crops, livestock, and off-farm sources, among others. The data collection instruments are available from WFP.

TABLE 1: FO SAMPLE

	2009 (baseline)	2010	2012	2013	2014
Entire sample					
P4P FOs	13	13	13	13	13
Non-P4P FOs	7		9		8
Panel					
P4P FOs	13	13	13	13	13
Non-P4P FOs	7		7		7

TABLE 2: HOUSEHOLD SAMPLE

	2009 (baseline)	2012	2014
Entire sample			
P4P households	349	315	310
Non-P4P households	308	308	306
Panel			
P4P households	112	112	112
Non-P4P households	125	125	125

In the comparison group design, the outcomes for the non-P4P group represent the counterfactual, i.e., outcomes for the P4P groups had they not participated in P4P. Obviously, many factors other than P4P may affect outcomes of the two groups over time. The more similar the two groups, the less potential exists for other factors to differentially influence outcomes. It was not feasible, however, to randomly assign FOs to P4P and non-P4P groups (the best way to obtain comparable groups) and the EL Salvador country office matched them loosely on similarity of size, marketing experience, location, and organizational capacity.

Location may be an important determinant of all of the outcomes of importance to P4P. Therefore, it is important to match P4P groups to non-P4P groups in the same regions, or regions with similar access to

[6] Due to attrition, the size of the household panel (households interviewed in all three surveys) is smaller than the overall sample.
[7] The Country Office could not explain the cause of the high attrition rates.

markets and agricultural production environments. The relatively small number of FOs that met WFP's minimum requirements for participation made it difficult in El Salvador to find appropriate comparison FOs in some regions. The resulting sample is therefore somewhat unbalanced by region (Table 3). This has implications for the analysis as described in the next section.

TABLE 3: DISTRIBUTION OF FO AND HOUSEHOLD SAMPLES BY REGION

Region	Number of FOs		Number of households	
	P4P	Non-P4P	P4P	Non-P4P
Ahuachapán	5	2	117	72
Santa Ana	1		10	
Sonsonate	2	1	19	68
La Libertad		2		29
San Vicente	1	1	29	54
Usulután	2	1	78	85
Morazán	1		50	
La Unión	1		46	

Data Limitations

The most troublesome aspect of the El Salvador data is the potential bias resulting from the high attrition rates in the household sample between the 2009 baseline and the first follow-up survey in 2012. Even analyses based only on the household panel (which excludes the households selected to replace those dropped from the second follow-up survey) may produce biased results if the dropped households are systematically different than retained households. Comparison of the baseline characteristics of dropped and retained households suggests that they are indeed different with respect to many of the key P4P outcome indicators. The analysis addresses this limitation by using only panel households, stratifying on an index of P4P outcomes, and weighting the analyses to account for disproportionate representation in each stratum relative to proportions in the full baseline sample. The ability of this approach to eliminate potential biases in estimates of causal effects depends on the extent to which the stratification variable reflects household characteristics that are relevant to defining household responses to P4P. See Annex A for more information on the stratification approach.

In the FO data, the fact that only three of the five surveys collected data on non-P4P FOs severely restricts the scope of the analysis and probably biases some results. The missing observations for non-P4P FOs makes it impossible to fully compare temporal trends in outcome variables between the two groups. The limitation is particularly acute for variables formulated in cumulative terms, e.g., total quantity sold to date. In fact, in these instances, even a comparison of P4P and non-P4P FOs in the final year must ignore the 2010 and 2013 data for P4P FOs or values will not be comparable. Consequently, when necessary, comparisons of P4P and non-P4P FOs use data only for the years in which data from both groups exist. The missing data may also bias results for outcomes that exhibit considerable variability over time, especially if the causes of the variability are different for P4P and non-P4P FOs.

The very small number of observations on non-P4P FOs also limits the power of tests of impacts on FO capacity. Low power means that the chance of identifying an effect that does in fact exist is relatively small. In other words, an effect will have to be relatively large to be detected as a significant difference.

Analysis of Impacts on FO Capacity Indicators

As country offices designed their P4P programs, they had to match the number of FOs selected to participate with the anticipated level of procurement in order to provide a meaningful and consistent level of procurement throughout the pilot. El Salvador elected to work with 13 FOs. This number of FOs is too small to expect reliable results from rigorous approaches to estimating causal effects. Consequently, the analysis of the effects on FOs of participating in P4P relies on simple difference-in-differences (DiD) comparisons without controlling for other factors that might affect FO outcomes. The simple DiD estimator is the difference in average outcomes for the P4P group over time minus the difference in average outcomes for the non-P4P group. The impact of P4P on an outcome Y at time *t* is:

$$Impact_t = \left(\bar{Y}_{pt} - \bar{Y}_{p(t-k)}\right) - \left(\bar{Y}_{nt} - \bar{Y}_{n(t-k)}\right)$$

where $\bar{Y}$ indicates the group mean of outcome Y, the subscript *t* refers to time (surveys periods), *k* is the number of years prior to *t* from which to evaluate impact, *p* indicates P4P groups, and *n* is non-P4P groups.

Analysis of Impacts on Households

Analysis of the household data employs a DiD approach to estimate the causal effects of P4P on anticipated outcomes. The DiD estimator defines the impact of a program on an anticipated outcome as the relative change in the average outcome measure over time between a "treatment" group affected by the program and a "control" group that is not affected, or:

$$Impact = \left(\bar{Y}_{1t_1} - \bar{Y}_{1t_0}\right) - \left(\bar{Y}_{0t_1} - \bar{Y}_{0t_0}\right) \quad (1)$$

where $\bar{Y}$ indicates the group mean of outcome measure Y; the subscripts *0* and *1* refer to control and treatment groups, respectively, and the subscript *t* refers to time with the subscripts 0 and 1 on *t* referring to pre- and post- program time periods respectively.

The non-parametric DiD estimator in equation (1) is appropriate only if the treatment and control groups are statistically equivalent, that is, that differences are due only to chance. Statistical equivalence implies that the DiD impact estimate derived from equation (1) is due only to the treatment and not to other factors. Random assignment of experimental units (e.g., FOs or households) to treatment and control groups is the best way to ensure statistical equivalence. Except for Ghana, however, it was not possible to randomly assign FOs, or by implication, households, to P4P and non-P4P groups. Therefore, the simple estimator of equation (1) is not appropriate for El Salvador.

A generalization of the DiD estimator in a regression framework is more appropriate for cases where treatment and control groups are not equivalent. When the two groups are not statistically equivalent, the analysis needs to control for the differences to obtain reliable estimates of causal effects. One useful feature of the DiD estimator is that it completely controls for time-invariant differences between the two groups leaving only time-variant differences as possible confounders. The regression equivalent of the DiD estimator is:

$$Y_{it} = \alpha + \beta D_{it_0} + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (2)$$

where Y_{it} is the observed outcome for household i at time (survey) t, D_{it_0} is a vector of indicators of whether household i is in the treatment group at time $t=0$, τ is a vector of indicators for each time period except $t=0$, D_{it} is an indicator of household i being in the treatment group for all $t\neq 0$, X_{it} is a set of control variables which may include interactions, and ε_{it} is the error term. The elements of the coefficient vector γ are the average impacts of the treatment on Y at time t.

With panel data the regression equation becomes:

$$Y_{it} - Y_{it-1} = \alpha + \delta\tau + \gamma D_{it} + \theta X_{it} + \epsilon_{it} \quad (3)$$

where parameters are the same as those defined for equation (2).

Given the limitations of the data caused by high attrition rates, the analysis applies equation (3) to the small panel of households.

Comparability of P4P and Non-P4P Groups

The reliability of the DiD estimates of impact in the case of non-equivalent groups depends in part on their similarity. Therefore, prior to assessing the impacts of P4P on FO capacity and farmers' productivity and welfare, the analysis examines the differences between the two groups and the significance of observed differences.

Comparability of FOs

Side-by-side tests of differences in means and proportions of 31 FO characteristics served to assess the baseline comparability of P4P and non-P4P FOs. There were very few statistically significant differences between the two groups. However, the samples were too small for powerful tests of differences. The three significant differences that did emerge were:

- P4P FOs were significantly **more likely** than non-P4P FOs to report having received external assistance for marketing – 38 percent versus 0 percent.
- P4P FOs were significantly **less likely** to report providing any services to members – 69 percent versus 100 percent.
- P4P FOs were **more likely** than non-P4P FOs to report providing marketing services – 21 percent versus 0 percent.

Table 15 in Annex B provides the full details of the tests for similarity between P4P and non-P4P FOs.

Comparability of Households

Similarly, the comparison of P4P and non-P4P households relied on testing for differences between the two groups on the basis of 76 variables extracted from the household survey. The two groups of households differed significantly (i.e., p-value<=0.10) on 35 of the 76 variables. The most meaningful differences included:

- In terms of household characteristics:
    - P4P households were significantly **more likely** than non-P4P households to have a female household head – 73 percent compared to 54 percent.
    - P4P households were significantly **more likely** than non-P4P households to obtain water from an improved source – 96 percent versus 79 percent.
    - P4P households were significantly **less likely** than non-P4P households to have a concrete or wood floor (as opposed to dirt) – 59 percent compared to 70 percent.
- In terms agricultural production:
    - P4P households reported owning significantly **more** land than non-P4P households – an average of 1.79 ha compared to 0.97 ha.
    - P4P households reported cultivating significantly **more** land than non-P4P households – an average of 2.21 ha compared to 1.37 ha.
    - P4P households reported allocating significantly **more** land to maize production than non-P4P households – an average of 1.33 ha compared to 0.86 ha.
    - P4P households reported harvesting significantly **larger** quantities of maize (3.43 mt on average compared to 1.93 mt), producing a larger surplus of maize (2.28 mt versus 0.99 mt), and selling larger quantities of maize (4.92 mt compared to 2.43 mt).
    - P4P households were significantly **more likely** than non-P4P households to have received inputs through their FO – 80 percent versus 61 percent.
    - P4P household were significantly **more likely** than non-P4P households to use fertilizer – 42 percent compared to 29 percent.
    - P4P households reported spending significantly **more** than non-P4P households on producing crops – an average of USD 529 annually compared to USD 321.
    - P4P households earned significantly **more** from farming than non-P4P households – an average of USD 826 per year compared to USD 384.
- In terms of marketing, P4P households were significantly **more likely** than non-P4P households to report selling maize four weeks or more after harvest – 47 percent compared to 34 percent.
- In terms of income and expenditure:
    - P4P households reported significantly **larger** total household incomes – USD 1,083 per year versus USD 653. P4P households also reported higher income from all crop-related activities.
    - P4P households reported earning a significantly **smaller** share of total income from off-farm sources than non-P4P households – 19 percent compared to 39 percent.
    - P4P households reported spending significantly **less** than P4P households on household items (USD 573 compared to USD 443) and on "other" items (USD 2,768 versus 4,646).

Taken together these differences seem to imply that P4P households were significantly more involved in agriculture than non-P4P households. The discrepancy between income and expenditure makes it difficult to determine if one group is better off than the other.

Table 16 in Annex B provides the details of the comparisons.

THE P4P "TREATMENT"

An impact assessment determines the causal effect of a *treatment* on anticipated outcomes. For P4P this is the impact on FO capacity and household agricultural productivity and welfare associated with participating in

P4P. The P4P logframe defines a number of indicators of FO capacity and household productivity and welfare outcomes.[8]

The P4P development hypothesis expects WFP's commitment to buy from FOs during the pilot phase will catalyze the support of development partners to help build the capacities of participating FOs to capitalize on the opportunity to sell to WFP and of individual farmers to increase agricultural productivity and 2) provide individual farmers the financial incentive to invest in increasing agricultural productivity. In this context, the P4P *treatment* is merely WFP's procurement and the capacity building activities of partners are outcomes of the treatment.

However, many P4P programs purposely selected FOs based in part on the presence of development partners working to build the capacities of the FOs. Furthermore, country programs often directly supported capacity building activities, e.g., conducted training, provided infrastructure and equipment. The El Salvador program, for instance, focused on providing technical packages of inputs and associated training aimed at increasing production. In this context, access to inputs may be a component of the treatment rather than an outcome.

Impact assessments often carefully design treatments/interventions to vary the treatment elements and/or their intensity across subjects (e.g., FOs). With P4P, however, country offices had a great deal of latitude to design and implement their own programs. The P4P Rome-based coordination unit, which designed and managed the monitoring and evaluation system and the impact assessment framework, had little direct control over specific implementation decisions at the country level. The impact assessment therefore has to take the types and intensities of treatments as given.

The remainder of this section documents characteristics of the P4P treatment for individual FOs in El Salvador. These data will define the dimensions and intensity of the P4P *treatment* applied to individual FOs and help identify the characteristics of the treatment that influence particular outcomes. In the El Salvador context, the broad dimensions of the treatment are WFP procurement, establishing revolving funds to facilitate FO access to credit, distributing technical packages and training to improve agricultural productivity, and training. Because, in most cases, WFP's development partners were already working with participating FOs, coordinated their activities closely with WFP, and were often funded by WFP, the impact assessment considers their activities to be part of the P4P treatment rather than an outcome of the treatment.

WFP Procurement

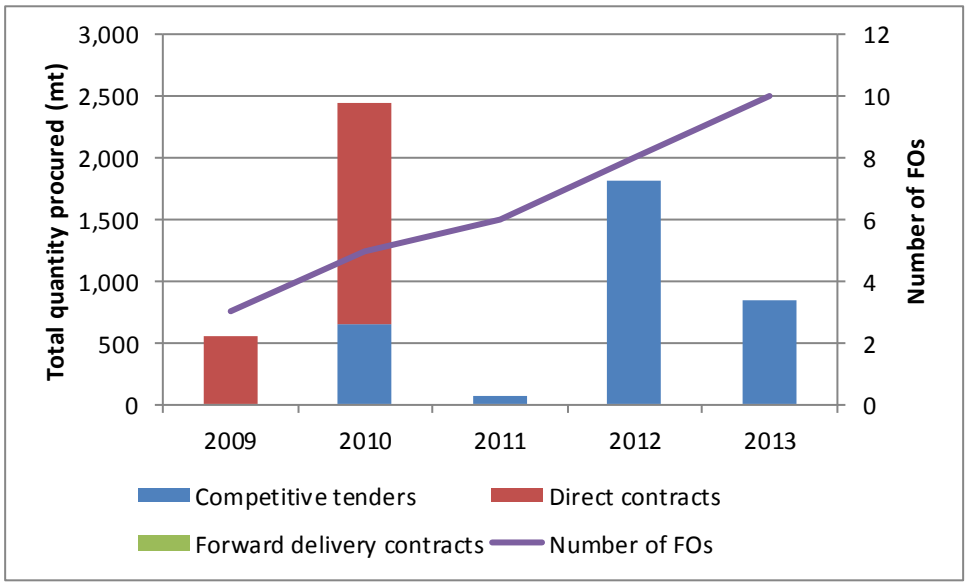
Between P4P's inception in 2009 and May 2014, WFP took purchased 5,758 mt of maize and beans from P4P FOs in El Salvador.[9] The quantities WFP procured varied throughout the course of the pilot, largely due to programmatic requirements external to the P4P program (Figure 4). Aspects of the treatment as they relate to procurement that the country office could control were the procurement modality; the number of FOs from which it purchased; the number of contracts (excluding competitive tenders where WFP could not control the outcome) awarded to each FO; and by implication, the quantities contracted from each FO.[10]

[8] P4P Global Logframe, Internal WFP document.
[9] Source: WFP procurement records. The most recent available data cover the period from inception (2009) to December 2013. The fourth quarter data from 2013 (i.e., October-December) had not been verified by the P4P Coordination Unit at the time of this analysis.
[10] With competitive tenders, the CO could control only the number of tenders it issued, and their size, but could not directly control the individual FOs that won tenders.

Figure 4 also illustrates that, over the course of the five-year pilot WFP switched from relying exclusively on direct contracts in 2009 to using only competitive tenders from 2011 onward. By the end of the pilot, WFP had executed 48 separate contracts and purchased from 10 of the 13 FOs participating in P4P

The P4P development hypothesis implies that the size and consistency of procurement matters. WFP's commitment to purchase from a FO is expected to provide the FO the space to build capacity with a patient buyer. The stimulus should also be large enough to provide member farmers with the incentive to invest in increasing production. This implies a consistent level of procurement large enough to represent a meaningful sale volume for individual farmers.

FIGURE 4: WFP PROCUREMENT FROM P4P FOS BY YEAR AND MODALITY



Source: WFP procurement records.

Over the course of the pilot El Salvador purchased at least once from 10 of the 13 FOs that participated in P4P at some stage during the pilot. It purchased in more than one year from 3 of the 10 FOs (30 percent) from which it purchased. Contract sizes ranged from 4.65 to 497.00 mt with an overall average of 120 mt. The average contracted per FO (considering multiple contracts in a year) ranged from 97.30 to 1,941.36 mt with an overall average of 576 mt (Table 4). These results suggest a reasonably large but inconsistent procurement stimulus. Table 17 in Annex C documents sales to WFP by FO and year and clearly illustrates the characteristics of the procurement stimulus for individual FOs.

