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Challenges in Implementing a Small-Scale Farmers' Capacity-Building Program

The Case of the Food Production, Processing, and
Marketing Project in the Democratic Republic of Congo

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ABSTRACT

In 2011, in collaboration with the United States Agency for International Development (USAID), the Democratic Republic of Congo's government launched the Food Production, Processing, and Marketing project—which aimed to raise incomes and improve food security in the target areas by improving agricultural productivity, market efficiency, and the capacity of producers to respond to market signals. In August–October 2013 and February–March 2014, halfway through the project's implementation, a midline survey was conducted to assess progress with respect to intermediate outcomes. The present paper highlights the results of that assessment survey. We pay close attention to accurate attribution of observed changes to the project and employ a double-difference method that compares the changes in indicators before the project and at the time of the survey (project midline) between the beneficiaries and comparable control groups. Overall, the survey results suggest weak impact on most of the outcome indicators, and they highlight challenges in implementing small-scale farmers' capacity building within the context of weak institutions and a fragile political context.

Keywords: agricultural capacity-building program, value chain, smallholder farmers, impact evaluation, agricultural productivity, Democratic Republic of Congo

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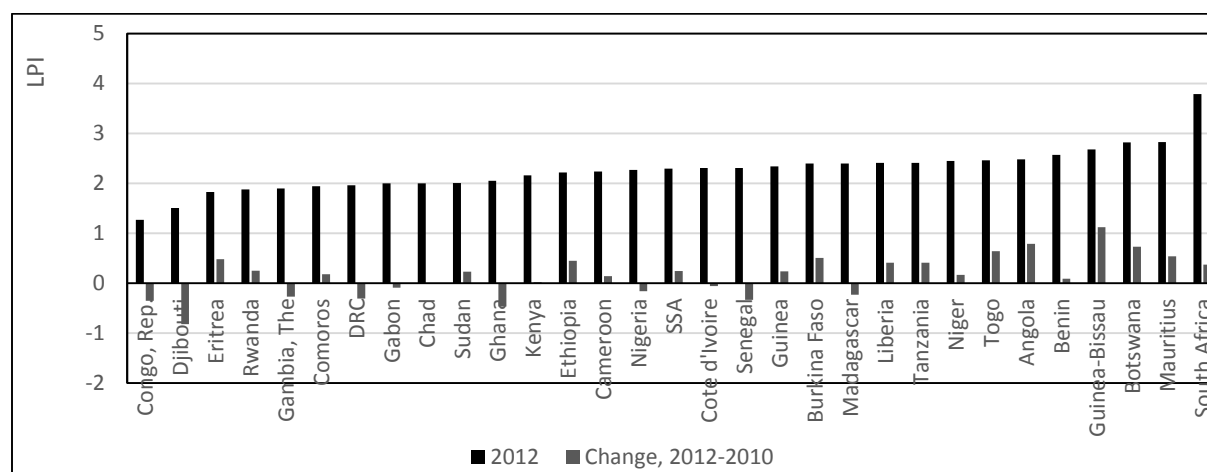
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1. INTRODUCTION

With an area of 2.3 million square kilometers and a population of 72 million people, the Democratic Republic of Congo (DRC) is the largest and the third-most-populous country in Africa south of the Sahara (SSA).¹ The country is also richly endowed with natural resources. It accounts for 35 percent of the carbon stock in SSA (Baccini et al. 2008) and 23 percent of renewable surface water in SSA (AQUASTAT 2012). Endowed with 80 million hectares of arable land (of which only 10 percent are used) and diverse climatic conditions, DRC has the potential to become the breadbasket of the entire African continent.

Despite its resources, DRC was ranked the worst in the Global Hunger Index in 2011 (IFPRI 2012). Child-stunting and infant mortality rates in DRC are among the highest in the world. Part of the reason for this countervailing pattern is civil war, which the country has experienced since 1996 with varying intensity (IRC 2008). The predominance of security issues particularly critical in the eastern part of the country and the additional funding requirements of military spending led to fiscal imbalances at the expense of the agriculture sector, observed until the end of 2008 (IMF 2013). Related to this, DRC's government effectiveness index—government's capacity to implement policies with independence from political pressures and with respect to the rule of law (Kaufmann, Kraay, and Mastruzzi 2010)—has been among the lowest five in SSA from 1996 through 2011 (World Bank 2011).² DRC's Logistics Performance Index (LPI)—the measure of quality of trade- and transport-related infrastructure services—is among the lowest and has worsened since 2010 (Figure 1.1).

Figure 1.1 Logistics Performance Index (LPI) in 2012 and its change since 2010



Source: World Bank (2013).

Note: LPI = Logistics Performance Index. LPI ranges from 1 (lowest) to 5 (highest).

In the past eight years, the country has taken significant steps to address these challenges. The Lusaka Peace Accords, which led to the establishment of a transitional government, led to presidential elections in 2006 and 2011 with new parliament, senate, and provincial assemblies (World Bank 2012). Since 2003, the country's real gross domestic product (GDP) grew at 5 percent or higher (IMF 2013).³ This impressive growth rate is a result of a series of institutional reforms and economic development strategies the country is implementing with development partners.

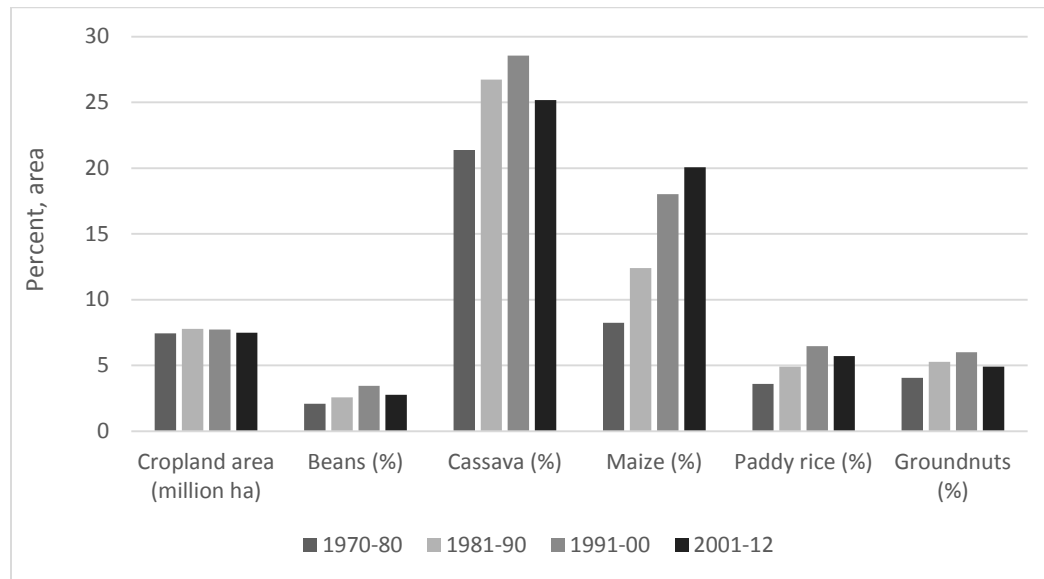
¹ DRC became the second-largest country in SSA after South Sudan ceded from Sudan in 2011. The first- and second-most-populous countries in SSA are, respectively, Nigeria and Ethiopia.

² For example, in 2010, DRC's government effectiveness index was the third lowest in SSA. The first and second countries with the worst government effectiveness in SSA were Somalia and Comoro, respectively (World Bank 2011).

³ However, due to the global financial crisis, DRC's GDP in 2009 grew at only 2.8 percent (IMF 2013).

One such strategy is the Food Production, Processing, and Marketing (FPPM) project, implemented in collaboration with the United States Agency for International Development (USAID). The FPPM project aims to achieve higher incomes and improved food security in its target areas by improving agricultural productivity, market efficiency, and the capacity of producers to respond to market signals. The project is mainly focused on maize, legumes (beans and groundnuts), rice, and cassava. Figure 1.2 shows the contribution of the target crops in the total cropland area in DRC over several years. Cassava and maize are the main crops in DRC, accounting for 25 percent and 20 percent of cropland area, respectively. All four FPPM crops account for a little over 60 percent of cropland area—underscoring the importance of the selected crops and the potential impact that the FPPM project is likely to make.

Figure 1.2 Contribution of FPPM crops to total cropland area, 1970–2011



Source: FAOSTAT raw data (1970–2012).

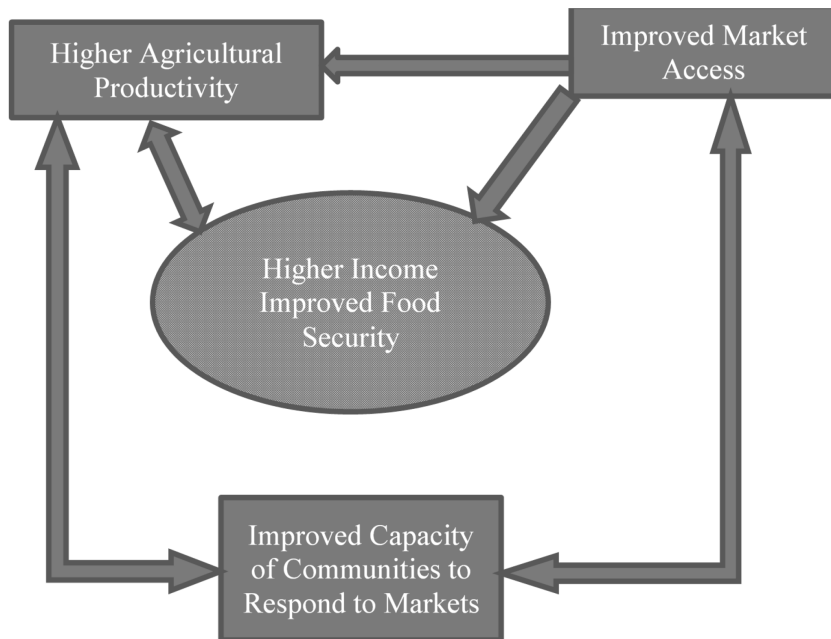
In August–October 2013 and February–March 2014, a midline survey was conducted to assess progress toward achieving the intermediate outcomes halfway through the project’s implementation. The survey covered three target provinces: Bandundu, Bas-Congo, and Kinshasa. The aim of this report is to present the results of the midline assessment survey to inform the project management about the progress of the project and suggest some adjustments in the implementation to achieve greater impact in the project’s remaining years.

The survey results suggest weak impact on most of the outcome indicators. The study pays close attention to accurate attribution of observed changes to the project and employs a double-difference method that compares the changes in indicators before the project and at the time of the survey (project midline) between the beneficiaries and comparable control groups. The details of the methodology, data collection, and data quality control processes are described next in section 2. Section 3 presents a descriptive analysis of the survey data and characteristics of the respondents. We present the midline impact of the FPPM project from the double-difference analysis in sections 4 through 6. The report concludes and provides recommendations for the FPPM project in section 7.