TABLE 4: DISTRIBUTION OF CONTRACTED QUANTITIES

	Number of observations	Mean	Median	Minimum	Maximum	Standard deviation
Quantity per contract (mt)	48	120	100	4.65	497.00	99.7958
Quantity per FO (mt)	10	576	328	97.30	1,941.36	615.3211

Source: WFP procurement records.

RESULTS FRAMEWORK

The results framework articulated in this section illustrates the interdependent, and often sequential, nature of P4P results and provides a context within which to interpret the findings. It is relevant at this juncture as context for the quantitative findings presented in the following two sections.

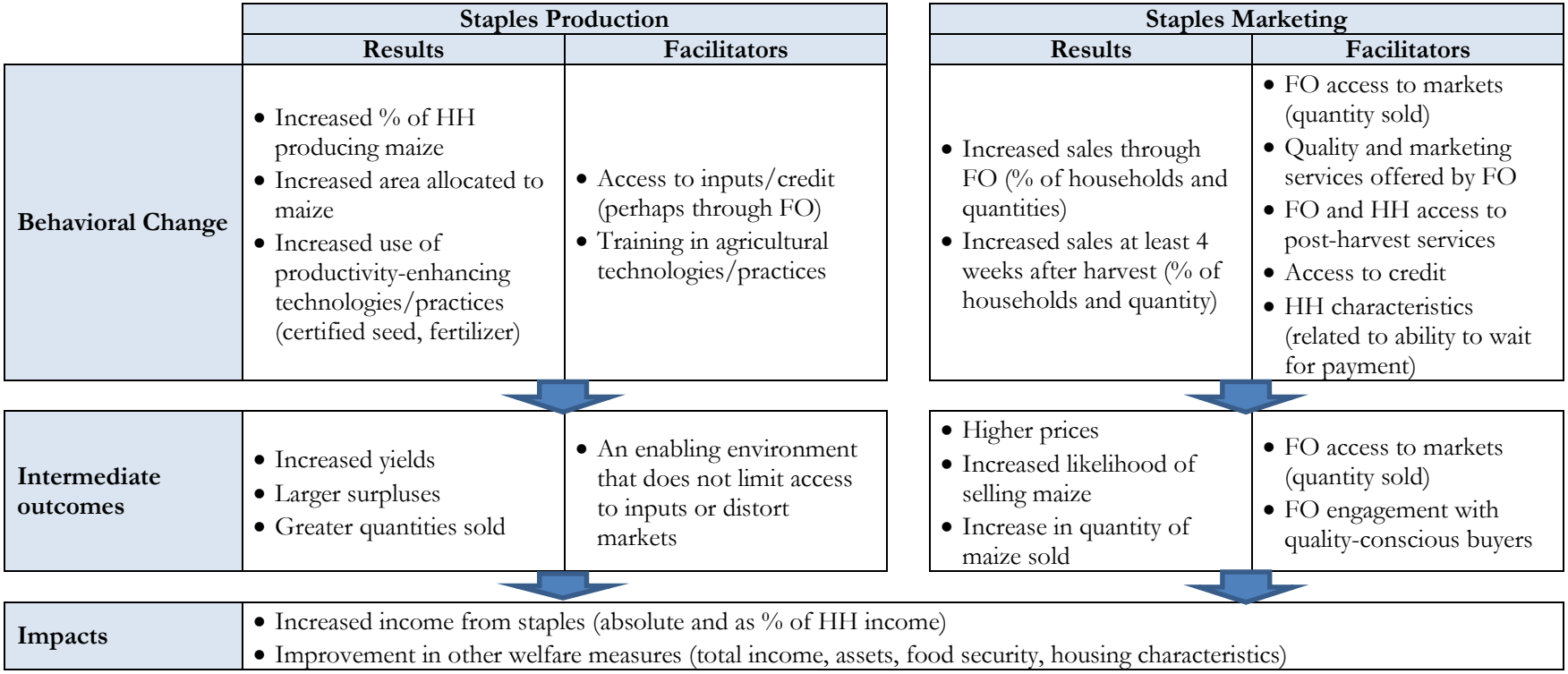
P4P is a capacity building program. By committing to buy a high-value (quality) product more directly from smallholder farmers, usually through FOs, WFP expects to catalyze the efforts of other development actors working to build the capacities of FOs. Stronger FOs will be more effective marketing entities able to aggregate larger quantities and add value to staple commodities by selling in bulk, improving quality, or transforming the product through processing. As FOs gain capacity, their smallholder farmer members benefit from enhanced access to markets enabling them to sell larger quantities through the FO at, perhaps, higher prices reflecting value addition. Increasing returns to agriculture, coupled with productivity-enhancing support from WFP and its partners, may begin to change farmers' perspectives on agriculture from a primarily subsistence activity to a viable business opportunity. As farmers recognize the potential of agriculture, they may begin to invest in productivity-enhancing technologies and practices, extending farm-level benefits beyond food security to increased incomes.

This is an obviously simplistic summary of a much more complex and nuanced development hypothesis. It does, however, illustrate the sequential and interdependent aspects of the pathway through which P4P expects to produce results. At both the FO and household levels, results progress from behavioral change to intermediate outcomes to higher level impacts. For example, at the FO level (illustrated in Figure 5), adopting a business orientation and increasing services provided to members (behavioral change) lead to increased quantities aggregated and sold and higher prices (intermediate outcomes) and then to sustainable access to value-added markets (impacts). At the household level (Figure 6), choosing to sell through the FO (behavioral change) will increase returns to agriculture (intermediate marketing outcomes) which should increase investments in agricultural production such as adopting productivity-enhancing technologies and practices (behavioral change) which should then lead to the intermediate production outcomes of increasing yields, quantities produced, and quantities sold. Producing and selling larger quantities at higher prices will have an impact on household welfare.

FIGURE 5: PROGRESSION OF FO RESULTS

	Staples Marketing	
	Results	**Facilitators**
Behavioral Change	• Acquiring a business orientation • Planning for production and marketing • Increased services/training offered to members	• Access to post-harvest facilities and equipment • WFP procurement (catalyst) • Supply-side support (capacity building, infrastructure)
Intermediate outcomes	• Increased quantities aggregated and sold • Increased range of markets (including quality-conscious buyers) • Able to facilitate financing for members • Obtaining higher prices	• Consistent and sizeable WFP procurement • Trust of membership, transparency • Improved access to credit
Impacts	• Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)	

FIGURE 6: PROGRESSION OF HOUSEHOLD RESULTS



There are several important things to note about the progression of results in Figure 5 and Figure 6.

1. Household results can be classified as production-oriented and marketing-oriented. However, these categories are not necessarily independent. For example, the development hypothesis posits that higher prices associated with selling through the FO (an intermediate outcome in the marketing column) will provide an incentive to invest in productivity-enhancing technologies and practices (a behavioral change in the production column). The interdependence of results therefore works horizontally and vertically in the household figure.
2. Results often depend on "facilitators", conditions that contribute to achieving results. Some facilitators are elements of the P4P program and some fall within the remit of development partners' or governments.
3. Many FO results appear as facilitators in the household results progression. This implies that household results are, in some cases, dependent on FO results. The FO and household frameworks are therefore interdependent and household results may lag FO results. It is also possible that FO results lag household results. For example, an FO may find it difficult to aggregate large quantities before achieving a level of trust with its members that will encourage them to sell through the FO.

The following two sections present the quantitative findings on FO capacity building and household production and welfare with little interpretation. The conclusions section returns to the framework articulated in this section to draw the quantitative and qualitative evidence together into a coherent story of the impact of P4P in El Salvador.

IMPACT OF P4P ON FO CAPACITY

The El Salvador follow up report shows substantial improvements in many measures of FO capacity. However, these results do not reflect the impact of P4P because they do not consider what would have happened had the FOs not participated in P4P. This report determines which of the observed changes in FO capacity can be attributed to participating in P4P.

Because El Salvador collected data for non-P4P FOs only in 2009, 2012, and 2014, it is possible to compare P4P and non-P4P groups only in these three years (see the Data Limitations section on page 3 for more detail). The missing data can lead to substantially biased impact estimates, especially for highly variable outcomes such as quantities sold or outcomes measured in a cumulative form such as services provided. To avoid bias associated with missing data, the analysis ignores the data on P4P FOs in 2010 and 2013 and compares the P4P and non-P4P groups only on the basis of the years for which data exist for both groups of FOs.

Impact of P4P on Organizational Capacity

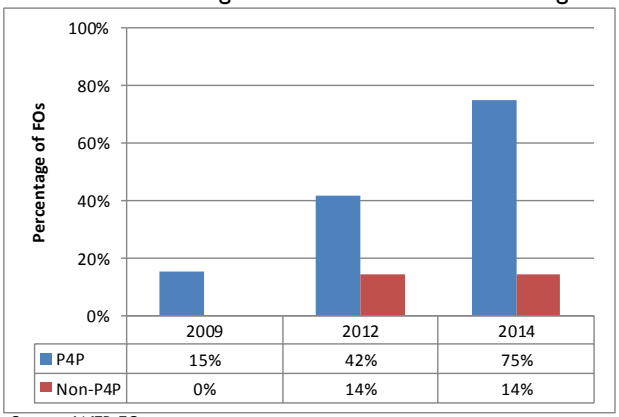
Organizational capacity refers to the human and physical capacity of an organization to effectively manage commodity aggregation, value addition, and marketing. The results framework of Figure 5 postulates that access to post-harvest infrastructure, WFP's procurement, and other supply-side support are important factors facilitating improvements in organizational capacity. At the time of the baseline, only 2 of the 13 P4P FOs reported having access to long-term storage and none of the non-P4P FOs reported access to storage (Panel 1 of Figure 7). WFP established revolving funds with P4P FOs and many used the funds to construct storage facilities. By 2014, 9 P4P FOs reported having access to storage while only one non-P4P FO gained access to storage during the same time period. Data on the capacity of storage facilities were inconsistent, i.e., showing declines in owned capacity, and are not reported.

Over the course of the P4P pilot, the percentage of P4P FOs receiving supply-side support also increased substantially, particularly support focused on marketing and infrastructure, two P4P focus areas (Panel 2 of Figure 7). Non-P4P FOs experienced similar growth in the percentage receiving supply-side support, particularly support related to post-harvest handling and marketing (Panel 3 of Figure 7). However, growth in the percentage of P4P FOs receiving assistance with marketing, inputs, tools, and infrastructure was substantially higher than for non-P4P FOs.

Finally, the consistency and size of WFP's procurement is also an important facilitating factor contributing to building organizational capacity. The "WFP Procurement" section on page 7 summarized WFP's procurement from P4P FOs and concluded that WFP provided a sizeable but inconsistent procurement stimulus.

FIGURE 7: ORGANIZATIONAL CAPACITY FACILITATORS

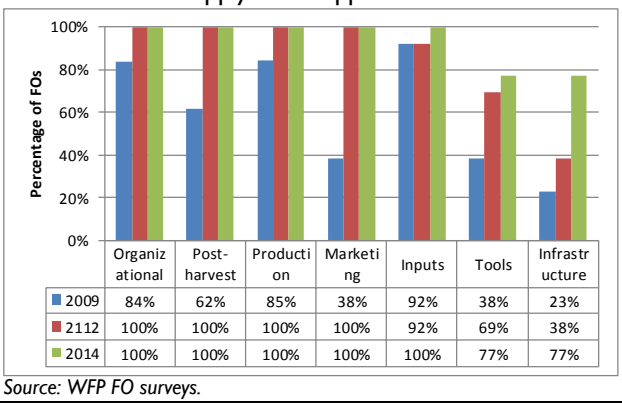
Panel 1: Percentage of FOs with Access to Storage



	2009	2012	2014
P4P	15%	42%	75%
Non-P4P	0%	14%	14%

Source: WFP FO surveys.

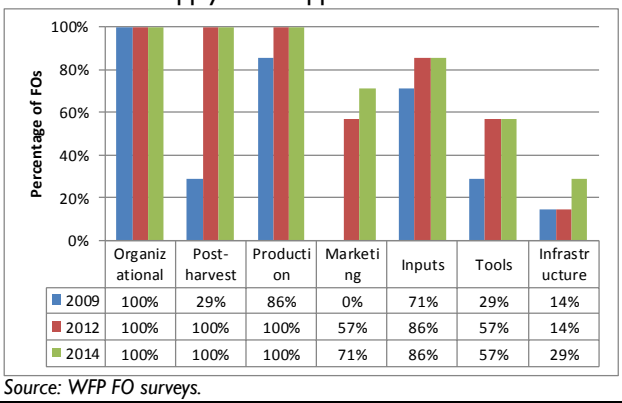
Panel 2: Supply-Side Support to P4P FOs



	Organizational	Post-harvest	Production	Marketing	Inputs	Tools	Infrastructure
2009	84%	62%	85%	38%	92%	38%	23%
2112	100%	100%	100%	100%	92%	69%	38%
2014	100%	100%	100%	100%	100%	77%	77%

Source: WFP FO surveys.

Panel 3: Supply-Side Support to Non-P4P FOs



	Organizational	Post-harvest	Production	Marketing	Inputs	Tools	Infrastructure
2009	100%	29%	86%	0%	71%	29%	14%
2012	100%	100%	100%	57%	86%	57%	14%
2014	100%	100%	100%	71%	86%	57%	29%

Source: WFP FO surveys.

WFP's procurement, its direct and indirect (through revolving funds) investments in warehouses, and the external assistance it brought to bear on the FOs significantly improved the facilitating conditions necessary to support improvements in organizational capacity. Except for the inconsistent procurement stimulus from WFP, by 2014, facilitating conditions for P4P FOs were generally supportive of improved organizational capacity. Indicators of organizational capacity include the range of services offered to members, ability to facilitate members' access to production inputs and provide production training to members, and planning for production and marketing.

The FO survey asked whether FOs provided a range of 18 different services; too many to examine individually. The services fall into four categories; value addition, quality, production, and marketing.[11] The analysis aggregates the services into these four categories and defines four service capacity indicators as the percentage of the services within a category the FO provides. Panels 1 and 2 of Figure 8 illustrate trends in the average percentage of services offered by P4P and non-P4P FOs, respectively.

Between 2009 and 2014, P4P FOs reported substantial increases in the percentage of quality, production, and marketing services they offered while non-P4P FOs reported virtually no change. In fact, the average percentage of quality services provided by P4P FOs increased by 49 percentage points relative to non-P4P FOs, production services increased by 34 percentage points, and marketing services by 29 percentage points. The non-parametric DiD results reported in Table 5 strongly suggest that these changes are attributable to participating in P4P.

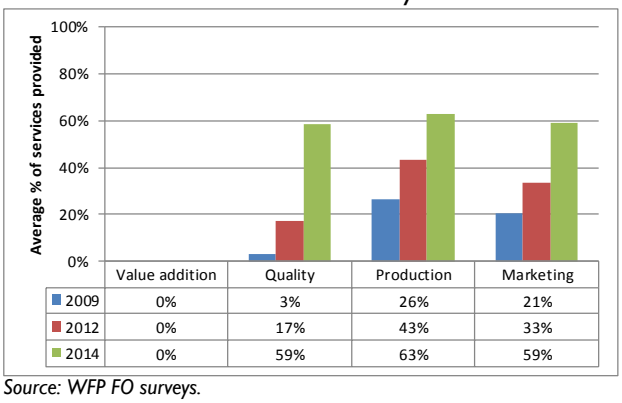
Panels 3 and 4 of Figure 8 show substantial increases in the percentages of P4P FOs that reported, respectively, facilitating access to inputs for their members and providing production training. In both cases, non-P4P FOs were significantly more likely than P4P FOs to provide these services in 2009 but P4P FOs surpassed non-P4P FOs by 2014. Non-parametric DiD analysis (Table 5) estimated a statistically significant 54 percentage point increase in the percentage of P4P FOs facilitating access to inputs relative to non-P4P FOs – a result that is consistent with the P4P focus on providing technical input packages. Similarly, the analysis concludes that the 40 percentage point increase in the percentage of P4P FOs providing production training relative to non-P4P FOs is attributable to participating in P4P.

The percentage of P4P FOs that reported planning for production and marketing also increased markedly between 2009 and 2014 while non-P4P FOs reported little change. The 32 percentage point growth among P4P FOs relative to non-P4P FOs was not statistically significant however so it cannot be attributed to P4P (Table 5).

[11] The value addition category includes two services; small-scale food processing and milling. The quality category includes eight services; drying commodities, cleaning commodities, removing small/broken grains, removing discolored grains, use of storage facilities, use of cleaning facilities, use of drying equipment, and fumigation. Production includes five services; technical assistance in agricultural technologies and practices, supplying agricultural inputs, facilitating access to inputs, maize threshing/shelling, and draft power. Marketing includes the three services of transporting good to buyers/markets, weighing and bagging, and aggregating commodities for sale.