2. METHODOLOGY

The evaluation done in this study assumes a clear impact pathway, defined as the expected causal chain of events leading from intervention activities to intermediate impacts, which in turn lead to the ultimate impacts. Figure 2.1 illustrates the FPPM impact pathway. In this framework, the FPPM intervention leads to the intermediate impacts, namely, improved agricultural productivity, higher market efficiency, and better response of beneficiaries to market signals. The intermediate impacts will translate to the project's ultimate impacts, namely, higher income of beneficiaries and improved food security, both of which are aligned with the overarching goal of the Congolese government—namely, sustainable reduction in poverty and hunger.

Figure 2.1 Conceptual framework of FPPM impact assessment



Source: Authors.

As Figure 2.1 shows, the three components of the FPPM project are closely linked. Improved marketing efficiency increases agricultural productivity since it provides farmers marketing opportunities and lower transaction costs, an outcome that in turn increases the use of inputs and therefore yields higher returns to their agricultural production (Angelsen 2010; Boyd and Slaymaker 2000). Likewise, increasing the capacity of farmers to respond to market signals increases their risk management ability and creates an incentive to invest in agriculture productivity using high-yield technologies. Higher agricultural productivity directly increases income and food security, while improved access to markets could open up new nonfarm activities more likely to increase income and food security. Higher income could also allow farmers to buy agricultural inputs, and that will increase their agricultural productivity. Table 2.1 shows the outcome indicators that we use to determine the type of data collected during the midline survey. The preliminary results of the survey vis-à-vis the outcome indicators are summarized in Table 2.1 and are discussed in detail in the next sections.

Table 2.1 Outcome indicators of the FPPM project

Outcome	Indicator and units	Progress in 2013
Component one: Increased agricultural productivity		
1. Establish Farmer Field Schools (FFSs)	<ul style="list-style-type: none"> • % of farmers with access to a FFS • % of farmers with access to agricultural extension services 	<ul style="list-style-type: none"> • Some impact: 59% of farmers in FPPM villages had access to FFS in 2013, up from 49% of farmers in 2010; compared with 33% of farmers in control villages (Bandundu survey only).* • Some positive impact of FPPM project. A total of 35% to 50% of FPPM beneficiaries while only 15% to 30% of control group reported access to extension services in the three provinces in 2013. Positive change from 2010 to 2013 is observed among FPPM beneficiaries, while a decrease in extension services access is reported among control group. These changes are statistically different between FPPM beneficiaries and control group in the three provinces.
2. Build smallholder seed multiplication through the FFSs	<ul style="list-style-type: none"> • Adoption rate of improved seeds 	<ul style="list-style-type: none"> • No impact, except some positive and significant impact on maize in Bandundu and beans in Bas-Congo. Slight increase in improved varieties adoption for cassava and beans is observed in the three provinces, and for groundnuts in Bandundu among both beneficiaries and control, and for groundnuts in Kinshasa among FPPM beneficiaries. A decrease in improved variety adoption in most crops is observed among the control group. These changes are not statistically different between FPPM beneficiaries and control group.
3. Develop biofortification pilot program	<ul style="list-style-type: none"> • Adoption rate of biofortified varieties (%) 	<ul style="list-style-type: none"> • No biofortified varieties were distributed and available at the time of the survey.
4. Improve access to fertilizer supply	<ul style="list-style-type: none"> • Adoption rate and intensity of fertilizer (% kg/ha) • Distance to nearest fertilizer input market (km) 	<ul style="list-style-type: none"> • No impact. No farmers in Bas-Congo, 2% among control households in Bandundu, and only 1% to 6% in Kinshasa used fertilizer in 2010 and 2013. A slight decrease among FPPM beneficiaries and slight increase among the control group are observed in Kinshasa in 2013. • Weak impact, except some positive impact for maize in Bas-Congo and cassava in Bandundu. Distance to nearest input source decreased slightly for all crops among FPPM beneficiaries and the control group—therefore reduction in distance may not be all attributable to FPPM project.
5. Train farmers in crop management	<ul style="list-style-type: none"> • % of crop loss • % of postharvest loss 	<ul style="list-style-type: none"> • Did not specifically ask about postharvest loss during the survey.
6. Promote farm mechanization	<ul style="list-style-type: none"> • % of farmers using mechanization by types of activity (clearing, plowing, planting, harvesting, packaging, processing, and so on) 	<ul style="list-style-type: none"> • No impact. Almost no farmers used mechanization in Bas-Congo (less than 1% of farmers). 4% of FPPM beneficiaries and no members of control group in Bandundu used mechanization, while 70% of FPPM beneficiaries and 10% of control group in Kinshasa used mechanization for land preparation. No statistically significant increase in mechanization is observed from 2010 to 2013.
7. Improve on-farm storage	<ul style="list-style-type: none"> • % of farmers using storage structures • Storage losses (% of harvest) 	<ul style="list-style-type: none"> • Some impact: 41% of farmers in FPPM villages used storage structures in 2013, up from 38% in 2010; compared with 34% of farmers in control villages (Bandundu survey only).*

Table 2.1 Continued

Outcome	Indicator and units	Progress in 2013
Component one: Increased agricultural productivity (Continued)		
8. Develop livestock/fish raising activities	<ul style="list-style-type: none"> • Adoption rate of livestock/fish technologies 	<ul style="list-style-type: none"> • No impact. Less than 1% of farmers in Bandundu and Bas-Congo and 2% to 3% in Kinshasa have adopted new livestock breed or management practices in the last five years.
9. Promote conservation farming	<ul style="list-style-type: none"> • % of farmers using conservation farming 	<ul style="list-style-type: none"> • No impact; only 5% of farmers in FPPM villages and 4% of farmers in control villages practiced conservation farming in 2010 and 2013 (only included in the Bandundu survey).
Component two: Improved market efficiency		
1. Improve farm-to-aggregation-center transport links	<ul style="list-style-type: none"> • Level of decrease in transaction costs of agricultural products (%) • Group marketing (% of households conducting group marketing) • Distance to agricultural market (km) • Share of farmer and agricultural trader groups with horizontal and vertical linkages (%) 	<ul style="list-style-type: none"> • No impact. Cost of hiring trucks and motorbikes and fares to the nearest urban area actually increased. Time taken to wait for motor vehicle or motorcycle transport to market decreased slightly in Bandundu and Bas-Congo, although not statistically different from control group. It actually increased in Kinshasa. • No impact. Proportion of farmers conducting collective marketing is 10% in Bandundu, only 4% in Bas-Congo, and 6% in Kinshasa. • No impact. Distance to nearest market and to all-weather road and travel time to nearest all-weather road decreased slightly among FPPM beneficiaries and also the control group; therefore reduction in distance may not be all attributable to FPPM project. • Did not specifically ask. However, only 3% of households in Bandundu and Bas-Congo and 10% of households in Kinshasa are engaged in agricultural trading or any off-farm small or medium-sized enterprise (SME).
2. Improve aggregation-center-to-end-market links	<ul style="list-style-type: none"> • Level of decrease in transaction costs of agricultural products (%) • Group marketing (% of households conducting group marketing) • Distance to agricultural market (km) • Share of farmer and agricultural trader groups with horizontal and vertical linkages (%) 	<ul style="list-style-type: none"> • No impact. Cost of hiring trucks and motorbikes and fares to the nearest urban area actually increased. Time taken to wait for motor vehicle or motorcycle transport to market decreased slightly in Bandundu and Bas-Congo, although not statistically different from control group. It actually increased in Kinshasa. • No impact. Proportion of farmers conducting collective marketing is 10% in Bandundu, only 4% in Bas-Congo, and 6% in Kinshasa. • No impact. Distance to nearest market and to all-weather road and travel time to nearest all-weather road decreased slightly among FPPM beneficiaries and also the control group; therefore reduction in distance may not be all attributable to FPPM project. • Did not specifically ask, but only 3% of households in Bandundu and Bas-Congo and 10% of households in Kinshasa are engaged in agricultural trading or any off-farm SME.
3. Improve postharvest storage and treatment	<ul style="list-style-type: none"> • Postharvest storage losses as % of quantity harvested 	<ul style="list-style-type: none"> • Did not specifically ask during survey.

Table 2.1 Continued

Outcome	Indicator and units	Progress in 2013
Component two: Improved market efficiency (Continued)		
4. Develop opportunities for on-farm household processing	<ul style="list-style-type: none"> • % of households that process agricultural products • Processed agricultural products as % of quantity harvested • Value addition: change in price of processed product as % of raw agricultural product price 	<ul style="list-style-type: none"> • Some positive impact in Bandundu and Kinshasa; no impact in Bas-Congo. We observe no change in proportion of those that processed agricultural products for control group in Bandundu, a decrease for both FPPM beneficiaries and control group in Bas-Congo, and a slight increase among FPPM beneficiaries and a decrease among the control group in Kinshasa. • Many missing values and outliers reported on price data. These figures will need to be verified.
5. Expand rural SME processing units	<ul style="list-style-type: none"> • Number of SMEs in villages 	<ul style="list-style-type: none"> • Village-level survey was not implemented. This can be sourced from the project monitoring and evaluation (M&E) system of the implementing organization, Development Alternatives Inc. (DAI). • Based on the household survey, only 3% of households in Bandundu and Bas-Congo and 10% of households in Kinshasa are engaged in agricultural trading or any off-farm SME.
Component three: Increased capacity to respond to market opportunity		
1. Develop business skills of producer organizations and SMEs	<ul style="list-style-type: none"> • Number of trainees in business skills of SME managers and farmers • Number of trainings on business skills given to farmers 	<ul style="list-style-type: none"> • SME-level survey was not implemented. This can be sourced from the project M&E system of the implementing organization, DAI. • SME-level survey was not implemented. This can be sourced from the project M&E system of the implementing organization, DAI. • Based on the household survey, only 3% of households in Bandundu and Bas-Congo and 10% of households in Kinshasa are engaged in agricultural trading or any off-farm SME. Almost none of them received training.
2. Strengthen nongovernmental organizations (NGOs) for sustainable delivery of extension services	<ul style="list-style-type: none"> • Access to agricultural extension services provided by NGOs (%) • Type of agricultural extension services provided by traditional and NGO providers (% of farmers receiving) 	<p>Some positive impact of FPPM project. A total of 35% to 50% of FPPM beneficiaries while only 15% to 30% of control group reported access to extension services in the three provinces in 2013. Positive change from 2010 to 2013 is observed among FPPM beneficiaries, while a decrease in extension services access is reported among control group. These changes are statistically different between FPPM beneficiaries and control group in the three provinces.</p> <ul style="list-style-type: none"> • No change, except some improvements in the delivery of extension advice on improved seeds and general crop production management that are likely due to the FPPM project, but there is no impact on the provision of advice on other topics, especially on marketing and sources of credit, two topics that the project explicitly aims to improve.

Table 2.1 Continued

Outcome	Indicator and units	Progress in 2013
Component three: Increased capacity to respond to market opportunity (Continued)		
3. Develop value chain leadership skills within business associations	<ul style="list-style-type: none"> Number of farmers trained in value chain leadership skills 	<ul style="list-style-type: none"> SME-level survey was not implemented. This can be sourced from the project M&E system of the implementing organization, DAI. Based on the household survey, only 3% of households in Bandundu and Bas-Congo and 10% of households in Kinshasa are engaged in agricultural trading or any off-farm SME. Almost none of them received training.
4. Match value chain participants to formal financial services	<ul style="list-style-type: none"> % farmers with access to formal financial services along the value chain 	<ul style="list-style-type: none"> No impact. Low access to credit remains (only 10% to 16% of households in Bandundu, 10% to 11% of households in Bas-Congo, and 1% to 6% of households in Kinshasa borrowed funds in 2013). There is almost no borrowing from formal financial services and no increase in 2013.
5. Promote expansion of village savings and loan groups	<ul style="list-style-type: none"> Access to savings and credit cooperatives (SACCOS) (%) 	<ul style="list-style-type: none"> No impact. Low access to credit remains (only 10% to 16% of households in Bandundu, 10% to 11% of households in Bas-Congo, and 1% to 6% of households in Kinshasa borrowed funds in 2013). There is small borrowing from informal village savings groups, and there is no increase in 2013.
6. Establish market information systems	<ul style="list-style-type: none"> Access to market information (%) 	<ul style="list-style-type: none"> Some positive impact on market information in Bandundu and Kinshasa. No impact in Bas-Congo.

Source: DAI (2011).

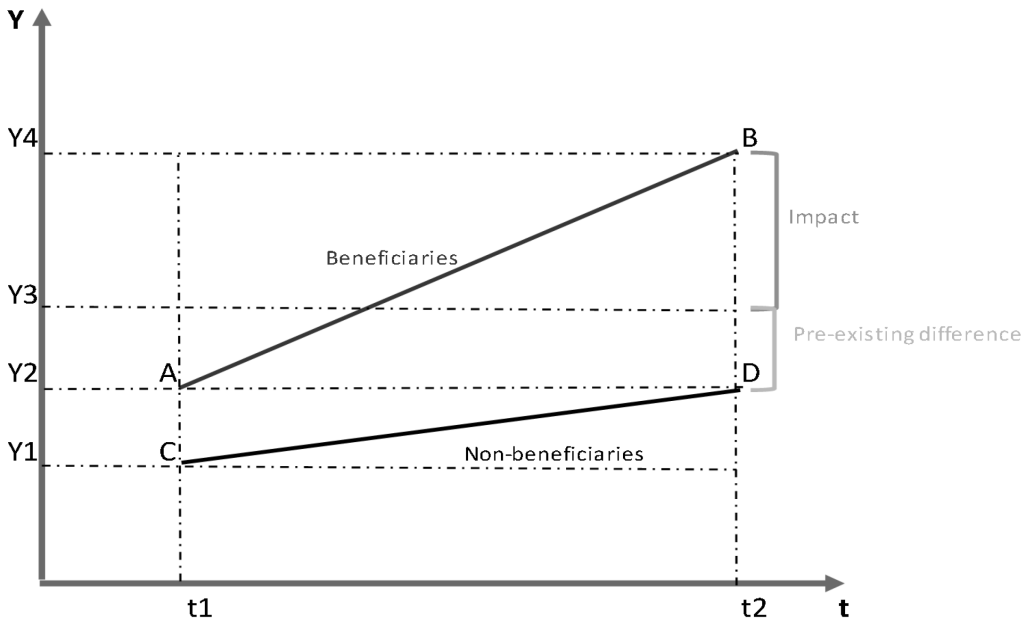
Note: * This topic/question was included in the Bandundu survey only (and not in the Kinshasa or Bas-Congo portions).

The impact evaluation process was not straightforward as many other factors may affect the outcomes that the project plans to change. The main difficulty in the impact evaluation is in ascertaining attribution, or how to measure the observed changes in the indicators that can be attributed solely to the FPPM project. For example, other projects may also be working to reduce poverty, improve market integration, build capacity, and improve food security even in areas with no FPPM intervention. Farmers may also be involved in other activities unrelated to the project that affect the outcomes. Changes in farmer socioeconomic characteristics—such as remittances and new nonfarm activity that is unrelated to the project—may affect the outcome indicators as well.

Difference-in-Differences (or Double Difference)

A critical aspect of the impact evaluation process is defining the counterfactual and collecting data on control, or nonbeneficiary, groups in order to compare situations with and without the project, in addition to before and after the project. This approach nets out the additive and time-invariant factors that affect outcomes. This is better illustrated in Figure 2.2. The change in the indicator from A to B is not the impact of the project but the change in the indicators of the beneficiaries in relation to the change in the same indicators of the nonbeneficiaries. Therefore, the impact is measured as $(B - A) - (D - C)$, where $(D - C)$ nets out the impacts of time-invariant and additive factors that affect outcomes.

Figure 2.2 Illustration of estimating impact via difference-in-differences



Source: Illustration by authors.

Note: Y = any outcome indicator; t = time (year).

The study addresses several challenges in impact assessment. First, project placement bias can be a problem for many government programs or projects such as the FPPM project. For example, communities closer to roads are often the targets of value chain projects as in the case of the FPPM project. Second, self-selection occurs when farmers who participate in the project do so freely and individuals select themselves into a group, causing a biased sample with nonprobability sampling. The most common methods for addressing the placement and self-selection biases are quasi-experimental methods (Smith and Todd 2001). One such approach is the matching method, in which beneficiaries and nonbeneficiaries are selected such that they have comparable observable characteristics that affect project participation and outcomes. The matching method nets out the effect of observable time-invariant drivers of the project outcome. The difference of the outcome between the treatment and control groups—before and after the intervention—is the impact of the intervention (Smith and Todd 2005). Using propensity score matching (PSM), FPPM territories were matched with comparable territories based on per capita expenditure using an available national dataset (National Institute of Statistics’ household surveys, called Enquête 1-2-3, collected in 2005). The treatment villages were randomly selected from the list of beneficiary villages in target territories from the FPPM implementing organization, Development Alternatives Inc. (DAI); and villages in the control group were then randomly selected from the matched territories. Random sampling enables general conclusions for the underlying population that was sampled.

Third, possible spillover of impacts can also be a challenge in impact assessment. Impacts may spill over from treatment villages to nontreatment villages; and not incorporating spillover or selecting control villages that are close to the treatment villages may underestimate the benefits or costs of the project. Some inputs and processes are of a public good nature, and FPPM nonbeneficiaries will likely benefit, therefore reducing the impact of the FPPM project. To address this issue, we selected control territories that are not too close to the treatment territories but are comparable to the treatment territories in terms of average per capita expenditure based on PSM.

In this report, we will not employ the commonly used quasi-experimental matching method, PSM, at the household level, since there is a potential loss of nonmatching observations that would result in an even more serious small-sample-size problem. As described above, however, PSM was used to match treatment and control villages and this will enhance analysis of comparable villages but not necessarily households. Hence our analysis will be restricted to only the descriptive double difference (DD) results, in which changes in treated and control observations are compared, that is, $DD = (B - A) - (D - C)$ (Figure 2.2 above).

Survey Implementation

This midline assessment study of the FPPM project is based on survey data collected from FPPM beneficiaries and nonbeneficiaries in the three target provinces—Bandundu, Bas-Congo, and Kinshasa. Data were collected in the provinces of Kinshasa in August 2013, Bas-Congo in September and October 2013, and Bandundu in February and March 2014 using computer-assisted and mobile-based personal interviewing instruments. Since no baseline data were collected, respondents had to report outcomes for before the FPPM intervention in 2011 and the corresponding outcomes for 2013. Due to the recall nature of the survey, we did not collect baseline data for short-recall outcomes such as daily or weekly expenditures.

Prior to the survey implementation, the IFPRI team in charge of coordinating the survey activities prepared rigorously to ensure the quality of data to be collected. Such preparation included the sampling design, design of the questionnaire, training and selection of enumerators, pretesting, random sampling, and review of survey instruments for the determination of level of risk to human subjects involved. These steps in the preparation of the survey implementation are described below.

Sampling Design

This study uses power calculation to compute for the sample size required to detect difference between treated and control groups for a given minimum effect size⁴ and required level of confidence (Lenth 2001). In computing the sample size we also took into account the loss of observations that do not match. This required the use of secondary data, including major FPPM outcomes reported in Table 2.1. Unfortunately, no agricultural household survey data had been collected to measure key FPPM outcomes in DRC. However, a project implemented in eastern DRC under the Integrated Agricultural Research for Development (IAR4D) process collected baseline data in 2008 and endline data in 2010 (Buruchara et al. 2013). The data may not be representative of the FPPM intervention area in western DRC, but it serves as a good basis in estimating the FPPM project's effect size. Assuming a balanced sample (equal number of control and treatment groups) and nine clusters corresponding to the FPPM project's nine territories (subdistricts) with zero intraclass correlation, Table 2.2 shows a minimum sample size required to detect significant differences between the income change of the treatment and control groups. Assuming a 100 percent match, a sample of 1,023 households from the treatment group and another 1,023 households from the control group is required. However, if we assume a 50 percent loss of observations due to nonmatching observations, attrition, and other factors,⁵ a total of 1,534 households from the treatment villages and another 1,534 households from the control villages (Table 2.2) is required. Other outcomes may require a much larger sample size, but we base our decision on income, an outcome that directly affects the other key outcomes shown in Table 2.1.

⁴ Effect size is the relationship between an intervention variable(s) and its outcome. For example, FPPM interventions and the change in agricultural income.

⁵ For example, Nkonya et al. (2012b) observed a 50 percent loss of observations in an impact assessment.

Table 2.2 Baseline income and its change after IAR4D intervention in eastern DRC for the calculation of sample size of the FPPM midline survey

Treatment	Mean	Standard deviation	Minimum sample size with ^c	
			100% matching and 0% attrition	50% loss of observations
Income change ^b (000 CDF/household)				
Control ^a	50.52	272.01	1,023	1,534
IAR4D	18.06	231.67	1,023	1,534

Source: Buruchara et al. 2013

Note: CDF = Congolese francs. ^a Control group included the clean villages—that is, villages with no form of intervention (see Buruchara et al. 2013). ^b Income change = endline income – baseline income. ^c Assuming power of test of .90 and significance difference of .05.