FIGURE 8: TRENDS IN FO ORGANIZATIONAL CAPACITY INDICATORS

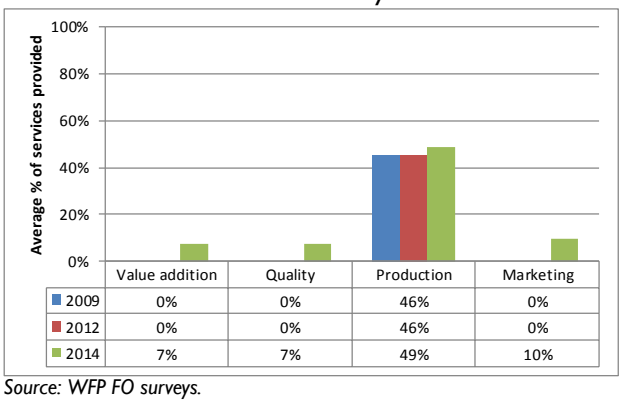
Panel 1: Services Provided by P4P FOs



	Value addition	Quality	Production	Marketing
2009	0%	3%	26%	21%
2012	0%	17%	43%	33%
2014	0%	59%	63%	59%

Source: WFP FO surveys.

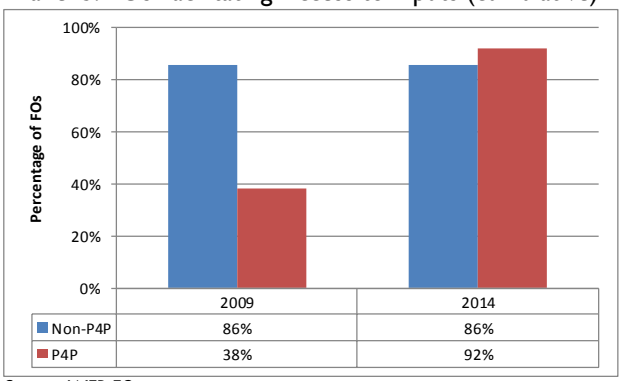
Panel 2: Services Provided by Non-P4P FOs



	Value addition	Quality	Production	Marketing
2009	0%	0%	46%	0%
2012	0%	0%	46%	0%
2014	7%	7%	49%	10%

Source: WFP FO surveys.

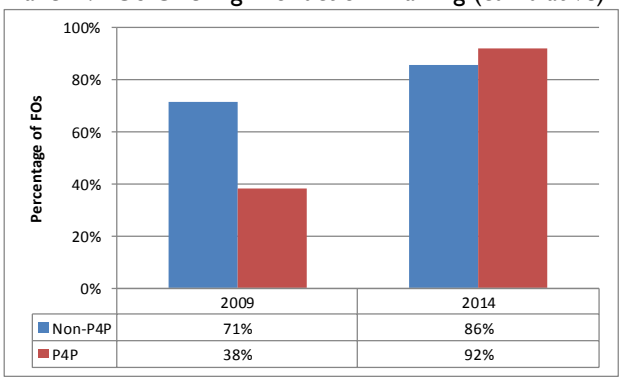
Panel 3: FOs Facilitating Access to Inputs (cumulative)



	2009	2014
Non-P4P	86%	86%
P4P	38%	92%

Source: WFP FO surveys.

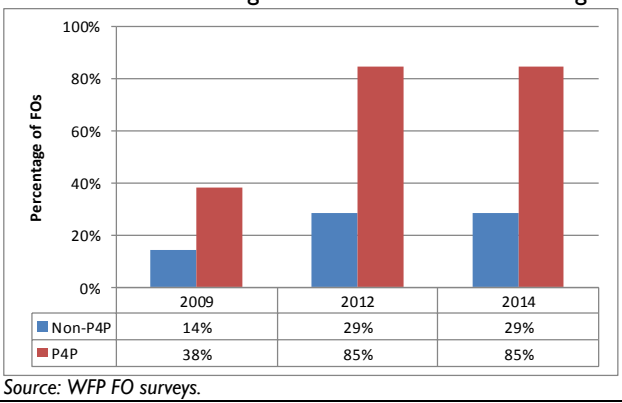
Panel 4: FOs Offering Production Training (cumulative)



	2009	2014
Non-P4P	71%	86%
P4P	38%	92%

Source: WFP FO surveys.

Panel 5: FOs Planning for Production and Marketing



	2009	2012	2014
Non-P4P	14%	29%	29%
P4P	38%	85%	85%

Source: WFP FO surveys.

TABLE 5: NON-PARAMETRIC DID ESTIMATES OF THE IMPACT OF P4P ON ORGANIZATIONAL CAPACITY

Model	Impact (coefficient/p-value)		
	2009-2012	2012-2014	2009-2014
Percentage of value addition services provided (cumulative %)	0% (---)	-7% (0.1800)	-7% (0.1800)
Percentage of quality services provided (cumulative %)	14% (0.1480)	34%*** (0.0030)	49%*** (0.0000)
Percentage of production services provided (cumulative %)	17% (0.1480)	17%* (0.0910)	34%*** (0.0100)
Percentage of marketing services provided (cumulative %)	13% (0.1400)	16% (0.1330)	29%** (0.0440)
Likelihood of facilitating access to inputs (cumulative %)	Data not collected from non-P4P FOs in 2012		54%*** (0.0020)
Likelihood of providing production training (cumulative %)	Data not collected from non-P4P FOs in 2012		40%* (0.0650)
Likelihood of planning for production and marketing (%)	32% (0.1710)	0%	32% (0.1710)

Numbers in parentheses are p-values.
* *significant at p< 0.10*
** *significant at p< 0.05*
*** *significant at p< 0.01*

Impact of P4P on FOs' Marketing Capacity

The results framework of Figure 5 identifies three factors that should facilitate improvement in FOs' marketing capacity. These include consistent and sizeable WFP procurement, trust of members' and organizational transparency, and improved access to credit. Anticipated marketing capacity outcomes include increased quantities aggregated and sold, accessing a larger range of markets (including quality-conscious buyers), the ability to provide financing to members, and obtaining higher prices. This section investigates changes in facilitating factors and then links them to marketing capacity outcomes.

Previous sections have already documented trends in WFP's procurement from P4P FOs and concluded that WFP provided a sizeable but inconsistent procurement stimulus. Figure 10 illustrates trends in three additional facilitators of FO marketing capacity: use of credit, percentage of households choosing to sell through the FO (a proxy for members' trust), and the percentage of FOs with leaders trained in organizational and financial management (a proxy for transparency).

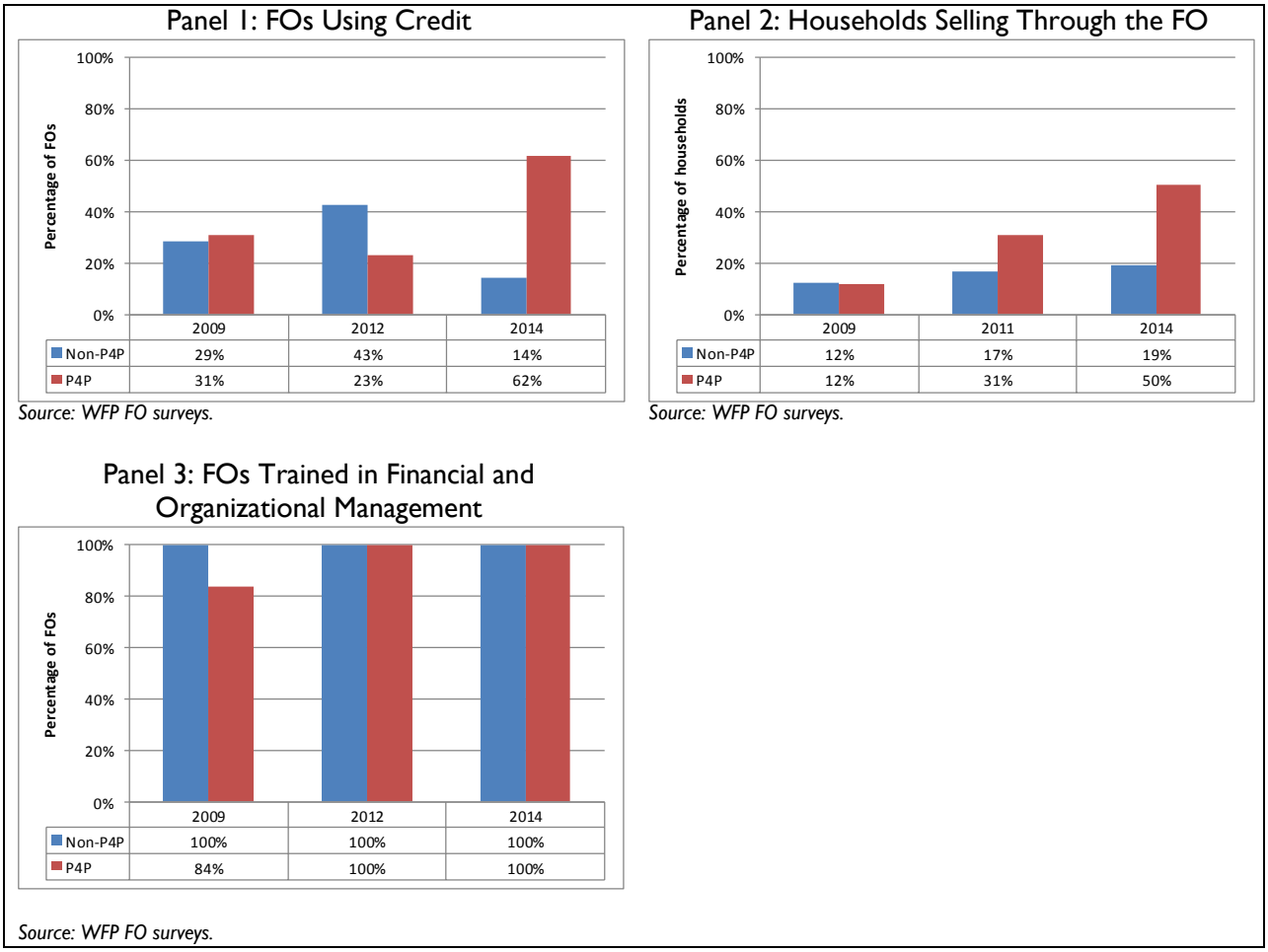
The percentage of FOs using credit (Panel 1 of Figure 10) does not exhibit a consistent trend across the three years for which data exist. However, the percentage of P4P FOs that reported using credit doubled from 31 percent in 2009 to 62 percent by 2014. The DiD analysis attributes the 67 percentage point increase between 2012 and 2014 and the 45 percentage point increase between 2009 and 2014 in the percentage of P4P FOs using credit to participating in P4P (Table 6).

If the percentage of households choosing to sell through the FO reflects, among other things, trust in the FO, then the 38 percentage point increase among members of P4P FOs suggests that members' trust in the FO improved between 2009 and 2014 (Panel 2 of Figure 10). Furthermore, the improvement among P4P FOs relative to non-P4P FOs (i.e., 16 percentage points between 2009 and 2012, 13 percentage points

between 2012 and 2014, and 29 percentage points between 2009 and 2014) were all statistically significant indicating that the changes are attributable to participating in P4P (Table 6).

Almost all P4P and non-P4P FOs reported that their leaders had been trained in financial and organizational management (Panel 3 of Figure 10) although P4P FOs registered a small improvement in this facilitating condition between 2009 and 2012 (Panel 3 of Figure 10). The small change among P4P FOs between 2009 and 2012 is not statistically significant relative to non-P4P FOs (Table 6). The bottom line is that this facilitating condition was in place in most P4P FOs in 2009 and in all of them by 2012.

FIGURE 9: TRENDS IN FO MARKETING FACILITATORS



Source: WFP FO surveys.

Source: WFP FO surveys.

Source: WFP FO surveys.

Improvements in the marketing capacity facilitating conditions among P4P FOs should contribute to positive changes in the indicators of FO marketing capacity: i.e., increased quantities aggregated and sold, increased range of markets (including quality-conscious buyers), ability to provide financing to members, and obtaining higher prices. Figure 10 illustrates trends in quantities of maize sold (to WFP and to other buyers), the percentage of FOs providing financing to members, and average prices received for maize.

Panel 1 of Figure 10 shows substantial increases in the percentage of P4P FOs selling to WFP and to other buyers as well as increases in average quantities sold. Non-P4P FOs reported no corresponding trends. The percentage of FOs with sales is cumulative and thus represents the percentage of FOs with sales during a

particular period or any subsequent period. Data for sales to WFP are from WFP's procurement database while data on sales to other buyers are from the FO surveys. Panels 2 and 3 of Figure 10 present data on sales in a slightly different way. Data are entirely from the FO surveys and thus not necessarily consistent with WFP's procurement data since FOs may record a sale in a different year than the procurement records. Though Panels 2 and 3 show slightly different numbers than Panel 1, the trends are the same, i.e., substantial increases in the percentage of P4P FOs engaged in maize marketing and average quantities sold with no corresponding increase among non-P4P FOs. The DiD estimates in Table 6 attribute many of these changes in sales activity to participating in P4P. In particular, participating in P4P significantly increased the likelihood of P4P FOs selling maize relative to non-P4P FOs as well as the average quantities sold to any buyer and to buyers other than WFP.

Panel 4 of Figure 10 shows no obvious trends in the percentage of FOs providing post-harvest (i.e., financing to bridge the gap between aggregation and sale) financing to their members. The DiD estimates of Table 6, however, show that the 23 percentage point increase between 2009 and 2012 for P4P FOs (coupled with a 14 percentage point decline among non-P4P FOs) resulted in a statistically significant 37 percentage point increase attributable to participating in P4P.

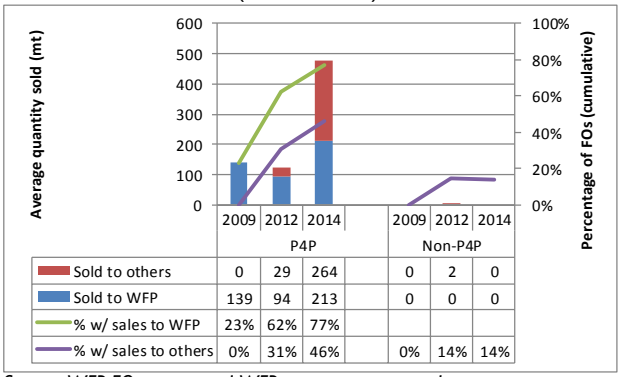
The FO surveys recorded only 11 sales of maize, 10 among P4P FOs and 1 among non-P4P FOs. This number of observations is far too small to identify differences in maize prices between the two groups. The household surveys, on the other hand, contain data on 487 transactions, 185 in 2009, 165 in 2012, and 137 in 2014. Panel 5 of Figure 10 shows trends in reported prices generally following trends in average wholesale prices reported by FAO.[12] It also shows households that are members of P4P FOs reporting higher prices than members of non-P4P FOs. The difference in prices between P4P and non-P4P households is statistically significant only in 2012, a year when WFP purchased from only one FO.

Panel 6 of Figure 10 examines average prices reported by households that sold through the FO and those that did not. As with the previous analysis, trends in prices reported by households generally follow trends in average wholesale prices reported by FAO. However, differences in prices were not statistically significant in any survey period. These results suggest that, with the exception of a 12 percent higher price in 2012, P4P FOs did not obtain higher prices than non-P4P FOs and, more importantly, households that reported selling through the FOs did not obtain significantly higher prices than those that did not.

[12] http://www.fao.org/giews/pricetool/

FIGURE 10: TRENDS IN FO MARKETING CAPACITY

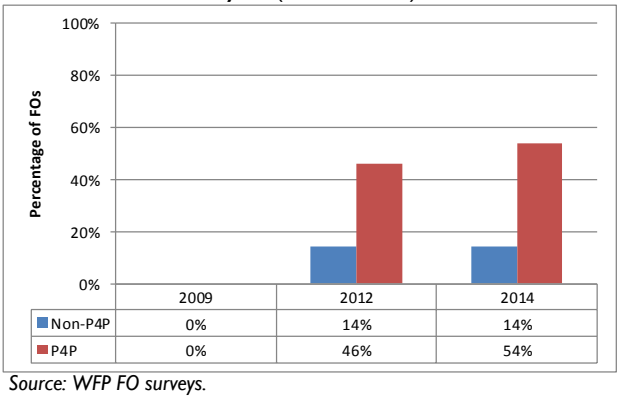
Panel 1: Percentage of FOs Selling Maize (cumulative)



	P4P			Non-P4P		
Sold to others	0	29	264	0	2	0
Sold to WFP	139	94	213	0	0	0
% w/ sales to WFP	23%	62%	77%			
% w/ sales to others	0%	31%	46%	0%	14%	14%

Source: WFP FO surveys and WFP procurement records.