The list of targeted FPPM territories was obtained from USAID and DAI. The treatment villages were randomly selected from the list of beneficiary villages in the treatment territories; and villages in the control group were then randomly selected from the matched territories. The lists of all villages of the provinces of Bandundu, Bas-Congo, and Kinshasa were obtained from the Ministry of the Interior.⁶

Next, two teams of three enumerators each visited each village on the list of treatment or control villages to obtain or draw a full list of households in each of the sample villages with the help of the village chief. These lists of households were used to draw randomly the sample of households to be interviewed in each sample village. This second stage occurred when all enumerators visited the selected villages for the interviews. The random selection of households was performed through the Stata command “sample *x*, count,” where *x* is the village sample size determined by the team of enumerators based on the village size.

In total, 3,000 households were targeted for the survey in the three provinces. In each of Bandundu and Bas-Congo provinces, 1,260 households in 84 villages were targeted; 480 households in 32 villages were targeted in Kinshasa. Of the 1,260 households in each of Bandundu and Bas-Congo, 630 were expected for the treatment group and 630 for the control group. The corresponding figures for Kinshasa were 240 and 240, respectively.

However, the actual number of households interviewed was slightly different from the targeted one: in total, 3,110 households (110 more households). The actual numbers of surveyed households were different across the three provinces: there were more interviews in Bandundu (1,360 instead of 1,260, or 100 more interviews completed) and Bas-Congo (1,332 instead of 1,260, or 72 more interviews completed) and slightly fewer interviews in Kinshasa (418 instead of 480, or 62 fewer interviews completed). Table 2.3 shows the subdistrict divisions (territories) from which the treatment and control groups were selected. It also shows the actual number of villages and actual number of households interviewed for the survey.

⁶ A commune and a territory are both subdistrict administrative divisions in urban and rural areas, respectively, in DRC.

Table 2.3 FPPM target territories and sample villages and households

Province	Target FPPM territories	Actual number of villages	Actual number of households
Bandundu		89	1,360
Treatment	Bulungu	14	193
	Idiofa	17	277
	Masi-manimba	14	193
Control	Kenge	22	352
	Bagata	22	345
Bas-Congo		88	1,332
Treatment	Mbanza-Ngungu	16	211
	Kasangulu	7	106
	Madimba	7	87
	Lukula	14	192
	Luozi	1	12
Control	Seke-Banza	14	227
	Tshela	14	253
	Boma Mwanda	15	244
Kinshasa		27	418
Treatment	Maluku	17	234
Control	Mont Ngafula	10	184
Total sample		204	3,110

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing.

The slight discrepancy in the actual and target sample size is explained by two factors. First, although a target of 15 households was set per village, some villages were too small to allow a sample size of more than 10. To compensate for this gap, enumerators with large-sized villages were allowed to draw a random sample of 15 households or more, but no more than 20.

Second, some of the originally targeted FPPM villages had a small number of beneficiary households (that is, less than five households) or were not actually beneficiary villages. To resolve this issue, other FPPM villages needed to be selected from the list of FPPM treatment villages to replace the villages with less than five beneficiary households or villages with no beneficiary households at all. The replacement criterion used was the proximity of another beneficiary village (not yet selected) to the village to be replaced. However, the replacement beneficiary village was not necessarily the same size as the one to be replaced; therefore, the number of selected households did not match the one planned. The use of the proximity criterion allowed the replacement of 12 beneficiary villages in Bas-Congo and five in Kinshasa.

Design of the Questionnaire

The questionnaire was constructed based on outcome indicators reported in Table 2.1 and other basic information required to determine household capital endowment and other characteristics that help explain drivers of household-level impact of the FPPM project on key outcomes.

Since the FPPM project was in the third year of its implementation and no appropriate baseline data involving both treatment and control households⁷ had been collected, the questionnaire was adjusted to collect baseline (year 2010–2011) and midline (2012–2013) data. As discussed earlier, however, recall data were only collected for outcomes that respondents could recall. The questionnaire was structured into seven main components, namely, household characteristics; agricultural productivity; livestock productivity; nonfarm activities; agro-processing; marketing; and household expenditures.

Training and Selection of Enumerators and Pretesting

Thirty-five enumerators were needed for the implementation of the midline survey in the provinces of Kinshasa in August 2013 and Bas-Congo in September and October 2013. The same teams of enumerators implemented the survey in Bandundu from February to March 2014. To ensure the quality of data, a combination of criteria was used to select the enumerators. Those criteria included basic knowledge of descriptive statistics and sampling, previous participation in a survey as an enumerator, good knowledge of a computer's keyboard and frequent usage of the computer, good communication skills, holder of a university degree, and others. Using the criteria, the survey coordination team preselected 53 enumerator candidates who participated in a two-week intensive training. Of the 53 candidates, two hold a master's degree, 48 have a bachelor's degree, and three have a diploma (that is, a three-year undergraduate degree). Fourteen of these candidates participated as enumerators in our previous surveys on rural producer organizations, agricultural extension, and multistakeholder platforms in DRC's agricultural sector; two were IFPRI trainees on data entry and cleaning; one was an IFPRI trainee on policy analysis; and the remaining 36 responded to the call for survey enumerators. Twenty-seven of the candidates were civil servants from different government agencies including the Ministries of Agriculture, Rural Development, Scientific Research, Land, Energy, and others; 15 were from nongovernmental organizations; three were teaching assistants from three main universities; and eight were looking for a job.

The candidates were trained for two weeks on a certain number of themes including the FPPM project (that is, its objectives and components), importance of the household surveys to assess the impact of the project, impact assessment approaches and challenges, methods of impact assessment, sampling development and sample size calculation, computer-assisted personal interviewing, tablet-related issues (data management, troubleshooting, structure of interviews), and data-cleaning procedures.

Institutional Review of Survey Instruments

Prior to the launching of this survey, the coordination team submitted a form to the International Review Board (IRB) in IFPRI for a review of the survey instruments to ensure their corresponding activities would not pose more than minimal risks to human subjects involved in the data collection and that all conditions were met to ensure informed consent of each of those subjects for their involvement in these activities. The IRB determined that no more than minimal risks were expected from survey activities and that conditions for informed consent were met. So, the IRB approved the implementation of the survey instruments.

Further, the survey instruments were submitted to the local statistics authority in DRC (the National Statistics Institute, or INS) for review and approval. That institution's review of the instruments led to minor adjustments of the questionnaire and of the survey design. The approval/authorization for the implementation of the survey instruments was granted by INS after taking into account their observations and suggestions on the instruments.

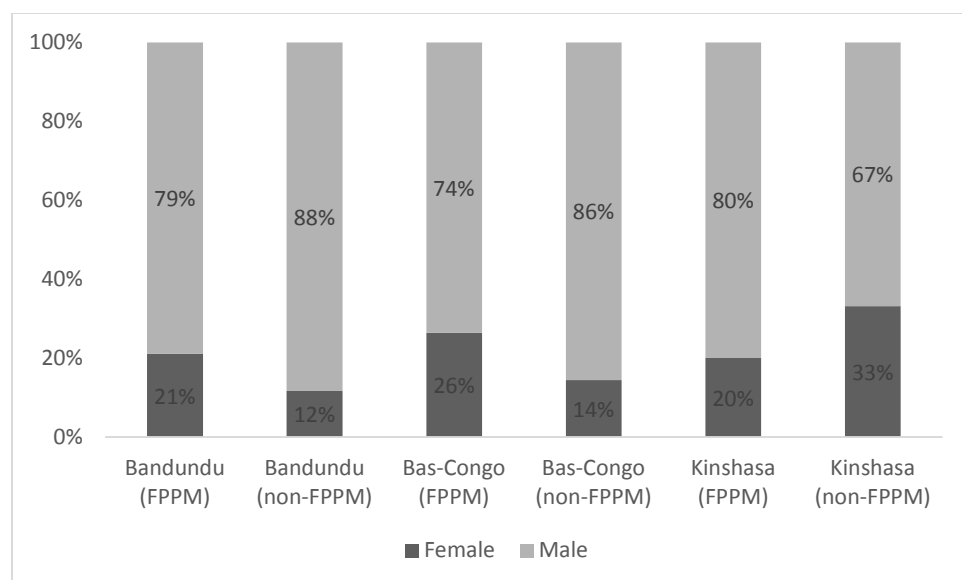
In the next sections, we describe some key characteristics of the sample households and then present the impact of the FPPM project by comparing changes in key outcome indicators between FPPM beneficiaries and nonbeneficiaries.

⁷ DAI conducted a baseline survey 2011, but only the beneficiaries were interviewed and not the control group.

3. CHARACTERISTICS OF SAMPLE HOUSEHOLDS

The majority of the sample households are male headed, with only 19 percent headed by women (Figure 3.1). The average household size is five to six members; it is slightly higher in Kinshasa (six members) than in Bandundu and Bas-Congo (five members). The average age of the sample heads of households is 48. This average is lower in Bandundu (46), and even lower among nonbeneficiaries in Bandundu. Overall, the age of respondents ranges from 20 to 93 years.

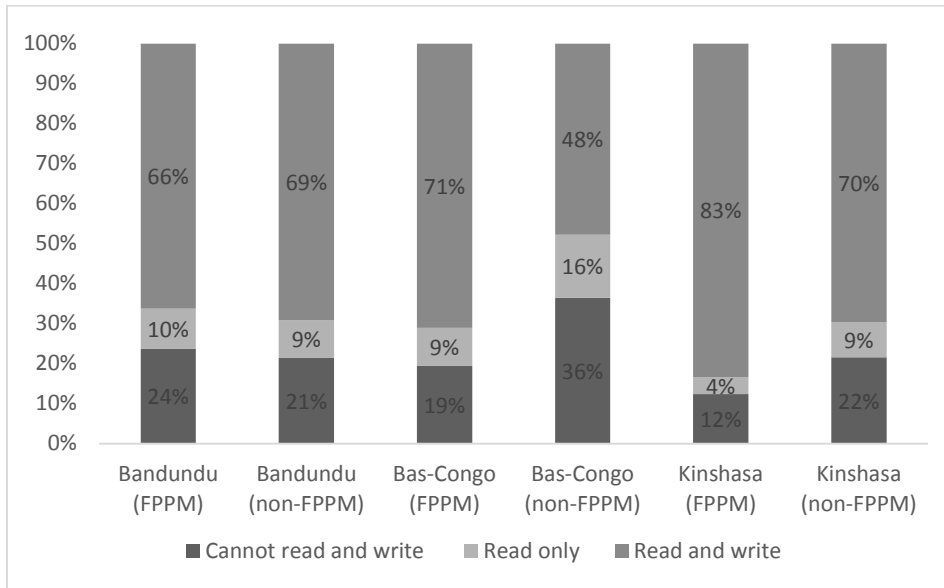
Figure 3.1 Proportion of sample male- and female-headed households



Source: IFPRI/MINAGRI survey (2013-2014).

Whereas the majority of household heads can read and write (65 percent of the sample households), many cannot read and write, with the highest proportion in Bas-Congo (29 percent), followed Bandundu (23 percent), and last Kinshasa (17 percent) (Figure 3.2). Similarly, the proportion of those who cannot read and write is higher among nonbeneficiaries than among FPPM beneficiaries in Bas-Congo and Kinshasa. The highest proportion of those who cannot read and write are non-FPPM beneficiaries in Bas-Congo. About 36 percent of nonbeneficiaries in Bas-Congo cannot read and write.