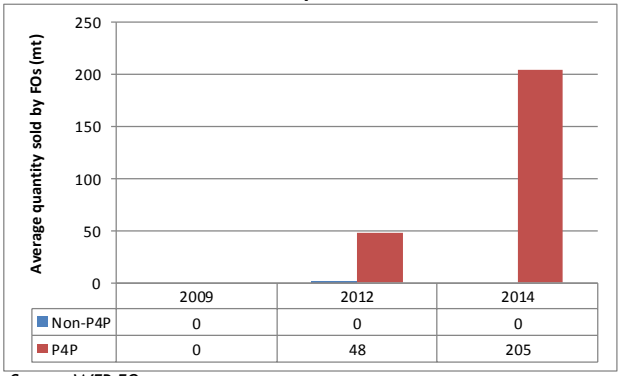
Panel 2: Percentage of FOs with Maize Sales to any Buyer (cumulative)



	2009	2012	2014
Non-P4P	0%	14%	14%
P4P	0%	46%	54%

Source: WFP FO surveys.

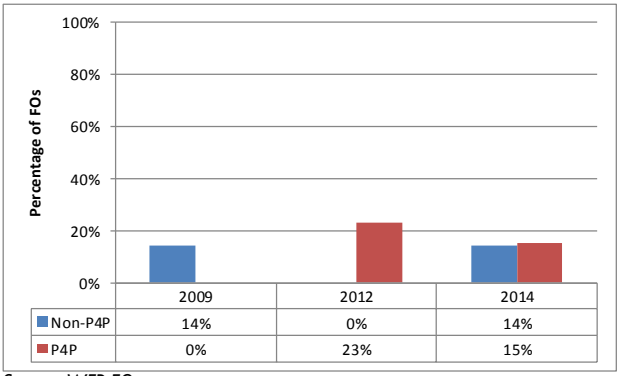
Panel 3: Average Quantity of Maize Sold to any Buyer



	2009	2012	2014
Non-P4P	0	0	0
P4P	0	48	205

Source: WFP FO surveys.

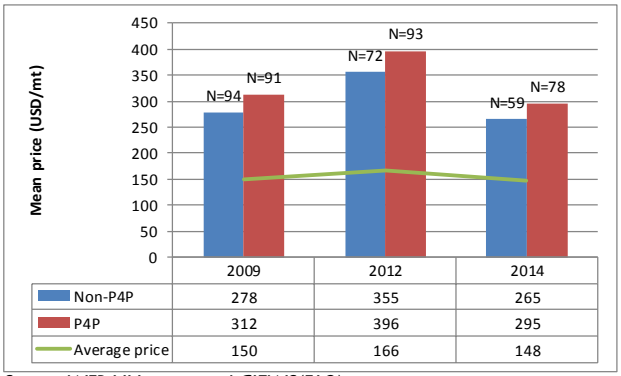
Panel 4: Providing Financing to Members



	2009	2012	2014
Non-P4P	14%	0%	14%
P4P	0%	23%	15%

Source: WFP FO surveys.

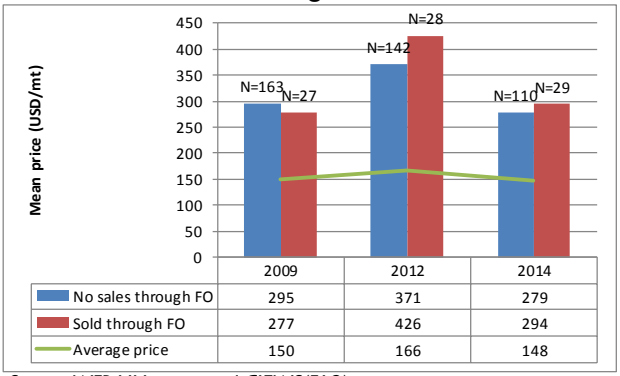
Panel 5: Average Household Maize Prices by P4P Status



	2009	2012	2014
Non-P4P	278	355	265
P4P	312	396	295
Average price	150	166	148

Source: WFP HH survey and GIEWS(FAO).

Panel 6: Average Household Maize Prices by Sales Through FO



	2009	2012	2014
No sales through FO	295	371	279
Sold through FO	277	426	294
Average price	150	166	148

Source: WFP HH survey and GIEWS(FAO).

TABLE 6: DID ESTIMATES OF THE IMPACT OF P4P ON FOS' MARKETING CAPACITY

Model	Impact (coefficient/p-value)		
	2009-2012	2012-2014	2009-2014
Facilitators of Marketing Capacity			
Percentage of FOs using credit (%)	-22% (0.3200)	67%*** (0.0100)	45%* (0.1030)
Percentage of households selling through the FO (cumulative) (%)	15.83%*** (0.0030)	13.22%*** (0.0050)	29.05%*** (0.0000)
Percentage of FOs with financial or organizational management training (%)	15.38% (0.1530)	0.00% (0.2050)	15.38% (0.1620)
Marketing Capacity Indicators			
Total quantity of maize sold to any buyer	22* (0.0770)	15 (0.7040)	36 (0.4250)
Likelihood of selling maize to any buyer (%)	31.87% (0.1250)	7.69% (0.3300)	39.56%* (0.0650)
Average quantity of maize sold to any buyer (mt)	22* (0.0770)	41 (0.1550)	63* (0.1010)
Likelihood of selling maize to buyers other than WFP (%)	16.48% (0.4010)	15.38% (0.1530)	31.89% (0.1310)
Average quantity of maize sold to buyers other than WFP (%)	9* (0.0860)	52 (0.1360)	61 (0.1140)
Likelihood of providing financing to members (%)	37.36%* (0.0520)	-21.98% (0.2710)	15.38% (0.5260)

Numbers in parentheses are p-values.
** significant at p< 0.10*
*** significant at p< 0.05*
**** significant at p< 0.01*

In summary, participating in P4P appears to have contributed to positive change in many of the facilitators of FO organizational capacity which led to significant improvements in indicators of organizational capacity. Statistically significant changes reported by P4P FOs relative to non-P4P FOs (and thus attributable to participating in P4P) include:

- A 49 percentage point increase between 2009 and 2014 in the average percentage of quality services offered;
- A 34 percentage point increase between 2009 and 2014 in the average percentage of production services offered;
- A 29 percentage point increase between 2009 and 2014 in the average percentage of marketing services offered; and
- A 54 percentage point increase between 2009 and 2014 in the percentage of P4P FOs facilitating members' access to inputs.

The period between 2009 and 2014 also saw significant advancement in the conditions facilitating improvement of FO marketing capacities that contributed to:

- A 40 percentage point increase between 2009 and 2014 in the percentage of P4P FOs using credit relative to non-P4P FOs;
- A 29 percentage point increase between 2009 and 2014 in the percentage of members choosing to sell maize through P4P FO relative to non-P4P FOs;

- A 63 mt increase between 2009 and 2014 in the average quantity of maize sold by P4P FOs relative to non-P4P FOs;
- A 9 mt increase between 2009 and 2012 in the average quantity of maize sold to buyers other than WFP; and
- A 37 percentage point increase in the percentage of P4P FOs providing post-harvest financing to members relative to non-P4P FOs.

IMPACT OF P4P ON HOUSEHOLD MARKETING, PRODUCTION, AND WELFARE

At the household level, the P4P development hypothesis posits that increasing the capacity of FOs will improve access to markets for the farmer members of the FOs. Furthermore, to the extent that higher capacity FOs are able to obtain higher prices, perhaps because they can identify and access markets that demand quality, farmers may earn higher returns from producing staple crops and invest more in productivity. Training in agricultural production practices and quality management coupled with improved access to equipment (e.g., threshers, cleaning and drying equipment), inputs, and services (e.g., credit) facilitated by P4P may also contribute to increased agricultural productivity

WFP purchased maize and beans from P4P FOs in El Salvador. Maize accounted for 95 percent of the total quantity (5,473 mt of a total of 5,758 mt) and more FOs sold maize than beans (10 sold maize to WFP and 3 sold beans).[13] These statistics suggest that impacts from WFP procurement are more likely for maize than for beans. For this reason, the technical review panel that WFP convenes annually to guide P4P also recommended in 2013 that the quantitative analysis of impacts focus on maize. Consequently, the analysis of this section considers only maize.

Following the results framework of Figure 6, the analysis of this section first examines the impacts of P4P on three broad classes of household results; marketing, production, and welfare. The sub-sections on marketing and production set the stage for understanding anticipated outcomes by first exploring the status of the conditions expected to facilitate improvements in marketing and production. The welfare sub-section considers the combined effect of changes in household marketing and production on several measures of household welfare.

Each of the three sub-sections first presents the data in a graphical format that facilitates a visual comparison of trends in key facilitators and outcomes over time for P4P and non-P4P households. The analysis then presents DiD estimates derived from a regression model that incorporates covariates to control for factors other than participation in P4P that may influence the outcome measures differently for P4P and non-P4P households. Relevant covariates include factors on which P4P and non-P4P households differed at the time of the baseline and also factors that might be expected to differentially influence outcomes and which are exogenous to the treatment. Many of the candidate variables are not exogenous. For example, higher maize yields might indicate that a particular farmer is more likely to be using productivity-enhancing technologies or practices which are also anticipated outcomes of the treatment. For this reason, the regressions use baseline values for the selected covariates which are exogenous because they are measured prior to the treatment. Table 11 describes and summarizes baseline values for the covariates included in the analysis.

[13] WFP procurement records through May 2014.

Location-specific characteristics such as weather, agricultural productivity, input availability, population, distance to urban centers, and transportation infrastructure might also influence agricultural production and marketing activity. To control for these factors, the covariate model included dummy variables for each of the three regions in which the households reside.

The P4P development hypothesis suggests that many of the anticipated household-level outcomes of P4P are contingent on selling through the FO. However, few surveyed households reported selling through the FOs. In fact, only 19 percent of non-P4P households and 50 percent of P4P households reported having sold through the FOs at any time between 2009 and 2014. In an attempt to isolate impacts for this group of households, a separate set of analyses estimated impacts for all household indicators using selling through the FOs as the treatment. Those analyses identified no significant impacts, perhaps because the numbers are small, and the results are not reported here.

TABLE 7: COVARIATES IN HOUSEHOLD ANALYSIS

Variable description	Baseline values				
	P4P status	N	Mean	Median	Standard deviation
Household characteristics					
Indicator of household head having completed at least a secondary education	P4P	112	0.06	0.00	0.2431
	Non-P4P	125	0.08	0.00	0.2724
Indicator of female headed household	P4P	112	0.21	0.00	0.4122
	Non-P4P	125	0.26	0.00	0.4382
Age of household head (years)	P4P	112	56.76	57.00	13.1712
	Non-P4P	125	54.78	54.00	13.2450
Indicator of farming as household head's primary occupation	P4P	112	0..87	1.00	0.3411
	Non-P4P	123	0.84	1.00	0.3705
Percentage of household income from off-farm sources	P4P	110	0.19	0.00	0.3701
	Non-P4P	119	0.39	0.00	1.1607
Number of family members involved in farming	P4P	112	2.44	2.00	1.8540
	Non-P4P	125	2.06	2.00	1.6884
Number of household members	P4P	112	5.75	5.00	2.7361
	Non-P4P	125	5.33	5.00	2.4122
Indicator of access to an improved source of water	P4P	112	0.96	1.00	0.2074
	Non-P4P	125	0.79	1.00	0.4075
Indicator of household member in FO leadership	P4P	112	0.42	0.00	0.4957
	Non-P4P	125	0.32	0.00	0.4684
Indicator of dirt floor	P4P	112	0.59	1.00	0.4942
	Non-P4P	125	0.70	1.00	0.4618
Agricultural production					
Area of land owned (ha)	P4P	98	1.79	1.04	2.2558
	Non-P4P	105	0.97	0.70	1.0720
Area allocated to maize production (ha)	P4P	112	1.33	1.04	1.1484
	Non-P4P	125	0.86	0.70	0.6474
Indicator of receiving agricultural inputs on credit from FO	P4P	112	0.73	1.00	0.4448
	Non-P4P	125	0.53	1.00	0.5012
Indicator of receiving loans for agricultural purposes	P4P	112	0.36	0.00	0.4813
	Non-P4P	125	0.32	0.00	0.4684
Indicator of hiring labor for agricultural production	P4P	112	0.89	1.00	0.3107
	Non-P4P	125	0.78	1.00	0.4186
Indicator of using fertilizer	P4P	112	0.42	0.00	0.4957
	Non-P4P	125	0.29	0.00	0.4546
Quantity of maize sold	P4P	112	2.46	1.35	3.5204
	Non-P4P	125	1.21	0.54	2.5235
Location					
Indicator of household located in region 3 (Sonsonate)	P4P	112	0.04	0.00	0.2074
	Non-P4P	125	0.27	0.00	0.4468
Indicator of household located in region 10 (San Vicente)	P4P	112	0.14	0.00	0.3515
	Non-P4P	125	0.08	0.00	0.2724
Indicator of household located in region 11 (Usulután)	P4P	112	0.38	0.00	0.4863
	Non-P4P	125	0.22	0.00	0.4132

The results reflect the panel of households described in Table 2.

Impact of P4P on Household Maize Marketing

Following the outline of the results framework illustrated in Figure 6, this section first examines changes in the factors facilitating changes in household marketing behavior and then links them to observed changes in marketing behavior, i.e., decisions about the location and timing of sales. It then presents evidence of changes in facilitating factors for intermediate marketing outcomes and links them to observed changes in prices received for maize, the primary intermediate household marketing outcome.

Figure 11 illustrates trends in four maize marketing facilitators, use of post-harvest services, use of marketing services, use of loans for agriculture, and use of loans for other purposes. The percentage of P4P households that reported ever using post-harvest and marketing services increased substantially between 2009 and 2014, by 28 percentage points for post-harvest services and 34 percentage points for marketing services. By the end of the P4P pilot, 54 percent of P4P households reported having used post-harvest services and 40 percent reported having used marketing services. Comparable percentages among non-P4P households were 21 percent and 20 percent, respectively.

These findings are consistent with the services FOs would be required to provide in order to satisfy WFP's quality standards and to manage sales. The DiD regression results reported in Table 8 suggest that participating in P4P contributed to establishing these facilitating factors. The opportunity to sell to WFP through P4P contributed to a 23 percentage point increase between 2009 and 2012 in the percentage of households using post-harvest services relative to non-P4P households and a 16 percentage point increase between 2009 and 2014. These results suggest that not only did conditions for facilitating positive marketing outcomes improve for P4P households but P4P contributed to the improvement.

Trends in households' use of credit for agriculture or for other purposes are not as clear. DiD analysis found no statistically significant impact of P4P on households' use of credit (Table 8) but this is not particularly important. What is relevant is that a relatively large percentage of P4P households reported using credit for agriculture and for other purposes at some point during the P4P pilot and thus may not be constrained by one of the barriers to positive marketing outcomes, access to credit.

FIGURE 11: HOUSEHOLD MAIZE MARKETING FACILITATORS

Favorable facilitating conditions should give households greater flexibility in their choices about where and when to sell commodities. If selling through the FO is more profitable, then access to relevant services and credit can address some of the barriers households face selling through the FO. Similarly, services (especially post-harvest services) and credit may make it possible for households to hold commodities for later sale when prices may be higher.

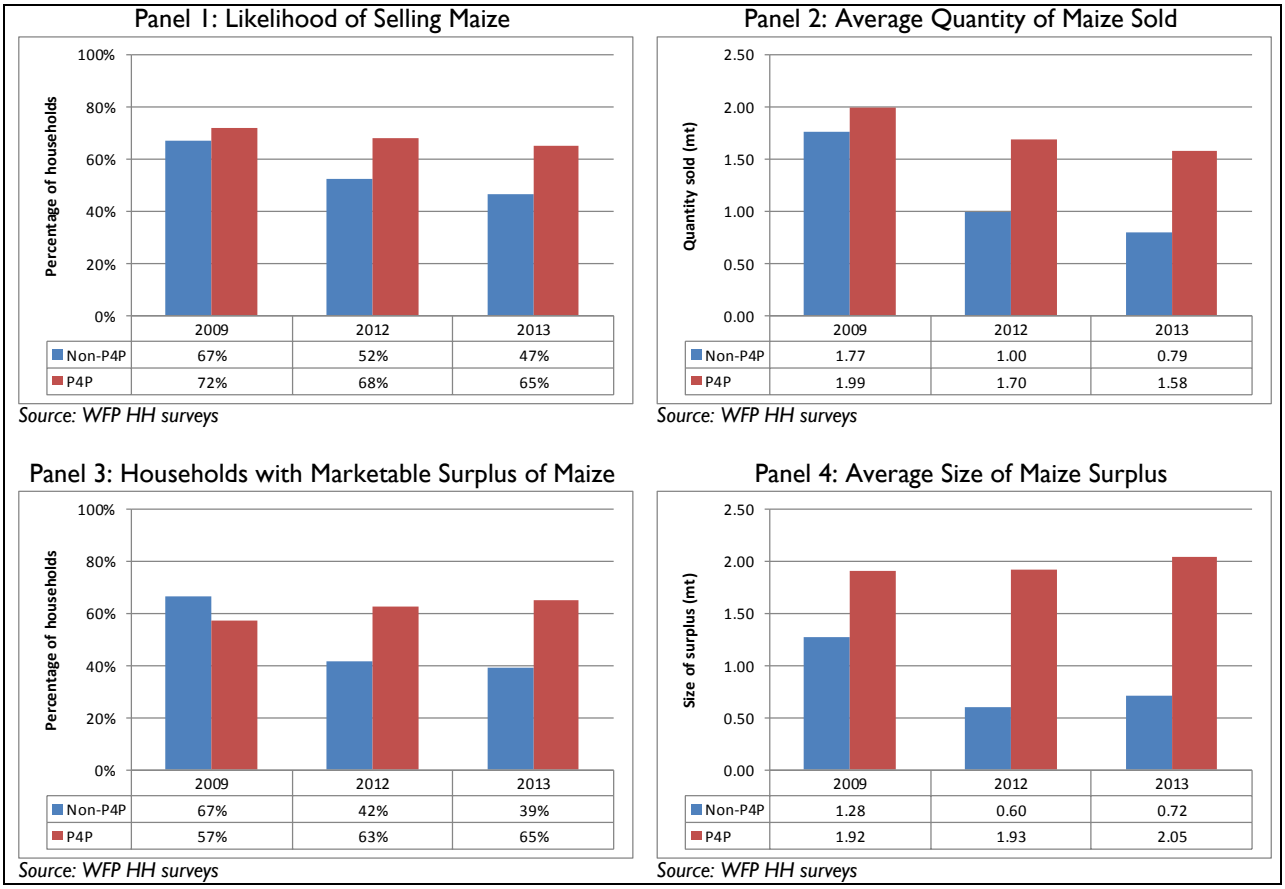
Figure 12 illustrates trends in households' marketing choices. Panels 1 and 2 of Figure 12 show a steady increase in the percentage of P4P households choosing to sell through the FO and corresponding increases in the average percentage of their surpluses they channel through the FO. Non-P4P households reported slower growth in both outcomes. The DiD analysis reported in Table 8 conclude that the changes in marketing behavior are attributable to participating in P4P.

Panels 3 and 4 of Figure 12 show a decreasing percentage of P4P and non-P4P households selling maize four weeks or more after harvest and a corresponding decline in the average percentage of maize sold at that time. This is a more difficult indicator to interpret without knowing the full range of markets available to a household and the terms of sale in each. The DiD analysis results in Table 8 found no statistically significant differences between P4P and non-P4P households in terms of changes in this marketing behavior which suggests that participating in P4P has not affected households' decisions about when to sell maize.

FIGURE 12: LOCATION AND TIMING OF SALES

As a greater percentage of P4P households begin selling larger quantities through FOs that are able to access a wider range of remunerative markets, they should begin to obtain higher prices. Higher prices should induce a greater percentage of households to begin selling maize and increase the quantity of maize they sell. The section on FO capacity concluded that participating in P4P has contributed to an increased volume of sales for P4P FOs. Figure 13 illustrates trends in some of the household level marketing outcomes the P4P development hypothesis suggests will flow from increased engagement with markets at the FO level, i.e., the likelihood of selling maize, average quantities sold, the percentage of households with a marketable surplus of maize, and the average size of the surplus.

FIGURE 13: MAIZE MARKETING PARAMETERS



The charts of Figure 13 tell an interesting story. The percentage of P4P households producing a surplus and the average size of surplus increased slightly between 2009 and 2014 (Panels 3 and 4 of Figure 13). At the same time, however, the percentage of P4P households that reported selling maize and the average quantity sold declined (Panels 1 and 2 of Figure 13).

Taken together, the results reported in Figure 13 suggest that a few households (15 percent in 2009 and 5 percent in 2012) were selling maize even though they did not produce a surplus. These households presumably buy back maize later in the season to meet household needs. The rationality of this strategy depends on anticipated differences in prices between the time of sale and time of purchase as well as the household's need for cash at the time of sale. It is interesting that the gap between those producing a surplus and those selling declines over time and disappears in 2014. Non-P4P households reported a reverse of this trend with no gap in 2009, a 10 percent gap in 2012, and an 8 percent gap in 2014. These results suggest that the percentage of P4P households that find it necessary to sell maize when they have no surplus has declined over time while it has increased among non-P4P households.

A comparison of the size of surplus (Panel 4 of Figure 13) and quantity sold (Panel 2 of Figure 13) suggests that in 2012 and 2014, some surplus-producing P4P households chose not to sell their entire surplus. Non-P4P households, on the other hand, consistently reported selling more than they claimed they had as surplus. The overall story seems to be one of increasing resilience among P4P households while non-P4P households are becoming more vulnerable.

These trends are not impact. Many external factors may affect maize production and households' maize marketing behavior. The impact of P4P is the change among P4P households relative to change among non-P4P households. The DiD estimates of Table 8 conclude that the (statistically significant) impacts of P4P on maize marketing outcomes include:

- The likelihood that P4P households produced a surplus of maize increased by 48 percentage points between 2009 and 2014 relative to non-P4P households.
- The average size of P4P households' maize surplus increased by 1.05 mt relative to non-P4P households between 2009 and 2014.
- The likelihood of selling maize increased by 26 percentage points among P4P households relative to non-P4P households between 2009 and 2014.
- The average quantity of maize sold by P4P households increased by 1.21 mt between 2009 and 2014 relative to non-P4P households.

TABLE 8: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2014	2009-2014		
Household marketing facilitators					
Likelihood of using post-harvest services (%)	23.30%*** (0.0000)	-6.89% (0.2050)	16.32%** (0.0160)	390	0.1647
Likelihood of using marketing services (%)	20.92%*** (0.0000)	1.04% (0.8350)	21.96%*** (0.0010)	390	0.1362
Likelihood of using agricultural credit (%)	10.31% (0.2890)	-3.78% (0.6300)	6.54% (0.4290)	390	0.1957
Likelihood of using credit for any purpose (%)	12.04% (0.1070)	-10.95% (0.1890)	1.09% (0.8520)	390	0.3792
Behavioral change					
Likelihood of selling maize through the FO (cumulative % of households)	15.83%*** (0.0030)	13.22%*** (0.0050)	29.05%*** (0.0000)	338	0.1936
Average percentage of marketed maize sold through the FO (%)	12.57%** (0.0440)	1.32* (0.8280)	13.89%** (0.0220)	338	0.1879
Likelihood of selling maize four weeks or more after harvest (%of households)	-11.07% (0.3540)	13.89% (0.1790)	2.82% (0.7550)	338	0.1392
Average percentage of marketed maize sold four weeks or more after harvest (%)	-15.55% (0.1660)	14.80% (0.1140)	-0.0075% (0.9250)	338	0.1271
Household marketing outcomes					
Likelihood of producing a surplus (% of producing households)	0.33*** (0.0030)	0.04 (0.6560)	0.48*** (0.0000)	363	0.1980
Average size of maize surplus (mt) (producing households)	1.04*** (0.0020)	-0.04 (0.9070)	1.05*** (0.0050)	313	0.2575
Likelihood of selling maize (% of producing households)	10.86% (0.2270)	15.21%* (0.0630)	26.06%*** (0.0040)	390	0.1496
Average quantity sold (mt): (selling households)	0.93*** (0.0130)	0.29 (0.4810)	1.21** (0.0300)	338	0.1569

Values in parentheses are p-values
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

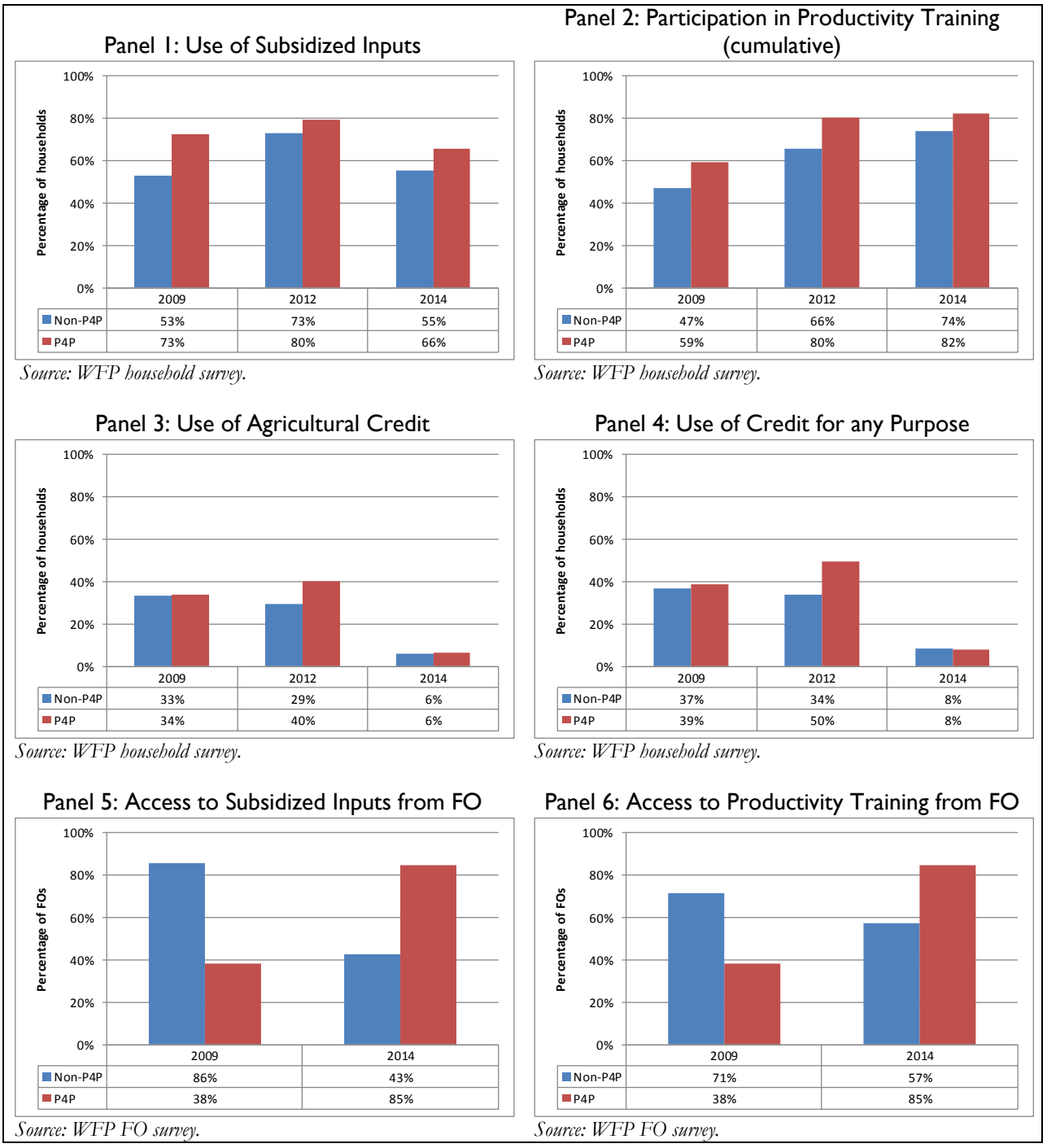
Impact of P4P on Household Maize Production

Maize is a primary staple crop in El Salvador and a large majority surveyed households (between 81 percent and 96 percent depending on the year and strata) reported producing maize. Behaviors that are likely to influence the average quantity of maize households produce include the decision to cultivate maize, the land allocated to maize production, the use of productivity-enhancing inputs such as certified seed and fertilizer, and the knowledge of how to use inputs effectively. Positive changes in these behaviors should increase yields and total quantities produced.

Weather is also likely to strongly influence maize production. In the absence of accessible subnational rainfall data, the regional dummy variables control, to some extent, for weather-related factors that influence production.

The results framework presented in Figure 6 defines a number of "facilitators" that might be expected to influence household production behavior. These include access to productivity-enhancing inputs and training and use of credit. Figure 14 illustrates changes in these facilitators over time for P4P and non-P4P households. Panels 1 through 4 present the household perspective while Panels 5 and 6 reflect results from the surveys of FOs.

FIGURE 14: TRENDS IN FACILITATORS OF BEHAVIORAL CHANGE IN MAIZE PRODUCTION



A fairly large percentage of P4P households reported receiving subsidized inputs from some organization, not necessarily the FO. The percentage fluctuated over time but never dropped below 66 percent (Panel 1 of Figure 14). Non-P4P households reported a similar trend but values lagged somewhat behind P4P households. Similarly, most P4P households reported having received production training with the percentage of households that had received training at some time during the P4P pilot reaching 82 percent by 2014

(Panel 2 of Figure 14). Again, non-P4P households followed a similar trend but with values lagging those of P4P households.

No more than half (depending on the year) of P4P households reported using credit for agricultural or other purposes. The data show no clear trend although the percentage of non-P4P households using credit was never larger than the percentage of P4P households (Panels 3 and 4 of Figure 14).

P4P households' access to subsidized inputs and productivity training through the FO (i.e., the percentage of FOs that reported providing these services) increased substantially between 2009 and 2014 (Panels 5 and 6 of Figure 14). Over the same time period, the percentage of non-P4P FOs providing these services fell precipitously. The relevant point is that by 2014, more than 80 percent of P4P households should have had access to subsidized inputs and productivity training, whether or not they used either service.

In summary, P4P households experienced improvements in three of the six facilitators of production behavior between 2009 and 2014. Even though the percentage of households receiving subsidized inputs declined slightly, the percentage was still relatively high (66 percent) in 2014. Use of credit appears to be the only major unresolved barrier to productivity-enhancing behavioral change among the facilitators considered in this analysis.

The presence of favorable facilitating conditions is more important than whether improvement in the conditions can be attributed to P4P. Of these six facilitating conditions, however, increases in households' use of subsidized inputs and the percentage of FOs providing subsidized inputs and productivity training are attributable to participation in P4P (Table 9).

TABLE 9: DID ESTIMATES OF THE IMPACT OF P4P ON MAIZE PRODUCTION FACILITATORS

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2014	2009-2014		
Utilization of subsidized inputs (%) – all households	-19.08** (0.0290)	9.38% (0.2210)	-9.70% (0.2990)	390	0.2072
Utilization of productivity training (%) – all households	7.50% (0.4460)	-8.76% (0.3140)	-1.25% (0.9070)	390	0.1270
Utilization of agricultural credit (%) – all households	10.31% (0.2890)	-3.78% (0.6300)	6.54% (0.4290)	390	0.1957
Utilization of credit for any purpose (%) – all households	12.04% (0.1070)	-10.95% (0.1890)	1.09% (0.8520)	390	0.3792
Likelihood of FOs facilitating access to subsidized inputs (%)	Data for 2012 are missing		89.01%*** (0.0020)	40	0.5419
Likelihood of FO providing productivity training (%)	Data for 2012 are missing		39.56%* (0.0650)	40	0.3953

Note: Estimates based on FO data are based on a non-parametric DiD model with data only for 2009 and 2014. Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

Generally favorable facilitating conditions should support behavioral change consistent with increasing production. Relevant behaviors include the decision to cultivate maize, area allocated to maize production,

and decisions about using productivity-enhancing inputs such as certified seed and fertilizer. Figure 15 illustrates trends in maize production behaviors reported by P4P and non-P4P households.

The percentage of P4P households that reported cultivating maize remained virtually unchanged between 2009 and 2014 while the percentage of non-P4P households cultivating maize fell by 15 percentage points from 96 percent to 81 percent (Panel 1 of Figure 15). The DiD estimates presented in Table 10 conclude that participating in P4P prevented a 19 percentage point decline in the percentage of P4P households choosing to cultivate maize.

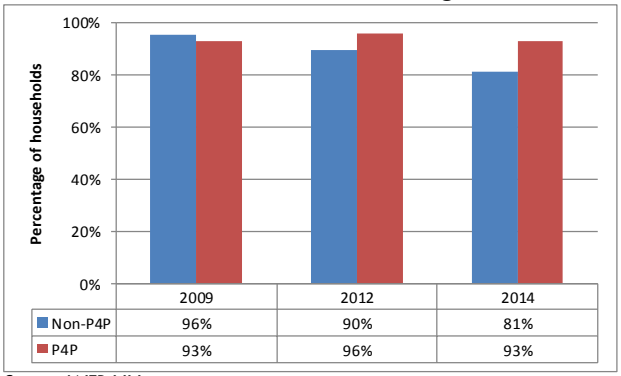
While P4P households allocated less land to maize production in 2014 than in 2009, non-P4P households reported a much steeper decline (Panel 2 of Figure 15). The DiD estimates presented in Table 10 conclude that participating in P4P prevented a reduction of 0.29 ha in average area allocated to maize production.