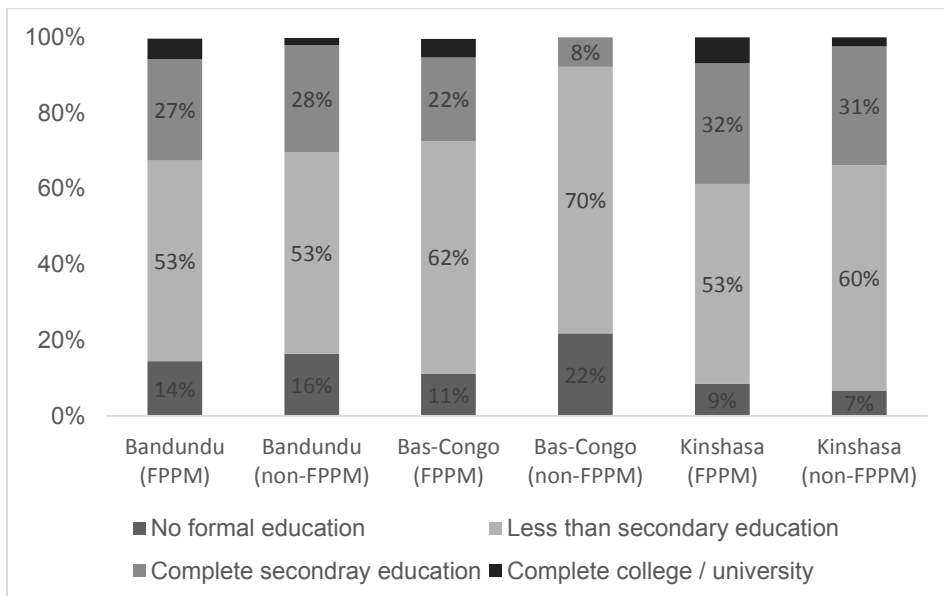
Figure 3.2 Proportion of sample household heads by literacy level



Source: IFPRI/MINAGRI survey (2013-2014).

Fifteen percent of the sample household heads have no formal education; 59 percent have some schooling but did not finish high school; 23 percent have secondary education; and only 3 percent have a college or university degree (Figure 3.3). The proportion of respondents with no formal education is higher in Bas-Congo, followed by Bandundu. The proportion of those with no formal education is higher among nonbeneficiaries than among the FPPM beneficiaries. Non-FPPM beneficiaries in Bas-Congo have the highest proportion of households with no formal education. About 22 percent of nonbeneficiaries in Bas-Congo have no formal education, and another 70 percent have minimal schooling but did not finish secondary education.

Figure 3.3 Proportion of sample household heads by education level



Source: IFPRI/MINAGRI survey (2013-2014).

4. IMPACT ON AGRICULTURAL PRODUCTIVITY

Increasing productivity (measured in terms of yield per hectare of land) is a major performance indicator of the FPPM project. Both cassava and maize yields are low, although there is much variation across households. For cassava, while the average yields are about 2.6 tons⁸ per hectare and 1.6 tons per hectare in the monocropping system and intercropping system, respectively, some farmers experience high yields even greater than 10 tons per hectare. These average figures are very low compared with the national estimate of 7.3 tons per hectare (by FAOSTAT). Despite efforts by the survey team to emphasize to the farmers that yield covers the entire harvest in multiple stages, cassava yield is seemingly significantly underreported. For maize, the average yield is 1.3 tons per hectare in the monocropping system (and 750 kilograms per hectare of maize in the intercropping system). These average figures are comparable to the national estimate of 800 kilograms per hectare (by FAOSTAT).

The majority of fields are intercropped. Of those fields with maize or cassava as the primary crop, three-fourths are intercropped and only a quarter are monocropped. The most common are cassava-maize, cassava-groundnuts, and maize-groundnuts intercropping systems. Given the difficulty of measuring and comparing yields and productivity between mono- and intercropped fields, we use the total value of production per hectare to measure any productivity improvement. In Bandundu, productivity increased from 2010 to 2013 in both the FPPM and the control villages (Table 4.1). The increase in productivity is significantly higher in FPPM villages than in the control villages, and therefore we infer some positive impact of FPPM on productivity of sample farmers in Bandundu. In Bas-Congo and Kinshasa, productivity decreased from 2010 to 2013 for both FPPM and control villages. The decrease in productivity in FPPM villages seems to be smaller than that in the control villages. No significant impact on the change in productivity is observed in these two provinces.

Table 4.1 Total value of crop production per hectare per household (in CDF)

Variable	Bandundu	Bas-Congo	Kinshasa
FPPM villages			
- Average 2010	1,087,856	1,403,821	1,002,238
<i>N</i> (2010)	590	533	184
- Average 2013	1,451,150	1,061,709	987,705
<i>N</i> (2013)	607	531	188
- Change (2010–2013)	363,294**	(342,112)	(14,533)
Control villages			
- Average 2010	1,044,506	1,445,408	570,456
<i>N</i> (2010)	647	665	129
- Average 2013	1,315,037	978,281	377,563
<i>N</i> (2013)	653	661	133
- Change (2010–2013)	270,531**	(467,127)	(192,893)
Difference (DD)	92,763	125,015	178,360

Source: IFPRI/MINAGRI survey (2013-2014).

Notes: FPPM = Food Production, Processing, and Marketing. *N* = number of observations. ** indicates a significant difference between the FPPM and control villages at 5% level. CDF = Congolese franc. DD = double difference.

⁸ Tons in this paper prefer to metric tons.

Productivity-enhancing inputs such as improved seeds, fertilizer, mechanization, and extension services were the target inputs for the success of the FPPM project.

Access to Extension Services

Table 4.2 shows that the FPPM project had a positive impact on access to extension services of 10 percent, 14 percent, and 30 percent in Bandundu, Bas-Congo, and Kinshasa, respectively. Further investigation suggests that the proportion of farmers accessing such services remains relatively low. Although that proportion rose in the treatment group in Bandundu from 44 percent to 49 percent and in Kinshasa from 33 percent to 39 percent, it was however stagnant in Bas-Congo (35 percent). Due to the drop in access to such services in the control group, we observe a positive double difference and therefore positive impact attributable to the FPPM intervention in Bas-Congo. For Kinshasa, there was a slight increase in access to extension services in the FPPM villages but a large drop in access in the control villages—leading to a much larger positive double difference and therefore larger positive impact attributable to the FPPM project. The change is statistically different between the treatment and control groups in the three provinces, confirming the positive impact of the FPPM project observed on increasing extension agents’ contact.

Table 4.2 Proportion of households with contact with extension agents

Variable	Bandundu		Bas-Congo		Kinshasa	
	FPPM	Control	FPPM	Control	FPPM	Control
Sample size	662	644	579	699	224	167
Percentage of households						
Baseline	44	32	35	25	33	20
Midline	49	32	35	20	39	16
Change (2010–2013)	4	0	0	–5	6	–4
Paired student t-tests FPPM vs. Control	**		**		*	
Impact						
- Double difference (% of households)	4		5		10	
- % change due to FPPM	10		14		30	

Source: IFPRI/MINAGRI survey (2013-2014).

Note: * and ** indicate statistical significance at the 10% and 5% levels, respectively. FPPM = Food Production, Processing, and Marketing

No change is observed in the proportion of households accessing different types of extension advice among FPPM beneficiaries, although a slight decrease is apparent among the control group (Table 4.3). After comparing the FPPM beneficiaries and control group, we find statistically significant difference in the change in the proportion of those accessing extension advice between the FPPM and control groups, except on the use of fertilizer and pest and disease management. Results show less impact on the provision of advice on marketing and sources of credit, two areas that the FPPM intervention explicitly aims to improve.

Table 4.3 Type of information provided by extension agents

Type of extension service	% of households						Paired t-test of change (FPPM vs. Control)	DD (% of hh)	% change due to FPPM
	FPPM			Control					
	2010	2013	Change	2010	2013	Change			
Use of fertilizer	38	37	0	31	28	-3		3	9
Use of improved varieties	76	77	1	68	65	-3	**	4	5
Pest and disease management	62	61	-1	54	51	-3		2	4
Soil management	76	77	1	71	68	-3	**	4	5
Weather information	68	69	1	63	59	-4	**	5	7
Marketing advice	60	62	2	49	48	-2	*	3	6
Source of credit	36	39	3	28	27	-1	*	4	11
General crop production advice	79	81	2	75	70	-5	***	7	9
Other	57	57	0	47	41	-5	*	6	10

Source: IFPRI/MINAGRI survey (2013).

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; blank cells in this column indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing; DD = double difference; hh = households.

Adoption of Improved Varieties

Adoption of improved varieties of cassava is quite high, especially for the FPPM treatment group (Table 4.4). In 2013, in Bas-Congo, among FPPM beneficiaries 81 percent of cassava farmers used improved varieties, while 57 percent of nonbeneficiary cassava farmers used improved varieties. In Kinshasa, 73 percent among both beneficiaries and nonbeneficiaries planted improved cassava varieties in 2013. In Bandundu, 65 percent among beneficiaries and 29 percent among nonbeneficiaries grew improved cassava varieties in 2013. Adoption of improved cassava varieties is lowest among nonbeneficiaries in Bandundu. Obama (TME416) and Rav are the most popular cassava varieties, with some variation of relative popularity across provinces.

In 2013 large percentages of farmers opted for improved maize varieties in Bandundu (61–78 percent) and Bas-Congo (61–67 percent), but the share was much lower in Kinshasa (35–41 percent). Kasaï 1 (released in 1990) is the most popular maize variety, followed by Samaru (released in 1988). These older improved varieties are still the popular ones, and although more-recently released varieties exist, they have yet to be promoted and adopted widely.

Strong adoption of groundnuts and rice improved varieties, despite the small sample of households that cultivate rice, is also observed among the FPPM beneficiaries in Bandundu. Unlike cassava and maize, the rate of adoption is rather modest for improved varieties of rice, groundnuts, and beans in both Bas-Congo and Kinshasa.

In Bandundu, we note an increase in the adoption of improved varieties of all focus crops among the FPPM beneficiaries. In Bas-Congo, we see a modest increase in the adoption of improved varieties of cassava and a larger increase for beans, but no change for groundnuts and maize and a decrease in the adoption of improved planting materials of rice among FPPM beneficiaries. In Kinshasa, we observe a slight increase in the adoption of improved varieties in cassava, groundnuts, and beans among the FPPM beneficiaries, but we observe no change for maize. Overall, no statistical difference is apparent in the change in adoption of improved varieties of the focus crops between treatment and control groups, except for maize in Bandundu and beans in Bas-Congo. These results suggest the FPPM project has a weak impact on significantly increasing the adoption of improved varieties.