Non-P4P households were more likely to use certified maize seed in 2009 and used it more intensively, i.e., certified maize seed accounted for a larger proportion of all the maize seed they used (Panels 3 and 4 of Figure 15). Between 2009 and 2014, however, P4P households registered greater growth in these two measures of certified use than non-P4P households. Consequently, even though non-P4P households still had higher values for both indicators in 2014, the improvement among P4P households relative to non-P4P households is an impact of participating in P4P. The DiD analyses reported in Table 10 estimate that participating in P4P was responsible for an 18 percentage point increase in the percentage of P4P households using certified maize seed relative to non-P4P households and a 27 percentage point increase in the average proportion of maize seed that was certified.

The percentage of P4P and non-P4P households that reported using fertilizer increased in tandem between 2009 and 2014 with the percentage of P4P households keeping just ahead of non-P4P households (Panel 5 of Figure 15). By 2014, 94 percent of P4P households reported using fertilizer. Because P4P and non-P4P households reported similar rates of growth in fertilizer use, the increase among P4P households is not attributable to participating in P4P (Table 10).

FIGURE 15: TRENDS IN PRODUCTIVITY-ENHANCING PRODUCTION BEHAVIORS

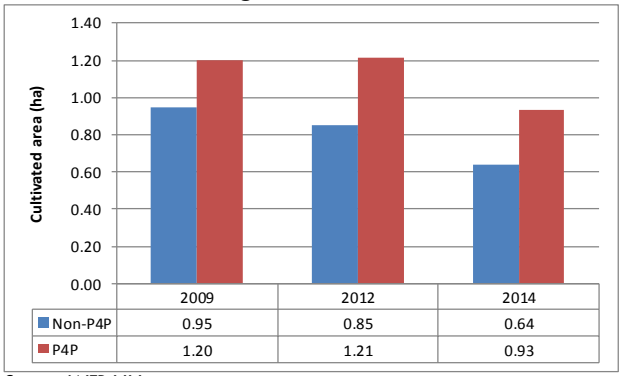
Panel 1: Households Cultivating Maize



	2009	2012	2014
Non-P4P	96%	90%	81%
P4P	93%	96%	93%

Source: WFP HH surveys.
All households

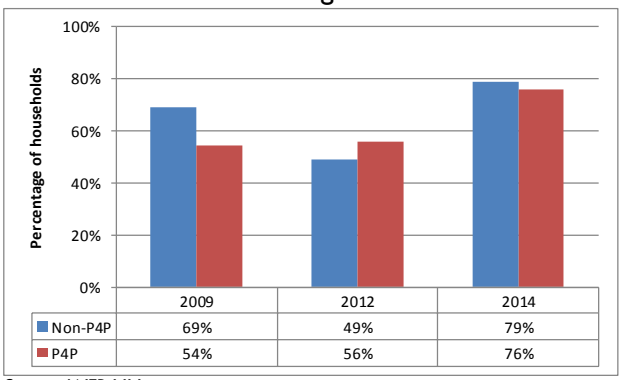
Panel 2: Average Area Planted to Maize



	2009	2012	2014
Non-P4P	0.95	0.85	0.64
P4P	1.20	1.21	0.93

Source: WFP HH surveys.
Households planting maize

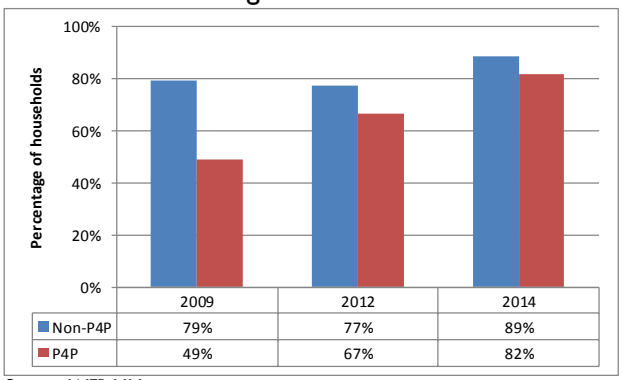
Panel 3: Households Using Certified Maize Seed



	2009	2012	2014
Non-P4P	69%	49%	79%
P4P	54%	56%	76%

Source: WFP HH surveys
Households planting maize

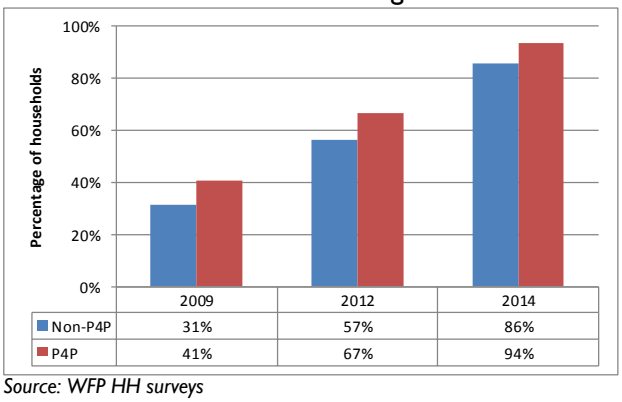
Panel 4: Percentage of Seed that is Certified



	2009	2012	2014
Non-P4P	79%	77%	89%
P4P	49%	67%	82%

Source: WFP HH surveys
Households planting maize

Panel 5: Households Using Fertilizer



	2009	2012	2014
Non-P4P	31%	57%	86%
P4P	41%	67%	94%

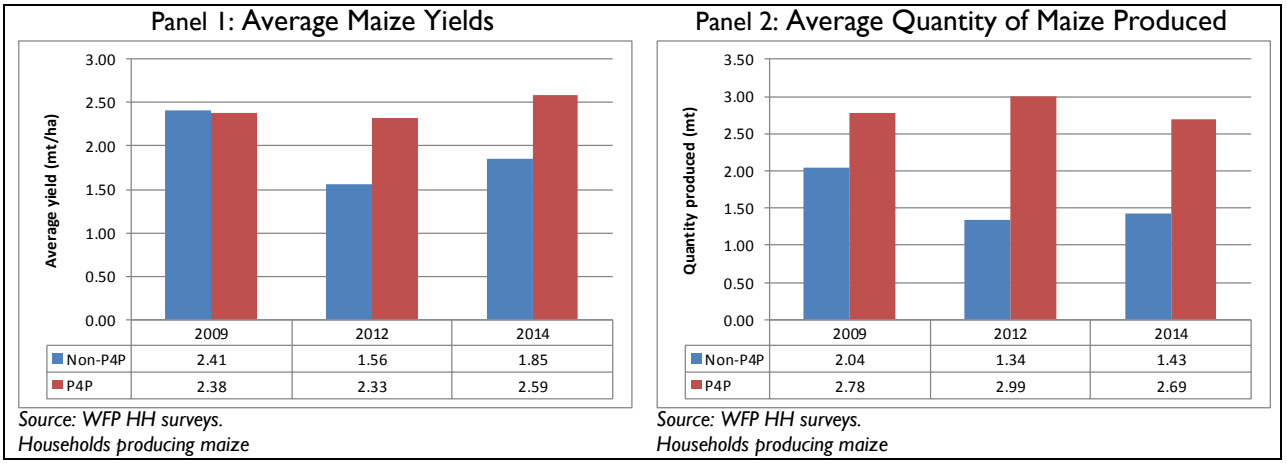
Source: WFP HH surveys
Households planting maize

It is not intuitively clear how the behavioral changes documented in Figure 15 might affect the quantity of maize produced. Increased use of certified seed and fertilizer may, or may not, have offset the decline in the average area allocated to maize. Panel 1 of Figure 16 shows a slight (9 percent) increase in average maize yields among P4P households which is consistent with increased use of certified seed and fertilizer. Non-P4P households, however, also reported increased use of certified seed and fertilizer and yet experienced a 23

percent decline in yields. Anecdotal information from interviews with farmers in El Salvador along with a more formal study of the issue in Mali, however, suggest that training on how to use inputs correctly may be ass, if not more, important than the inputs themselves. It is not clear from Figure 14 whether non-P4P households received appropriate training in inputs use. The percentage of households reporting that they received training increased over time but the percentage of FOs that reported that they provided training fell by 14 percentage points between 2009 and 2014. Regardless of the mechanism through which the effect took place, however, the DiD estimates of Table 10 attribute a 0.87 mt/ha increase in average maize yields to participation in P4P.

A reduction in the area allocated to maize appears to have offset higher yields among P4P households leading to a three percent decline in the total quantity of maize produced (Panel 2 of Figure 16). Even though the quantity of maize produced by P4P households declined, however, non-P4P households experienced a much greater (30 percent) drop in average production. The causal interpretation is that participating in P4P prevented a greater decline in maize production among P4P households. The DiD estimates of Table 10 support this interpretation and attribute a 1.08 mt increase in the quantity of maize produced (relative to the decline among non-P4P households) to participating in P4P.

FIGURE 16: TRENDS IN MAIZE PRODUCTION PARAMETERS



Source: WFP HH surveys.
Households producing maize

Source: WFP HH surveys.
Households producing maize

TABLE 10: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2014	2009-2014		
Likelihood of cultivating maize (%) – all households	7.57% (0.1200)	11.29%* (0.0690)	18.86%*** (0.0010)	390	0.2343
Average area planted to maize (ha) – cultivating households	0.21 (0.1250)	0.12 (0.1570)	0.29** (0.0280)	378	0.2106
Likelihood of using certified maize seed (%) – cultivating households	9.94% (0.3320)	8.35% (0.3850)	18.29%* (0.0830)	390	0.2531
Average percentage of maize seed that was certified (%) – certified seed using households	11.41% (0.2960)	3.71% (0.6840)	27.17%*** (0.0100)	238	0.2240
Likelihood of using fertilizer (%) – cultivating households	-5.08% (0.6010)	2.22% (0.7890)	-2.87% (0.7240)	390	0.1422
Average maize yield (mt/ha) – producing households	0.76*** (0.0050)	0.12 (0.6750)	0.87*** (0.0060)	378	0.1998
Average quantity of maize produced (mt) – producing households	1.32*** (0.0000)	-0.15 (0.6190)	1.08*** (0.0020)	378	0.1829

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

In summary, participating in P4P appears to have:

- Improved P4P households' access to and use of subsidized inputs relative to non-P4P households;
- Improved P4P households' access to, but not use of, productivity training relative to non-P4P households;
- Prevented a 19 percentage point decline in the percentage of households cultivating maize that would have occurred had P4P households not participated in P4P;
- Limited the decline in average area allocated to maize production to 22 percent instead of the 33 percent decline that would have occurred had P4P households not participated in P4P, essentially retaining 0.29 ha per household in maize production that would have been allocated to other uses had P4P households not participated in P4P;
- Increased the percentage of households using certified maize seed by 18 percentage points relative to what would have occurred had P4P households not participated in P4P;
- Increased the quantity of certified seed used (as a percentage of all seed) by 27 percentage points relative to not participating in P4P;
- Prevented a decline of 0.87 mt/ha in average maize yields, and
- Prevented drop of 1.08 mt in the average quantity of maize produced.

Impacts of P4P on Household Welfare Indicators

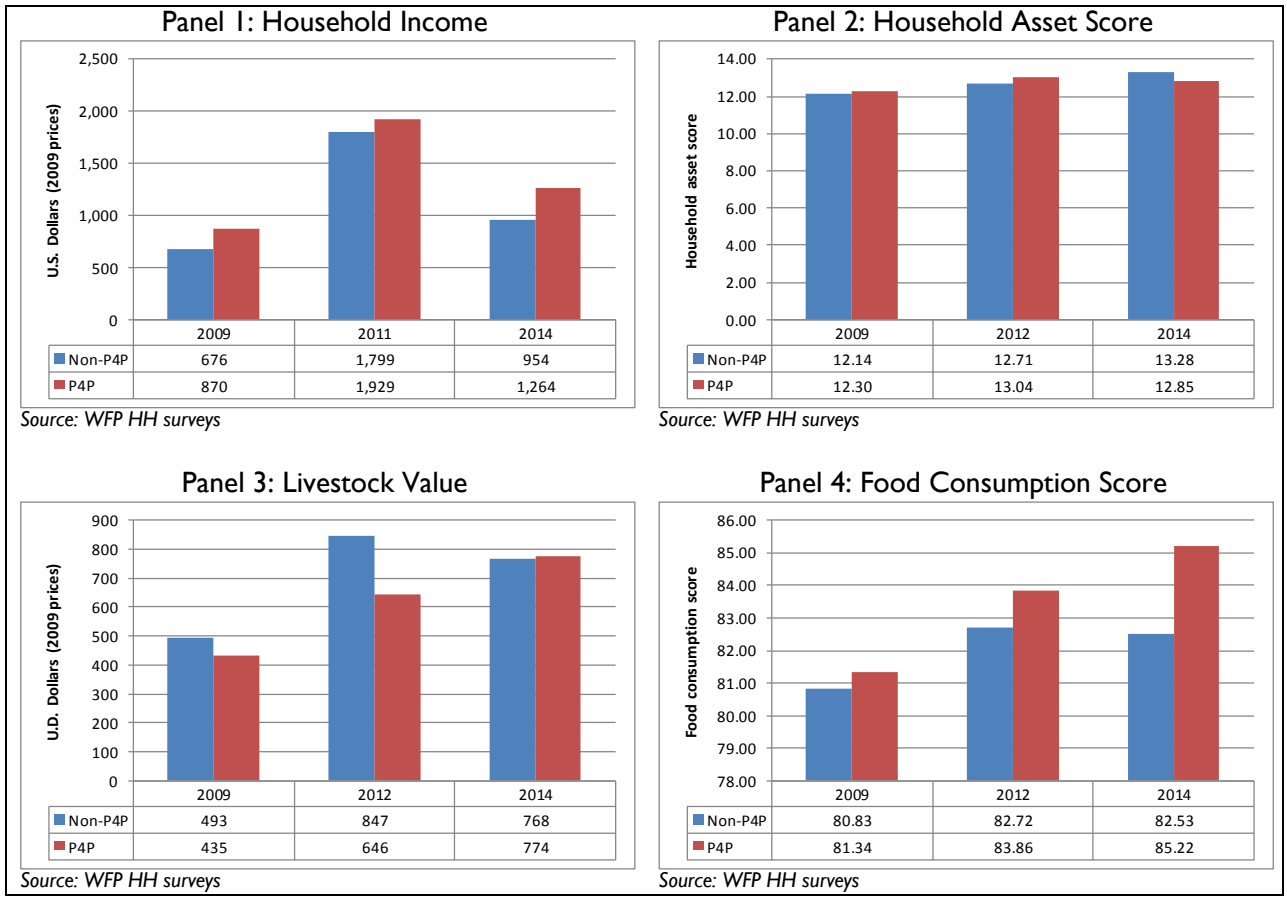
Welfare is a broad concept with dimensions including income, wealth, nutrition, food security, and physical security to name a few. The P4P proposal identified income as the primary household welfare measure. Because of the anticipated difficulty measuring small changes in income, however, the P4P logframe identified several alternate welfare indicators. These include the household asset score (a simple summary of household assets), the value of household livestock (an important store of wealth in many cultures), and the food consumption score (an indicator of food security). The analysis of the impacts of P4P on household welfare examines each of these indicators to provide a well-rounded picture of welfare change.

As with previous sections, the inquiry begins with illustrations of changes in income and other welfare measures (Figure 17). Income fluctuates as might be expected for households that depend largely on agriculture for their income (Panel 1 of Figure 17). P4P and non-P4P households reported similar trends in income and the difference between the two groups was statistically significant only in 2014. Assets are not likely to respond quickly to a transitory change in income and they do not, falling only slightly for P4P households as income declined between 2012 and 2014 (Panel 2 of Figure 17). Asset scores for P4P and non-P4P households were statistically identical in all survey periods.

Because livestock is more liquid than physical assets, it might respond more quickly to falling incomes. This is the case for non-P4P households between 2012 and 2014 but not for P4P households (Panel 3 of Figure 17). Similarly, the food consumption score should respond very quickly to falling incomes. Again only non-P4P households reported a decline in the food consumption score associated with falling incomes between 2012 and 2014 (Panel 3 of Figure 17). The household surveys were conducted immediately after harvest however when food consumption scores would be expected to be at their annual high point.

Taken together, these results suggest that P4P households are more resilient to shocks than non-P4P households. When income fell in 2014, P4P households weathered the decline without corresponding reductions in livestock assets or food consumption. Non-P4P households, on the other hand, had to deplete their wealth (livestock assets) and reduce their food consumption to cope with falling incomes.

FIGURE 17: HOUSEHOLD WELFARE INDICATORS



In spite of what look like meaningful differences in trends, particularly in the food consumption score, the DiD analysis found only the -0.55 fall between 2012 and 2014 in P4P households' asset score relative to non-P4P to be associated with participating in P4P.

TABLE 11: DID ESTIMATES OF THE IMPACT OF P4P ON HOUSEHOLD WELFARE INDICATORS

Model	Impact (coefficient/p-value)			N	R^2
	2009-2012	2012-2014	2009-2014		
Household income (2009 U.S. Dollars)	124 (0.7040)	-252 (0.4220)	-128 (0.5940)	390	0.3139
Household asset score	0.30 (0.5030)	-0.55** (0.0270)	-0.21 (0.6860)	375	0.1609
Value of livestock (2009 U.S. Dollars)	-8 (0.9610)	201 (0.4150)	193 (0.4480)	364	0.2089
Food consumption score	-2.36 (0.4060)	-0.50 (0.8650)	-4.10 (0.2260)	376	0.1484

Numbers in parentheses are p-values.
* significant at p< 0.10
** significant at p< 0.05
*** significant at p< 0.01

CONCLUSIONS

El Salvador initially purchased from first-level FOs that appeared, in the baseline survey, to be relatively low-capacity organizations. None of the P4P or non-P4P FOs reported selling maize prior to the 2009 baseline survey and only 2 of 13 (15 percent) P4P FOs reported having access to long-term storage facilities.

These basic conditions define the "baseline" for achieving the anticipated results laid out in the results framework of Figure 5 and Figure 6. The remainder of this section frames the conclusions in the context of the results framework. It presents results in the sequence in which they are likely to occur; FO organizational capacity, FO marketing capacity, household marketing, household production, and household welfare.

In the results framework figures in this section, facilitating conditions are not necessarily outcomes of P4P, they merely represent conditions that may facilitate or enhance the potential for positive outcomes. The results framework figures therefore indicate whether the facilitating conditions are positive (+) or negative (-); attribution to P4P is not important. The columns of results attributable to P4P, however, indicate whether the facilitating conditions and participation in P4P caused a statistically significant change in the outcome indicator relative to non-P4P FOs and households.

Impact of P4P on FO Capacity

Figure 18 summarizes changes in facilitating conditions and anticipated results for FO capacity and serves to frame the conclusions presented in this section.

The facilitating conditions supporting increased FO organizational capacity generally improved over the course of the P4P pilot. The percentage of FOs reporting access to long-term storage facilities increased from 15 percent to 75 percent. P4P FOs also reported substantial improvements in access to supply-side support. By the end of the P4P pilot, 100 percent of P4P FOs reported receiving supply-side support for

organizational strengthening, post-harvest handling, production, marketing, and inputs. The greatest changes were a 62 percentage point increase in the percentage of FOs receiving marketing support, a 54 percentage point increase in support for infrastructure, and a 38 percentage point increase in post-harvest handling support. The increases in post-harvest management, inputs, infrastructure, production, and marketing align with the particular areas on which the El Salvador P4P program focused.

WFP's procurement stimulus was relatively sizeable with the minimum quantity purchased from an FO in a given year at 40 mt, a maximum of 1,057 mt, and a mean of 342 mt.[14] However, procurement was inconsistent; WFP purchased in more than one year from only 3 of 10 P4P FOs registered as WFP suppliers.

The improvements in the facilitating environment prompted significant impacts in indicators of FO organizational capacity. In particular:

- Participating in P4P substantially increased P4P FOs' capacities to provide services to members relative to non-P4P FOs. The percentage of quality services offered increased by 49 percentage points, production services by 34 percentage points, and marketing services by 29 percentage points.
- Relative to non-P4P FOs, the percentage of P4P FOs facilitating members' access to inputs increased by 54 percentage points.
- The percentage of P4P FOs providing production training to members increased by 40 percentage points relative to non-P4P FOs.

The facilitating environment for marketing outcomes also generally improved for P4P FOs. The percentage of P4P FOs utilizing credit doubled from 31 percent to 62 percent between 2009 and 2014. WFP's procurement, although very inconsistent, was sizeable. These facilitating factors led to substantial increases in FO marketing capacity indicators. Although the indicator values increased substantially, only one could be attributed to P4P, probably because of the number of observations was too small to identify them as causal effects.

Specific marketing outcomes included:

- The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points relative to non-P4P FOs and average quantities sold increased by 262 mt.
- The percentage of P4P FOs reporting selling to buyers other than WFP rose from 0 percent to 54 percent – a 54 percentage point increase. However, probably because of the small number of observations, the result was not statistically significant relative to non-P4P FOs.
- Price data at the FO level was too thin for inferences. However, P4P households reported receiving significantly higher prices than non-P4P households in 2012 (12 percent higher), the year when WFP purchased the most and from the largest number of FOs.

[14] WFP procurement records through May 2013.

FIGURE 18: SUMMARY OF IMPACT OF P4P ON FO CAPACITY

Maize Marketing

	Indicators	Results attributable to P4P		Facilitators	Status	
Organizational capacity	Planning	→	Percentage of P4P FOs planning for production and marketing increased by 32% relative to non-P4P but difference not statistically significant.	Infrastructure	+	Revolving loans and direct support from WFP contributed to increasing access to storage. P4P FOs reporting access to storage increased from 15% to 75%.
	Services	↑	Statistically significant increases in percentage of quality services (49%), production services (34%), and marketing services (29%) provided by P4P FOs relative to non-P4P FOs.	Procurement	-	Sizeable but inconsistent procurement stimulus
	Inputs	↑	54% increase in percentage of P4P FOs facilitating members' access to inputs relative to non-P4P FOs.	Supply-side support	+	Substantial increase in supply-side support for marketing (62% increase), infrastructure (54% increase), and post-harvest handling (38% increase)
	Training	↑	40% increase in percentage of P4P FOs providing production training to members relative to non-P4P FOs.			
Marketing capacity outcomes	Sales	↑	The percentage of P4P FOs reporting sales to any buyer increased by 29 percentage points relative to non-P4P FOs and average quantities sold increased by 262 mt.	Procurement	-	Sizeable but inconsistent procurement stimulus
	Market diversity	→	32 percentage point increase in percentage of P4P FOs selling to buyers other than WFP but not statistically different from non-P4P FOs.			
	Financing for members	→	15 percentage point increase in percentage of P4P FOs providing post-harvest financing to members but not statistically different from non-P4P FOs.	Access to credit	+	Percentage of FOs utilizing credit doubled – from 31% to 62%.
	Prices	↑	Price data at the FO level was too thin for inferences. However, P4P households reported receiving significantly higher prices than non-P4P households in 2012 (12% higher), the year when WFP purchased the most and from the greatest number of FOs.			
Impacts	Sustainable access to value-added staples markets (increasing trajectory of quantities sold, especially to formal buyers; declining dependence on WFP market, established relationship with financial institutions, access to permanent storage facilities of at least 500 mt capacity)					

Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

Impact of P4P on Household Maize Marketing

The conditions facilitating change in household maize marketing behavior improved across the board in El Salvador during the P4P pilot (Figure 19). The percentage of P4P FOs selling maize increased as did the average quantities sold. The percentage of quality and marketing services available from the FO increased: quality services by 49 percentage points and marketing services by 29 percentage points. The percentage of P4P households using credit for agricultural and other purposes increased between 2009 and 2012; by 6 percentage points for agricultural loans and 8 percentage points for non-agricultural loans.

The improved facilitating conditions led to changes in household maize marketing behavior. Specifically:

- The percentage of P4P households that reported selling through the FO at some point during the pilot increased by 21 percentage points relative to non-P4P households and the average percentage of surpluses sold through the FO increased by 19 percentage points relative to non-P4P households.
- A 12 percentage point increase in the percentage of P4P households selling four weeks or more after harvest relative to non-P4P households was not statistically significant. However, the 13 percentage point increase, relative to non-P4P households, in the average percentage of maize surpluses sold was.

These behavioral changes, primarily the choice to sell through the FO in a year when WFP procurement was high, led to P4P households receiving significantly higher prices for maize than non-P4P households. The difference between the USD 396 reported by P4P households and the USD 355 obtained by non-P4P households represents an 11 percent higher price associated with being a member of a P4P FO.

Impact of P4P on Household Maize Production

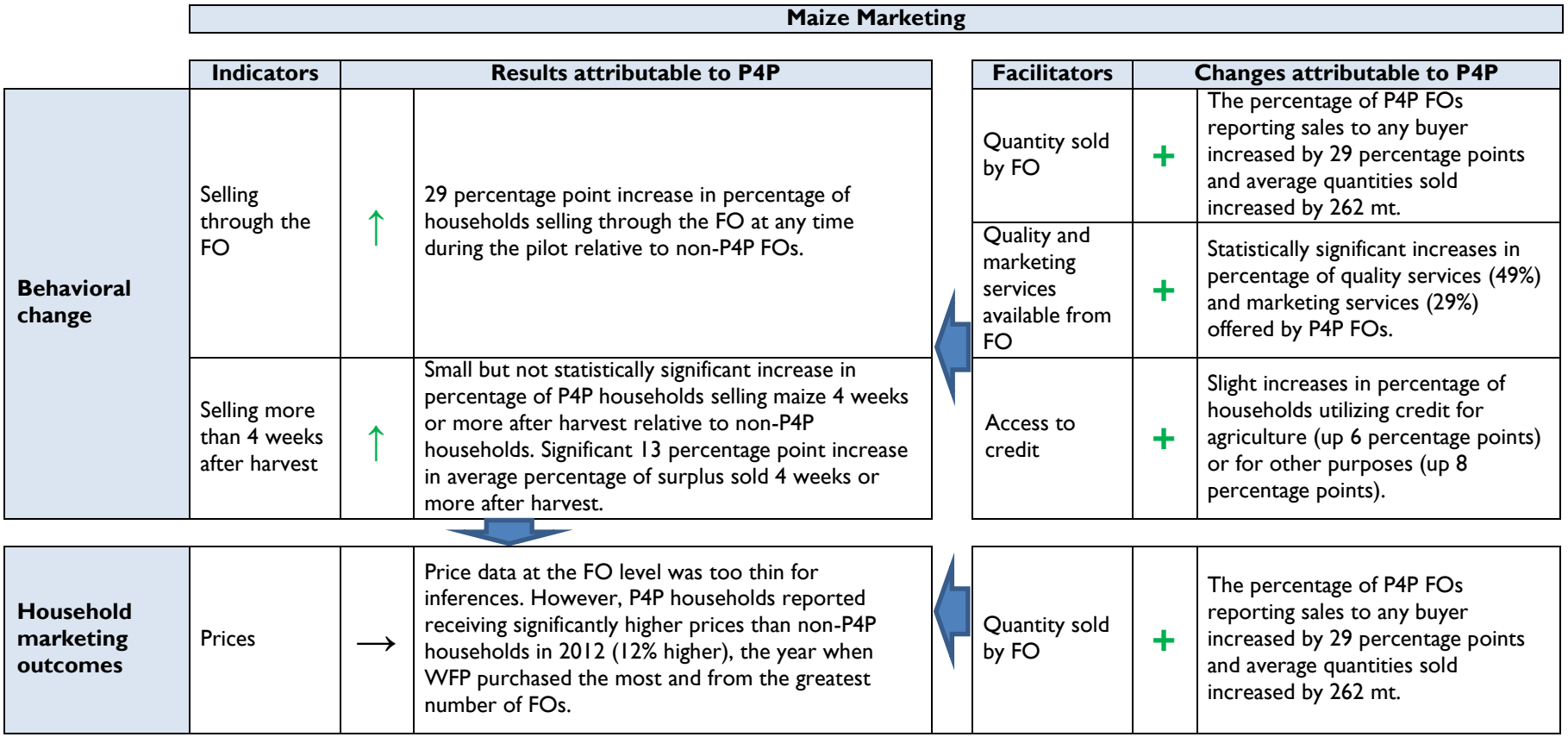
The P4P development hypothesis suggests that positive outcomes in household maize marketing lead to positive production outcomes. For example, higher prices obtained from selling maize through the FOs are expected to provide the incentive to invest in increasing maize production. In addition to the incentive provided by better access to markets, facilitating factors for maize production include access to inputs and credit to resolve financial constraints to investing in agriculture. Specific changes in production facilitating conditions (documented in Figure 20) include:

- The percentage of P4P households reporting receiving subsidized inputs through their FO increased by 7 percentage point.
- The percentage of P4P households using credit for agricultural purposes increased by 6 percentage points between 2009 and 2012.
- The percentage of P4P households receiving production training increased by 23 percentage points.

The positive facilitating environment coupled with a P4P program that provided customized technical packages of inputs and the training to use them correctly prompted P4P households to change their maize production behavior relative to non-P4P households. In particular:

- The percentage of P4P households choosing to cultivate maize increased by 19 percentage points relative to non-P4P households.
- P4P households allocated an average of 0.29 ha more to maize production than non-P4P households.
- The percentage of P4P households using certified maize seed increased by 18 percentage points relative to non-P4P households and the average percentage of maize seed used that was certified increased by 27 percentage points relative to non-P4P households.

FIGURE 19: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE MARKETING



Legend

↑	Statistically significant positive impact attributable to participating in P4P.
↓	Statistically significant negative impact attributable to participating in P4P.
→	No statistically significant impact associated with participating in P4P.
+	Favorable conditions/change.
-	Unfavorable conditions/change.

Consistent with the increased focus on maize production and the increased use of certified seed, P4P households reported a significant increase in maize production parameters. Specifically:

- P4P households' maize yields increased by 0.87 mt/ha relative to non-P4P households.
- The average quantity of maize produced by P4P households was 1.08 mt higher than it would have been had the households not participated in P4P.
- P4P households reported selling an average of 2.42 mt more maize than non-P4P households.

Impacts of P4P on Household Welfare

Ultimately, better access to markets and increased production should boost household welfare. However, the well-known difficulties in measuring income and the relatively small change anticipated make it likely that even if P4P "caused" a change in income, it would not be detected through the noise of reporting error (recall) and variability. The analysis therefore also considered alternative measures of changes in welfare where the prospects for detecting change were more promising. These included a summary measure of household assets (the household asset score), an indicator of food security (the food consumption score), the value of household livestock, and characteristics of the households housing (flooring, wall, and roofing materials). Which of these will respond first to changes in income will probably depend to some extent on characteristics of a particular household. For example, a food insecure household may spend additional income on food before investing in housing or livestock.

P4P households were better off in 2014 than in 2009 by almost any measure of welfare.

- Average real incomes increased by 45 percent, from USD 870 in 2009 to USD 1,264 in 2014;
- The average household asset score increased from 12.30 in 2009 to 12.85 in 2014, an increase of 4 percent;
- The average real value of household livestock increased by 78 percent, from USD 435 to USD 774; and
- The average food consumption score increased by 9 percent, from 81.34 in 2009 to 85.22 in 2014.

However, non-P4P households experienced similar improvements and none of the changes observed with P4P households were significantly different from those experienced by non-P4P households.

FIGURE 20: SUMMARY OF IMPACT OF P4P ON HOUSEHOLD MAIZE PRODUCTION

Maize Production						
	Anticipated Results	**Results attributable to P4P**		**Facilitators**	**Changes attributable to P4P**	
Behavioral change	Planting maize	↑	Significant 19 percentage point increase in likelihood that P4P households plant maize relative to non-P4P households.	Access to inputs/credit	+	7 percentage point increase in percentage of P4P households receiving subsidized inputs through the FO. 6 percentage point increase in percentage of households receiving credit for agricultural purposes between 2009 and 2012.
	Area allocated to maize	↑	Significant 0.29 ha increase in average area allocated to maize production by P4P households relative to non-P4P households.			
	Use of inputs	↑	The percentage of P4P households using certified maize seed increased by 18 percentage points relative to non-P4P households and the average percentage of maize seed used that was certified increased by 27 percentage points relative to non-P4P households.	Production training	+	23 percentage point increase in percentage of P4P households receiving production training.
Intermediate outcomes	Yields	↑	Significant 0.87 mt/ha increase in maize yields relative to non-P4P households.	Access to inputs/credit	+	7 percentage point increase in percentage of P4P households receiving subsidized inputs through the FO. 6 percentage point increase in percentage of households receiving credit for agricultural purposes between 2009 and 2012.
	Quantity produced	↑	Significant 1.08 mt increase in quantity of maize produced relative to non-P4P households.			
	Quantity sold	↑	Significant 2.42 mt increase in quantity of maize sold relative to non-P4P households.			

Legend

↑ Statistically significant positive impact attributable to participating in P4P.
↓ Statistically significant negative impact attributable to participating in P4P.
→ No statistically significant impact associated with participating in P4P.
+ Favorable conditions/change.
- Unfavorable conditions/change.

ANNEXES

Annex A: Adjusting for High Attrition Rates

El Salvador experienced substantial attrition in the household panel between the baseline in 2009 and the first follow-up survey in 2012. Of the 349 P4P and 308 non-P4P households interviewed in 2009, 234 (67 percent) of the P4P and 182 (59 percent) of the non-P4P households dropped out in the first follow-up survey in 2012. To address the attrition, the country office selected new households to replace those that dropped out and thus retained cross-sectional samples of 315 P4P and 308 non-P4P households. Attrition rates between 2012 and the final survey in 2014 were negligible; less than 2 percent of P4P households and less than 1 percent of non-P4P households.