Table 4.4 Proportion of households adopting improved varieties of major crops

Variable	Cassava			Maize			Rice		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size									
FPPM villages	606	601	233	550	271	140	43	26	2
Control villages	616	702	84	522	338	71		49	1
Percentage of households									
FPPM villages									
- Baseline	60	79	64	72	61	41	67	35	50
- Midline	65	81	73	78	61	41	72	31	50
- Change (2010–2013)	5	2	9	6	0	0	5	-4	0
Control villages									
- Baseline	25	55	73	61	69	41		35	0
- Midline	29	57	73	61	67	35		33	0
- Change (2010–2013)	3	2	0	0	-2	-6		-2	0
Paired student t-tests FPPM vs. Control				***					
Double difference (% of households)	2	0	9	6	2	6		-2	0
% change due to FPPM	3	0	9	9	3	15		-6	0

Variable	Groundnuts			Beans		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size						
FPPM villages	439	264	57	82	99	30
Control villages	515	272	38	133	206	19
Percentage of households						
FPPM villages						
- Baseline	71	58	25	52	24	23
- Midline	73	58	28	54	30	30
- Change (2010–2013)	2	0	4	1	6	7
Control villages						
- Baseline	41	42	21	32	43	11
- Midline	43	42	18	32	41	11
- Change (2010–2013)	2	0	-3	-1	-1	0
Paired student t-tests FPPM vs. Control					***	
Double difference (%) of households)	0	0	6	2	8	7
% change due to FPPM	0	0	24	4	33	30

Source: IFPRI/MINAGRI survey (2013-2014).

Note: *** indicates statistical significance at the 1% level; blank cells in this row indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing.

Seed recycling is a common practice; this can be a problem in cross-pollinating crops such as maize. Only 16 percent of farmers in Bandundu, 15 percent in Bas-Congo, and 13 percent in Kinshasa used certified maize seeds. We observe some positive impact on the users of certified maize seed in Bandundu and Kinshasa but not in Bas-Congo (Table 4.5).

Table 4.5 Proportion of households using certified maize seed (%)

Variable	Bandundu	Bas-Congo	Kinshasa
FPPM villages			
- Average 2010	14.0	16.0	11.3
<i>N</i> (2010)	709	617	238
- Average 2013	15.9	15.4	12.6
<i>N</i> (2013)	709	617	238
- Change (2010–2013)	2	-1	1
Control villages			
- Average 2010	9.6	10.5	4.9
<i>N</i> (2010)	706	727	185
- Average 2013	8.4	8.4	2.2
<i>N</i> (2013)	706	727	185
- Change (2010–2013)	-1	-2	-3
Paired student t-tests			
FPPM vs. Control	***		*
Difference (DD)	3	1	4

Source: IFPRI/MINAGRI survey (2013-2014).

Note: *** and * indicate statistical significance at the 1% and 10% levels, respectively; blank cells in this row indicate lack of statistical significance. *N* = number of observations; DD = double difference; FPPM = Food Production, Processing, and Marketing.

As we discuss later in the market efficiency section, the FPPM intervention had a weak impact on improvement of access to seed markets. That could have led to the FPPM project's weak impact on adoption of new varieties for most of the target crops.

The adoption of new livestock breeds and improved management practices remains limited. Almost no farmer tried a new breed or improved management practices in the last five years (Tables 4.6 and 4.7).

Table 4.6 Proportion of households using new livestock breeds in the past five years (%)

Variable	Bandundu	Bas-Congo	Kinshasa
FPPM villages	1	1	3
<i>N</i>	684	584	242
Control villages	0	0	2
<i>N</i>	678	716	171

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing. *N* = number of observations.

Table 4.7 Proportion of households adopting improved livestock management practice in the past five years (%)

Variable	Bandundu	Bas-Congo	Kinshasa
FPPM villages	1	0	3
<i>N</i>	681	586	238
Control villages	0	0	1
<i>N</i>	669	706	173

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing. *N* = number of observations.

Fertilizer Use

There is minimal use of inorganic fertilizer in western DRC as reflected by the data collected. None of the sample households in Bas-Congo used fertilizer, while only 1 percent of beneficiaries and 6 percent of nonbeneficiaries in Kinshasa and 2 percent of nonbeneficiaries in Bandundu used fertilizer in 2013 (Table 4.8). In Bandundu, we observe a decrease in the proportion of nonbeneficiaries using fertilizer. In Kinshasa, we observe a decrease in the proportion of FPPM beneficiaries using fertilizer and an increase in the proportion of nonbeneficiaries using fertilizer. The net effect of the FPPM project is a decrease in the proportion of households using fertilizer by 1 and 2 percentage points in Bandundu and Kinshasa, respectively. These results suggest the project has had no impact on increasing fertilizer use in the target areas.

Table 4.8 Proportion of households using inorganic fertilizers

Variable	Bandundu			Bas-Congo			Kinshasa		
	FPPM	Control	Impact	FPPM	Control	Impact	FPPM	Control	Impact
Sample size	938	825		0	0		412	220	
Percentage of households									
Baseline	0	1		n.o.	n.o.		2	5	
Midline	0	2		n.o.	n.o.		1	6	
Change (2010–2013)*	0	–1					–1	1	
Double difference (% of household)			–1			n.o.			–2

Source: IFPRI/MINAGRI survey (2013-2014).

Notes: FPPM = Food Production, Processing, and Marketing. n.o. = no observation. * No statistical difference between FPPM and control villages at less than 10% significance level.

Access to Farm Mechanization

There is almost no use of farm mechanization in Bas-Congo. Only 4 percent of FPPM beneficiaries in Bandundu used farm mechanization during land preparation in 2013; in Kinshasa the majority of FPPM beneficiaries (70 percent) and about 10 percent of nonbeneficiaries used mechanization during this stage of planting activity (Table 4.9). We note a slight increase in the proportion of households using farm mechanization (2 percent of households) among the FPPM beneficiaries in Bandundu, and we see a similar increase in both the treatment and control groups in Kinshasa; therefore no percentage change is attributed to the FPPM project. Almost no farmers used mechanization during planting and weeding in either the beneficiary or nonbeneficiary groups in the three provinces. These results suggest the project had no impact on access to farm mechanization after two to three years of implementation.

Table 4.9 Proportion of households with access to mechanization

Variable	Land preparation			Planting			Weeding		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size									
FPPM villages	573	615	224	573	615	224	573	615	224
Control villages	627	725	99	627	725	99	627	725	99
Percentage of households									
FPPM villages									
- Baseline	2	1	68	0	0	1	0	0	1
- Midline	4	1	70	0	0	2	0	0	1
- Change (2010–2013)*	2	0	2	0	0	1	0	0	0
Control villages									
- Baseline	0	0	8	0	0	0	0	0	0
- Midline	0	0	10	0	0	0	0	0	0
- Change (2010–2013)*	0	0	2	0	0	0	0	0	0
Double difference (% of households)	1	0	0	0	0	1	0	0	0
% change due to FPPM	62	2	0			34			0

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing.* indicates no statistical difference between FPPM and control villages at less than 10% significance level.

5. IMPACT ON MARKET EFFICIENCY

This section describes changes in the indicators of agricultural processing, access to market, collective marketing, and participation of small- and medium-scale agribusiness enterprises.

Opportunities for Agricultural Processing

The majority of farmers reported that they were involved in processing their own harvests, except for control villages in Kinshasa (Table 5.1). Disaggregating by crop, 76 percent of households reported processing their cassava harvest (highest in Kinshasa at 88 percent and lowest in Bandundu at 75 percent). Most cassava is processed as dried *cossettes*, while some is processed as flour, or *chikwangue*. There are three types of drying: (1) sun drying (most common); (2) use of fire (smoking); and (3) a method traders called *kamwanga* (involving soaking in water, air drying, and using the hand to powderize the cassava). Cassava processed using the last method is the most expensive as the cassava flour is more dense. Sun drying is preferred over smoking since the former can produce whiter *cossettes* and cassava flour. For maize, 67 percent of households reported processing their maize harvest (highest in Kinshasa at 89 percent of households and lowest in Bandundu at 66 percent). Most maize is processed as dried grain, while some is processed as flour.

The FPPM project seems to have had a weak impact on the incidence of agricultural processing among households and on the type and method of processing. On-farm agricultural processing decreased by 7 percentage points in Bas-Congo FPPM villages but increased only slightly in Bandundu and Kinshasa FPPM villages (Table 5.1). While agricultural processing stagnated among control villages in Bandundu, it decreased among control villages in the other two provinces—leading to a positive but statistically insignificant difference in Bas-Congo and a statistically and positively significant difference in Bandundu and Kinshasa. The decrease in processing could be attributed to an increase of imported staple crops (rice and maize) during the food crisis. Of those who reported processing, the most common method is still traditional (no or minimal machinery), and only 6 percent of households in Bandundu reported using modern methods (the use of several improved machinery and improved manufacturing practices).

Table 5.1 Households that process agricultural products

Variable	Bandundu	Bas-Congo	Kinshasa
Sample size: FPPM villages	594	592	224
Control villages	633	716	164
Percent of households processing agricultural products on-farm			
FPPM villages			
- Baseline	64	52	62
- Midline	66	45	63
- Change (2010–2013)	2	-7	1
Control villages			
- Baseline	85	58	17
- Midline	85	49	12
- Change (2010–2013)	0	-9	-5
Paired student t-tests			
FPPM vs. Control	*		**
Double difference (in % of households)	2	2	6

Source: IFPRI/MINAGRI survey (2013–2014).

Note: ** and * indicate statistical significance at the 5% and 10% levels, respectively; blank cell in this row indicates lack of statistical significance.

Improvement in Farm-to-Aggregation-Center Transport Link

The FPPM intervention aims to reduce the distance to the nearest source of inputs and to the market by improving and establishing aggregation centers and encouraging and training more agro-traders and SMEs. Our survey results show a reduction in the reported average distance traveled by the sample farmers to the nearest source of inputs and markets for both beneficiaries and nonbeneficiaries for all crops and in the three provinces (Table 5.2). For example, in 2010 an FPPM beneficiary farmer had to travel 5 kilometers to the nearest source of maize planting materials, which was reduced to only 2.4 kilometers in 2013. This may have resulted from more seed multipliers and distributors in the survey areas. Similarly, control villages were also experiencing a reduction in distance traveled; for example, a farmer in a control village had to travel 5.4 kilometers in 2010 and only 2.6 kilometers in 2013. Because the changes happened in both FPPM beneficiary villages and control villages, they may not all be attributable as an impact of the FPPM project. Only the changes with respect to maize among FPPM beneficiaries in Bas-Congo and cassava among FPPM beneficiaries in Bandundu are statistically different from the control group.