High rates of attrition can bias estimated causal effects if 1) households that dropped out of the survey were likely to respond differently to the P4P opportunity than retained households or 2) households selected to replace those that dropped out would respond differently to P4P than those they replaced.

The magnitude and direction of potential bias in either of these situations depends on the reasons for attrition, procedures for selecting replacement households, and assumptions about why some households are more likely to respond to the P4P opportunity than others. For example, households that underperformed in 2009 relative to the entire sample may have experienced poor results because of transient household-specific adverse conditions and may have regressed back toward the mean in the first follow-up survey. If these households dropped out of the P4P sample in disproportionate numbers, ceteris paribus, it would deflate estimates of causal effects. On the other hand, if underperforming households were less progressive farmers, then dropping them from the P4P sample in disproportionate numbers would tend to inflate estimated causal effects.

Short of reconstituting the panel, i.e., locating the households that dropped out and asking them to recall what their answers to the survey questions would have been in 2012 and 2014, there are three options for analyzing the El Salvador household data.

- Treat the data as repeated cross sections. This approach does not eliminate either source of bias.
- Analyze only the data from the small panel. This approach eliminates potential bias caused by differences between replacement households and those that dropped out. However, it does not address potential bias caused by differences between households that dropped out and those retained.
- Stratify households on the basis of likely differences in response to P4P. If it is possible with baseline data to assess households' likely response to P4P, then the analysis could stratify on the response variable and base the causal comparison on differences between P4P and non-P4P households in the same response stratum. The average treatment effect would then be the weighted average of treatment effects across the strata. The difficulty of this approach is finding an appropriate response variable on which to stratify households.

The household analysis followed the third of these options. The rationale for the approach is that the high attrition created a non-representative sample relative to the random baseline. The non-representativeness is a problem only to the extent that different segments of the sample are likely to respond to the P4P opportunity in different ways. Stratifying the remaining households on an measure of their likely response to P4P and then weighting the data in each strata to reflect their proportion in the baseline sample should correct for the disproportional household sample.

The challenge with the stratification approach is identifying an appropriate measure of likely response to P4P. For the analysis of the El Salvador household data the response measure is an index created from a factor analysis of baseline values of 13 anticipated household outcomes including the likelihood of planting maize (pmaize), the area allocated to maize (aream), the likelihood of using certified maize seed (cseedm), the likelihood of using fertilizer (fert), maize yield (yieldm), the quantity of maize harvested (harvestqm), the quantity of maize sold (qsoldm), the likelihood of selling maize through the FO (foi), the likelihood of selling maize four weeks or more after harvest (latersoldi), total households income (totincome), the household asset score (assets), the value of livestock (lasset), and the food consumption score (fcs). Table 12 reports the STATA output for a principle components factor analysis of the variables listed above.

TABLE 12: PRINCIPLE COMPONENTS FACTOR ANALYSIS RESULTS

Factor	Eigenvalue	Difference	Proportion	Cumulative proportion
Factor1	3.1633	2.3080	0.6633	0.6633
Factor2	0.8553	0.2148	0.1794	0.8427
Factor3	0.6405	0.1531	0.1343	0.9770
Factor4	0.4874	0.1319	0.1022	1.0792
Factor5	0.3555	0.2815	0.0745	1.1537
Factor6	0.0740	0.0631	0.0155	1.1692
Factor7	0.0109	0.0658	0.0023	1.1715
Factor8	-0.0549	0.0145	-0.0115	1.1600
Factor9	-0.0694	0.0390	-0.0145	1.1455
Factor10	-0.1084	0.0544	-0.0227	1.1228
Factor11	-0.1628	0.0314	-0.0341	1.0886
Factor12	-0.1942	0.0341	-0.0407	1.0479
Factor13	-0.2283	.	-0.0479	1.0000

Table 13 shows the factor loadings associated with the factor analysis of Table 12.

TABLE 13: FACTOR LOADINGS FOR FACTOR ANALYSIS

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Uniqueness
pmaize	0.2166	0.2544	-0.4955	0.1354	0.2234	-0.0088	-0.0001	0.5745
aream	0.7260	-0.3265	-0.2643	-0.1968	0.2329	-0.0344	-0.0146	0.2021
cseedm	0.1723	0.0249	0.1205	0.0118	0.1638	-0.0667	0.0847	0.9166
fert	0.1843	-0.2435	-0.2546	0.0327	-0.0967	0.0759	0.0296	0.8249
yieldm	0.4995	0.6302	-0.0564	0.2270	-0.0827	-0.0025	0.0036	0.2917
harvestqm	0.9449	0.1168	-0.0203	-0.1654	-0.1024	-0.0467	-0.0159	0.0528
qsoldm	0.8475	-0.0203	0.2020	-0.2196	-0.1642	-0.0298	0.0108	0.1643
foi	0.0019	0.1839	0.2386	-0.1800	0.2568	0.0816	-0.0049	0.8042
latersoldi	0.0853	0.2260	0.2328	-0.1124	0.2606	0.0531	-0.0163	0.8038
totincome	0.5881	-0.0146	0.0732	0.1451	-0.1062	0.1539	0.0042	0.5925
assets	0.3645	-0.2626	0.1326	0.3282	0.0911	-0.0006	-0.0365	0.6632
lasset	0.3827	-0.2349	0.1283	0.2395	0.1191	0.0693	0.0229	0.7051
fcs	0.1802	-0.0607	0.2254	0.2662	0.0567	-0.1466	-0.0102	0.8174

The P4P response index is the predicted value of factor 1 for each household.

The analysis then stratifies households on the value of the response variable, determines the proportions of the full baseline sample and panel households in the baseline sample, and calculates a weight by dividing the former proportion by the latter proportion. Table 14 shows the distribution of households by strata and illustrates the calculation of weights used to adjust the results to reflect the original baseline sample.

TABLE 14: DISTRIBUTION OF HOUSEHOLDS BY STRATA

		Proportions/(frequency)		
Stratum	Left boundary	Full baseline sample (A)	Panel HH in baseline sample (B)	Weight (A/B)
0	-2.0	0.0096 (4)	0.0127 (3)	0.7559
1	-0.80	0.0554 (23)	0.0380 (9)	1.4579
2	-0.60	0.2530 (105)	0.2152 (51)	1.1757
3	-0.40	0.2916 (121)	0.2911 (69)	1.0017
4	-0.20	0.1181 (49)	0.1435 (34)	0.8230
5	0	0.0843 (35)	0.0717 (17)	1.1757
6	0.20	0.0651 (27)	0.0591 (14)	1.1015
7	0.40	0.0241 (10)	0.0127 (3)	1.8976
8	0.60	0.0241 (10)	0.0295 (7)	0.8169
9	0.80	0.0120 (5)	0.0380 (9)	0.3158
10	1.00	0.0627 (26)	0.0886 (21)	0.7077

The analysis applied these weights using the svy: prefix in all STATA regression commands.

Annex B: Comparison of P4P and Non-P4P FOs and Households

TABLE 15: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P FOS

Characteristics	P4P FOs	Non-P4P FOs	p-value
FO characteristics			
Number of members	182	103	0.2560
Percentage of female members	0.73	0.64	0.3071
Percentages smallholder farmer members	0.88	0.84	0.8153
Number of full-time employees	14	21	0.1198
Distance from market (km)	105	56	0.2001
Indicator of higher level FO affiliations	0.08	0.29	0.2123
Indicator of higher and lower level FO affiliations	0.08	0.14	0.6392
Indicator of lower level FO affiliations	0.08	0.00	0.4515
Indicator of no FO affiliations	0.77	0.57	0.3572
FO capacity indicators			
Indicator of planning for production and marketing	0.38	0.14	0.2605
Indicator of receiving credit in past two years	0.31	0.43	0.5888
Indicator of providing financing to members	0.00	0.14	0.1621
Indicator of access to storage	0.15	0.00	0.2740
Indicator of receiving credit	0.31	0.29	0.9185
Indicator of using price information	0.00	0.00	
External assistance received			
Indicator of receiving organizational assistance	0.85	1.00	0.2740
Indicator of receiving post harvest assistance	0.62	0.29	0.1596
Indicator of receiving production assistance	0.85	0.86	0.9477
Indicator of receiving marketing assistance	0.38	0.00	0.0518
Indicator of receiving assistance for inputs	0.92	0.71	0.2123
Indicator of receiving assistance for tools	0.38	0.29	0.6583
Indicator of receiving assistance for infrastructure	0.23	0.14	0.6392
Indicator of receiving any assistance	1.00	1.00	
Services provided			
Indicator of providing any services	0.69	1.00	0.1008
Indicator of providing value addition services	0.00	0.00	
Indicator of providing quality services	0.03	0.00	0.3276
Indicator of providing production services	0.26	0.46	0.1997
Indicator of providing marketing services	0.21	0.00	0.0237
Marketing activity			
Indicator of selling during baseline year	0.00	0.00	
Indicator of selling during past two years	0.08	0.14	0.6392

Characteristics	P4P FOs	Non-P4P FOs	p-value
Maximum quantity sold in past two years (mt)	269	50	0.5643

TABLE 16: BASELINE DIFFERENCES BETWEEN P4P AND NON-P4P HOUSEHOLDS

Household characteristic	P4P	Non-P4P	p-value of difference
Number of individuals in household	5.75	5.33	0.2082
Indicator of using certified maize seed	0.59	0.69	0.1146
Indicator of using certified seed on crops other than maize	0.21	0.15	0.2848
Indicator of using certified seed on any crop	0.63	0.75	0.0487
Area of land owned (ha)	1.79	0.97	0.0010
Area allocated to maize (ha)	1.33	0.86	0.0001
Area allocated to crops other than maize (ha)	0.88	0.51	0.0004
Total cultivated area (ha)	2.21	1.37	0.0000
Average maize yield (mt/ha)	2.68	2.47	0.2856
Average quantity of maize harvested (mt)	3.43	1.93	0.0000
Average quantity of crops other than maize harvested (mt)	0.70	0.42	0.0174
Average quantity of all crops harvested (mt)	4.14	2.35	0.0000
Quantity of maize sold (mt)	4.92	2.43	0.0018
Quantity of crops other than maize sold (mt)	0.41	0.23	0.0920
Quantity of all crops sold (mt)	2.87	1.44	0.0013
Size of maize surplus (mt)	2.28	0.99	0.0001
Average percentage of maize sold within 4 weeks of harvest (%)	0.36	0.40	0.5276
Average percentage of maize sold 4 weeks after harvest (%)	0.40	0.26	0.0188
Average quantity of maize sold within 4 weeks of harvest (mt)	1.22	0.76	0.1319
Average quantity of maize sold 4 weeks after harvest (mt)	1.19	0.42	0.0015
Average percentage of maize sold through FO (%)	0.07	0.07	0.8665
Average percentage of maize sold elsewhere (%)	0.29	0.26	0.4865
Average percentage of maize sold at the farm gate (%)	0.39	0.34	0.3672
Average quantity of maize sold through FO (mt)	0.21	0.11	0.3408
Average quantity of maize sold elsewhere (mt)	0.73	0.64	0.7177
Average quantity of maize sold at the farm gate (mt)	1.47	0.44	0.0007
Value of loans received for agricultural purposes (2009 Ethiopian Birr)	392	239	0.2894
Value of loans received for non-agricultural business (2009 Ethiopian Birr)	3	6	0.5662
Value of loans received for any purpose (2009 Ethiopian Birr)	522	345	0.4059
Average food consumption score	81.70	80.00	0.4715
Average food consumption rank	3.00	3.00	
Average household asset score	12.61	12.06	0.2216
Value of livestock assets (2009 Ethiopian Birr)	449	404	0.7475
Average annual household income (2009 Ethiopian Birr)	1,083	653	0.0035
Average annual income from farming (2009 Ethiopian Birr)	826	384	0.0002

Household characteristic	P4P	Non-P4P	p-value of difference
Average annual off-farm income (2009 Ethiopian Birr)	257	269	0.8719
Net value of crops produced (2009 Ethiopian Birr)	798	314	0.0000
Net value of crops consumed (2009 Ethiopian Birr)	270	132	0.0057
Net value of crops sold (2009 Ethiopian Birr)	529	189	0.0008
Net value of staples sold (2009 Ethiopian Birr)	375	127	0.0008
Net income from livestock (2009 Ethiopian Birr)	28	70	0.2037
Income from livestock sales (2009 Ethiopian Birr)	5.71	5.46	0.9654
Value of livestock consumed (2009 Ethiopian Birr)	0.00	-0.11	0.8023
Income from livestock products and services (2009 Ethiopian Birr)	23	65	0.1885
Annual cost of keeping livestock (2009 Ethiopian Birr)	50	96	0.2827
Percentage of household income from off-farm sources	0.19	0.39	0.0780
Annual expenditure (2009 Ethiopian Birr)	4,817	6,366	0.1363
Annual expenditure on household items (2009 Ethiopian Birr)	573	443	0.0786
Annual expenditure on food (2009 Ethiopian Birr)	1,449	1,268	0.2461
Annual expenditure on other items (2009 Ethiopian Birr)	2,768	4,646	0.0656
Annual expenditure on rent (2009 Ethiopian Birr)	26	8	0.1534
Annual crop production expenses (2009 Ethiopian Birr)	529	321	0.0084
Indicator of female household head	0.73	0.54	0.0018
Indicator of metal roof on house	0.06	0.05	0.6245
Indicator of concrete floor in house	0.59	0.70	0.0864
Indicator of concrete or fired brick walls on house	0.44	0.50	0.3386
Indicator of improved toilet facilities in house	0.55	0.46	0.1337
Indicator of household access to improved water source	0.96	0.79	0.0002
Indicator of using fertilizer	0.42	0.29	0.0339
Indicator of access to inputs on credit or subsidized	0.80	0.61	0.0010
Indicator of irrigating maize	0.00	0.00	
Indicator of planting maize	0.94	0.96	0.4303
Indicator of planting crops other than maize	0.85	0.62	0.0001
Indicator of producing a surplus of maize	0.66	0.66	0.9887
Indicator of selling maize within 4 weeks of harvest	0.47	0.46	0.7908
Indicator of selling maize 4 weeks after harvest	0.47	0.34	0.0431
Indicator of selling maize through the FO	0.12	0.11	0.9215
Indicator of selling maize at the farm gate	0.42	0.34	0.1843
Indicator of selling maize elsewhere	0.47	0.43	0.5244
Indicator of receiving loans for agriculture	0.36	0.32	0.5460
Indicator of receiving loans for non-agricultural business	0.02	0.02	0.9118
Indicator of receiving loans for any purpose	0.41	0.36	0.4229

Household characteristic	P4P	Non-P4P	p-value of difference
Indicator of obtaining crop price information through FO	0.32	0.12	0.0002
Indicator of using crop price information	0.96	0.80	0.0003
Indicator of finding price information from FO useful	0.26	0.10	0.0018

Annex C: P4P Treatment Details

TABLE 17: QUANTITIES DELIVERED TO WFP BY FO AND YEAR

Organization type	FO name	Quantity delivered (mt)					Years w/ contracts	Average contract size (mt)[a]
		2009	2010	2011	2012	2013		
FO	ADESCOAGRISAL	280	728	66	868		4	114
FO	ACALESE	178	1,057		200		3	239
FO	ACPA COLIBRI DE R.L.	98					1	98
FO	AGROTROPICAL DE EL SALVADOR, DE RL		472				1	157
FO	ACPASM EL PESOTE DE R.L.		197		40		2	79
FO	ASOCIACION AGROPECUARIA DE TURIN DE RESP			11	86		2	32
FO	ASOCIACION COOPERATIVA DE PRODUCCIO				358		1	45
FO	ASOC COOP DE APRO. AGROPECUARIO,AHORRO,					297	1	0
FO	Asociacion De Productores Agropecuarios				266		1	89
Umbrella FO	UDP PRODUCTORES DE GRANOS BASICOS					557	1	557

Source: WFP procurement records

a. Average contract size may be different than average quantity delivered per year because some FOs had multiple contracts in a given year.

TABLE 18: WFP PROCUREMENT BY MODALITY

Contract year	Procurement modality						Total (all modalities)		
	Competitive tenders			Direct contracts					
	Beans	Maize	Total	Beans	Maize	Total	Beans	Maize	Total
2009					555	555		555	555
2010		660	660	49	1,745	1,794	49	2,405	2,454
2011	25	52	77				25	52	77
2012	211	1,607	1,818				211	1,607	1,818
2013		854	854					854	854
Total	**236**	**3,173**	**3,409**	**49**	**2,300**	**2,349**	**285**	**5,473**	**5,758**

Source: WFP procurement records.

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20 P4P pilot countries
Asia: Afghanistan
Africa: Burkina Faso, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Liberia, Malawi, Mali, Mozambique, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda, Zambia
Latin America: El Salvador, Guatemala, Honduras, Nicaragua