The vegetative propagation nature of cassava poses a big challenge for production and marketing of planting materials. Such a challenge could have hampered FPPM efforts to promote cassava seed marketing using the traditional agricultural traders, who may not have experience and facilities to market cassava planting materials. Experience in other countries has shown successful production and marketing of cassava planting material using women groups, schools, and other institutions. Such methods need to be taken seriously given that cassava accounts for about a quarter of cropland area in DRC (Figure 1.2). Marketing strategies for maize, groundnuts, and other food crops could be a challenge as well given the weak breeding programs and seed multiplication in SSA.

Table 5.2 Average distance (in kilometers) to nearest input source

Variable	Maize			Cassava			Groundnuts		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size									
- FPPM	512	236	111	614	582	213	396	227	23
- Control	469	300	39	592	662	60	465	238	45
Average distance (in km)									
FPPM villages									
- Average 2010	5.0	20.8	30.6	4.1	3.9	5	3.2	5.9	25.3
- Average 2013	2.4	14.1	14.8	2.6	2.9	4.5	2.2	4	8.1
- Change (2010–2013)	-2.6	-6.7	-15.7	-1.5	-1.0	-0.5	-1.0	-1.9	-17.2
Control villages									
- Average 2010	5.4	6.1	13.1	2.1	2.0	8.2	2.6	8.6	38
- Average 2013	2.6	4.2	9.3	1.4	1.1	5.1	1.5	4.8	13.4
- Change (2010–2013)	-2.7	-1.9	-3.8	-0.7	-0.9	-3.1	-1.1	-3.8	-24.6
Paired student t-tests FPPM vs. Control		***		**					
Difference (DD)	0.1	-4.8	-12	-0.8	0.0	2.6	0.1	1.9	7.4
% change due to FPPM	2.2	-23.1	-39.1	-19.2	-1.2	51.9	1.8	32.5	29.3

Table 5.2 Continued

Variable	Rice ^a		Beans		
	Bandundu	Bas-Congo	Bandundu	Bas-Congo	Kinshasa
Sample size					
- FPPM	50	23	63	76	20
- Control	2	42	108	185	4
Average distance (in km)					
FPPM villages					
- Average 2010	6.0	4.8	8.6	8.9	52.1
- Average 2013	4.1	1.8	1.3	7.2	20.9
- Change (2010–2013)	-1.9	-3	-7.3	-1.7	-31.2
Control villages					
- Average 2010	12.5	1.9	5.5	12.5	0.0
- Average 2013	2.0	2.6	1.1	10	0.0
- Change (2010–2013)	-10.5	0.7	-4.4	-2.5	0.0
Paired student t-tests FPPM vs. Control					
Difference (DD)	29.0	-3.7	-2.9	0.8	-31.2
% change due to FPPM	144.0	-76.4	-33.3	8.7	-59.9

Source: IFPRI/MINAGRI survey (2013-2014).

Notes: *** and ** indicate statistical significance at the 1% and 5% levels, respectively; blank cells in this row indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing. DD = double difference. ^a Very few farmers reported growing rice in Kinshasa; hence results not reported.

Access to Marketing Rural Services

The three most commonly reported marketing constraints in the three provinces are transport to market (both availability and costs), low market prices for farmers' produce, and difficulty for farmers to negotiate and set prices (Table 5.3). Transport seems to be the most cited constraint in Bandundu, while low market prices is the most cited in Bas-Congo and Kinshasa. Other important constraints cited are unavailability or limitations of markets and difficulty of storage. Concerns over difficulty in processing and lack of market information were cited by 11 to 16 percent of farmers. Farmers not being organized to market collectively and poor quality of produce are concerns raised by about 14 percent of farmers in Kinshasa and 5 to 13 percent of farmers in Bandundu and Bas-Congo.

Table 5.3 Proportion of households and their marketing constraints (%)

Variable	Bandundu	Bas-Congo	Kinshasa
	N = 1,328	N = 1,342	N = 418
Transport to the market	54.1	38.8	33.0
Low market prices	47.5	44.3	44.0
Difficulties in setting prices	37.7	39.2	27.0
Unavailability or limitations of markets	30.2	18.2	15.8
Difficulties of storage	16.6	21.8	17.9
Difficulties in processing	14.1	15.5	11.2
Lack of market information	11.4	13.9	11.5
Farmers are not organized to market collectively	9.3	12.7	14.1
Government policy	9.0	6.1	2.2
Low quality of produce	4.7	5.7	14.6
Other	9.6	13.9	10.0

Source: IFPRI/MINAGRI survey (2013-2014).

Notes: The columns do not add up to 100% because of multiple responses from respondents. N = number of observations.

To help address these concerns, the project intended to upgrade aggregation center infrastructure, test sorting technologies, test new appropriate technologies for farm-to-aggregation-center transport, and improve transport services by piloting some long-distance transport schemes.

Since availability and cost of transport is cited as the most important constraint in marketing, we explore this in detail and compare some indicators across the three provinces and their changes from 2010 to 2013. We use several indicators including distance to nearest input source and to nearest market, travel time by motor vehicle to nearest all-weather road, time taken to wait for motor vehicle and motorcycle transport to market, fare to nearest urban area, and cost of hiring trucks or motorbikes.

In 2013, on average, households are located 31 kilometers from the nearest market in Bandundu, although that distance is shorter in Bas-Congo (14 kilometers) and in Kinshasa (25 kilometers). The main means of transport used in Bandundu are walking and motorcycle. The main means of transport in Bas-Congo is walking, followed by motorcycle and car. In Kinshasa, the main means are car and motorcycle, followed by walking. Travel time via motorcycle to the nearest all-weather road from household's house is 101 minutes on average in Bandundu, 73 minutes in Bas-Congo, and 54 minutes in Kinshasa. The average fare via motor vehicle from household's location to nearest urban area (market) is 5,060 CDF (5.10 USD) in Bandundu, 3,047 CDF (3.10 USD) in Bas-Congo, and 2,268 CDF (2.30 USD) in Kinshasa. To hire a motorbike to go to nearest market, it would cost 9,070 CDF (9.30 USD) in Bandundu, 6,616 CDF (6.90 USD) in Bas-Congo, and 6,953 CDF (7.10 USD) in Kinshasa. To hire a pickup truck to go to nearest market, it would cost 49,800 CDF (52 USD) in Bandundu, 38,300 CDF (40 USD) in Bas-Congo, and 74,100 CDF (75 USD) in Kinshasa. These results show that compared with the other provinces, Bandundu households are of greater distance from nearest markets and therefore experience less accessibility to these market and face higher transport costs. The exception is for the hiring of pickup trucks, which seems to be the most expensive in Kinshasa.

In terms of change from 2010 to 2013, none of these indicators shows significant change (Tables 5.4 to 5.6). In fact, the cost of hiring trucks and motorbikes and fares to the nearest urban area increased. This was expected given the short time used in assessing the impact of the FPPM project. The cost of hiring a motorbike or truck is also strongly related to the distance to nearest market and therefore it is not surprising that both have comparable results. We observe a small decrease in distance to market, travel time, and wait time among FPPM beneficiaries and no significant impact when compared with control groups. Fares and costs of hiring increase in FPPM villages but we see no impact when compared with control groups. The number of traders did not increase.

Table 5.4 Several indicators of impact on market efficiency, Bandundu

Province/ Indicators	FPPM			Control			DD
	2010	2013	Change	2010	2013	Change	
<u>Bandundu</u>							
Distance to nearest market (km)	22.3	22.3	0.0	39.8	39.7	-0.2	0.1
Time taken to wait for motor vehicle transport to market (minutes)	279	275	-5	591	597	5	-10
Time taken to wait for motorcycle transport to market (minutes)	75	68	-8	99	84	-14	7
Fare to nearest market in urban area by motor vehicle (CDF)	3,165	3,485	320	3,783	4,072	290	30
Travel time by motor vehicle to all-weather road (minutes)	55	55	0	78	76	-1	1

Table 5.4 Continued

Province/ Indicators	FPPM			Control			DD
	2010	2013	Change	2010	2013	Change	
Distance to nearest all-weather road (km)	17.7	17.4	-0.3	20.4	20.3	-0.1	-0.2
Cost of hiring one pickup truck (CDF) (from farm to the nearest market)	47,233	47,330	98	54,684	53,631	-1,053	1,151
Cost of hiring one motorbike (CDF) (from farm to the nearest market)	7,059	7,337	277	10,357	11,042	685	-408
No. of traders who buy your products during past 12 months	8.4	8.1	-0.3	7.6	7.6	0.0	-0.3
No. of traders from whom you buy production inputs in 2010	2.3	2.3	0.0	2.0	1.9	-0.1	* 0.1

Source: IFPRI/MINAGRI survey (2013-2014).

Note: * indicates statistical significance at the 10 % level; blank cells in this row indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing. DD = double difference. CDF = Congolese francs.

Table 5.5 Several indicators of impact on market efficiency, Bas-Congo

Province/ Indicators	FPPM			Control			DD
	2010	2013	Change	2010	2013	Change	
<u>Bas-Congo</u>							
Distance to nearest market (km)	9.6	9.5	-0.1	16.7	16.4	-0.3	0.2
Time taken to wait for motor vehicle transport to market (minutes)	105	87	-18	734	735	2	-20
Time taken to wait for motorcycle transport to market (minutes)	40	37	-3	93	82	-11	8
Fare to nearest market in urban area by motor vehicle (CDF)	1,740	1,932	192	2,284	2,503	219	-27
Travel time by motor vehicle to all-weather road (minutes)	41	39	-2	72	71	-1	-1
Distance to nearest all-weather road (km)	12.8	12.4	-0.5	12.2	12.0	-0.2	-0.3
Cost of hiring one pickup truck (CDF) (from farm to the nearest market)	15,884	16,030	146	14,955	13,256	-1,700	1,845
Cost of hiring one motorbike (CDF) (from farm to the nearest market)	2,720	3,884	1,164	3,038	3,668	630	534
No. of traders who buy your products during past 12 months	8.2	7.5	-0.8	8.1	8.1	0.1	-0.8
No. of traders from whom you buy production inputs in 2010	2.1	2.1	0.0	1.7	1.7	0.1	** -0.1

Source: IFPRI/MINAGRI survey (2013-2014).

Note: ** indicates statistical significance at the 5% level; blank cells in this row indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing. DD = double difference; CDF = Congolese francs.

Table 5.6 Several indicators of impact on market efficiency, Kinshasa

Province/ Indicators	FPPM			Control			DD
	2010	2013	Change	2010	2013	Change	
<u>Kinshasa</u>							
Distance to nearest market (km)	38.1	37.6	-0.5	8.5	8.4	-0.2	-0.4
Time taken to wait for motor vehicle transport to market (minutes)	316	317	1	130	105	-24	26
Time taken to wait for motorcycle transport to market (minutes)	132	150	18	92	91	-1	19
Fare to nearest market in urban area by motor vehicle (CDF)	2,744	3,177	433	628	647	19	*** 414
Travel time by motor vehicle to all-weather road (minutes)	65	61	-3	25	28	3	* -6
Distance to nearest all-weather road (km)	23.9	22.8	-1.1	6.7	6.5	-0.3	-0.8
Cost of hiring one pickup truck (CDF) (from farm to the nearest market)	49,740	53,191	3,451	17,604	13,538	-4,066	7,517
Cost of hiring one motorbike (CDF) (from farm to the nearest market)	5,571	6,291	720	2,879	2,908	28	692
No. of traders who buy your products during past 12 months	9.8	8.5	-1.3	9.3	8.9	-0.4	-0.9
No. of traders from whom you buy production inputs in 2010	1.9	2.0	0.1	2.0	1.5	-0.5	0.5

Source: IFPRI/MINAGRI survey (2013-2014).

Note: *** indicates statistical significance at the 1% level, * at 10% level; blank cells in this row indicate lack of statistical significance. FPPM = Food Production, Processing, and Marketing. DD = double difference; CDF = Congolese francs.

Collective Marketing

Very few farmers reported conducting collective marketing (Table 5.7). Only 10 percent of the 680 farmer beneficiaries in Bandundu, 4 percent of the 583 farmer beneficiaries in Bas-Congo, and 6 percent of the 220 farmer beneficiaries in Kinshasa said they conducted collective marketing, an activity that has been shown to reduce transaction costs in the Lake Kivu area (Nkonya et al. 2012a).

Table 5.7 Farmers conducting collective marketing in 2013 (% of households)

Variable	Bandundu	Bas-Congo	Kinshasa
Sample size			
FPPM villages	680	583	220
Control villages	675	709	166
FPPM villages			
Percent (2013)	10	4	6
Control villages			
Percent (2013)	3	1	6

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing.

Participation in SME Activities

Participation in SME activities was also limited as only 3 to 4 percent of farmers from the FPPM and control villages in Bandundu and Bas-Congo participated (Table 5.8). As expected, participation in the FPPM villages in Kinshasa was much higher, probably due to more business opportunities in the area. However, participation in SME activities in the Kinshasa control villages was only 2 percent. Of those with SME participation, very few reported having access to training (10 percent in Bas-Congo and 31 percent in Kinshasa). The difference cannot be associated with the FPPM project, since we did not collect baseline information (2010). This result underscores the need to enhance SME participation in order to build farmers' business skills.

Table 5.8 Proportion of households that participated in SME activities in 2013 (%)

Variable	Bandundu	Bas-Congo	Kinshasa
Sample size:			
FPPM villages	679	597	228
Control villages	673	730	169
Percent of households			
FPPM villages			
Percent (2013)	3	3	10
Control villages			
Percent (2013)	4	3	2

Source: IFPRI/MINAGRI survey (2013-2014).

Note: FPPM = Food Production, Processing, and Marketing.

6. IMPACT ON CAPACITY TO RESPOND TO MARKET OPPORTUNITIES

Empirical evidence has shown that developing smallholder farmer organizations, reducing transaction costs, and enhancing farmers' access to improved technologies and productive assets are key drivers of farmers' participation in markets and their escape from subsistence-farming poverty traps (Barrett 2008; Hellin, Lundy, and Meijer 2009). In the short and medium term, such factors are more important than macroeconomic policies and trade policies (Barrett 2008; Hellin, Lundy, and Meijer 2009). In this section, we explore farmers' access to credit and market information—factors that have been shown to enhance farmer market participation and response to market signals (Hellin, Lundy, and Meijer 2009; Mather, Boughton, and Jayne 2013).

Access to Credit

Only a small proportion of sample farmers reported that they borrowed money from any source in either 2011 or 2013. In Bandundu and Bas-Congo, 10 percent of the sample beneficiaries borrowed funds in 2013. A slightly higher proportion of the nonbeneficiaries (16 percent) in Bandundu had access to a source of credit (Table 6.1). These figures are lower in Kinshasa, where only 6 percent of sample beneficiaries and 1 percent of nonbeneficiaries borrowed funds in 2013.

Table 6.1 Proportion of households having access to any source of credit (%)

Variable	Bandundu	Bas-Congo	Kinshasa
Sample size			
FPPM villages	739	616	234
Control villages	717	726	184
FPPM villages			
- Percent in 2010	9	10	4
- Percent in 2013	10	10	6
- Change (2010–2013)*	0.4	0	2
Control villages			
- Percent in 2010	12	9	2
- Percent in 2013	16	11	1
- Change (2010–2013)*	4.2	2	-1
Double difference (in % of households)	-4	-2	3

Source: IFPRI/MINAGRI survey (2013-2014).

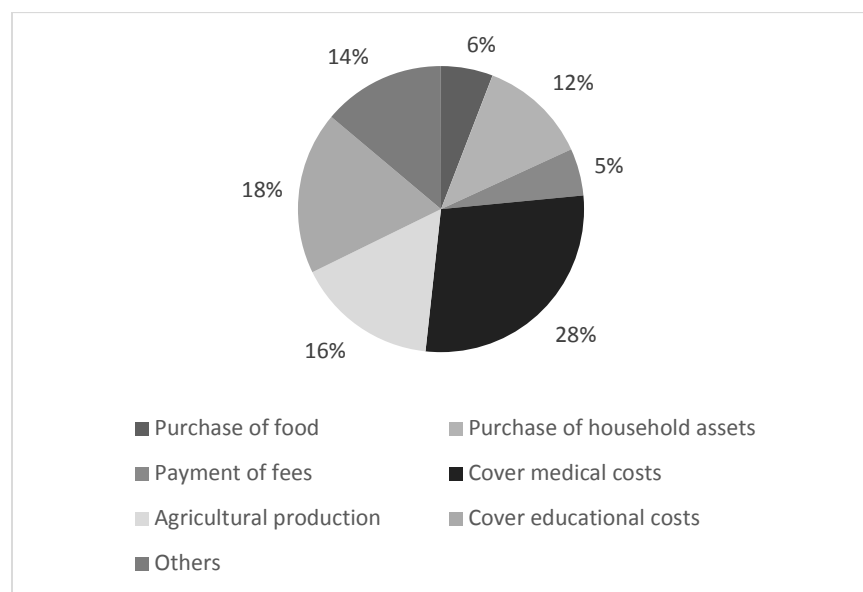
Note: * indicates no statistical difference at less than 10% level of significance. FPPM = Food Production, Processing, and Marketing.

We see a moderate positive impact in terms of percentage of farmers accessing credit in Kinshasa and what seems to be a negative impact in Bandundu and Bas-Congo (Table 6.1). In Kinshasa, we observe a small increase in the proportion of beneficiary households borrowing funds—from 4 percent in 2010 to 6 percent of in 2013. At the same time, there was a slight decrease in the proportion of nonbeneficiaries borrowing funds in Kinshasa—from 2 percent in 2010 to 1 percent in 2013. The FPPM project can be credited for 3 percent of the increase in borrowing in Kinshasa.

Next, we examine for what purposes households used credit in 2010 and 2013. Of those that borrowed money in the three provinces, only 16 percent borrowed for agricultural production/marketing purposes, 28 percent borrowed to cover medical costs, and another 18 percent borrowed to pay for education (Figure 6.1). As a proportion of all sample households, this means that only 1 percent of sample

households were borrowing funds for agricultural production purposes in Bandundu; this figure is about 2 to 4 percent in Bas-Congo and zero in Kinshasa (Table 6.2). This is consistent with past studies (for example, Nkonya et al. 2008), which have shown that borrowers are more likely to invest borrowed money into nonfarm activities that have higher returns than agriculture. If we consider only those who borrowed funds for agricultural production purposes, the project seems to have had no impact in promoting access to credit for agricultural production in the three provinces.

Figure 6.1 Purposes of borrowing funds



Source: IFPRI/MINAGRI survey (2013-2014).

Table 6.2 Proportion of households borrowing funds for agricultural production

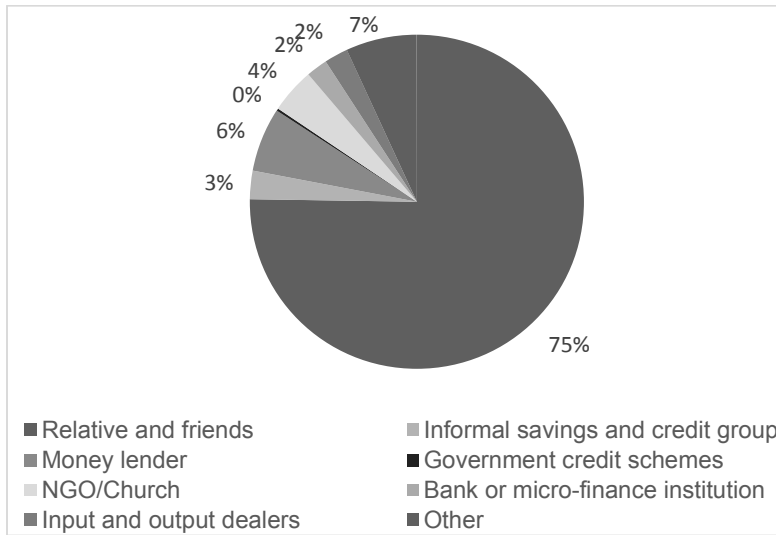
Variable	Bandundu	Bas-Congo	Kinshasa
Sample size			
FPPM villages	739	616	234
Control villages	717	726	184
FPPM villages			
- Number (%) 2010	10 (1%)	23 (4%)	4 (2%)
- Number (%) 2013	4 (1%)	9 (2%)	3 (1%)
- Change (2010–2013)	-1	-2	0
Control villages			
- Number (%) 2010	8 (1%)	16 (2%)	2 (0%)
- Number (%) 2013	5 (1%)	15 (2%)	0 (0%)
- Change (2010–2013)	0	0	-1
Double difference (in % of households)	0	-2	1

Source: IFPRI/MINAGRI survey (2013-2014).

Note: Blank cell in this row indicates lack of statistical significance. FPPM = Food Production, Processing, and Marketing.

Of those borrowing funds, a large majority (75 percent) sourced their credit from relatives and friends (Figure 6.2). Two percent received their credit from input and output dealers and traders; only 2 percent sourced their credit from formal lending institutions. These credit source patterns are similar for the three provinces, as well as for beneficiaries and nonbeneficiaries. Only one sample beneficiary and three nonbeneficiaries borrowed from formal lending and microfinance institutions for agricultural production in 2010 and 2013; and none borrowed from that source in Kinshasa. There is weak impact of the FPPM project in promoting access to formal financial service providers as one of its outcome indicators.

Figure 6.2 Sources of borrowed funds



Source: IFPRI/MINAGRI survey (2013-2014).

The amount of credit was small, 45 USD to 500 USD in Bandundu, 58 USD to 500 USD in Bas-Congo, and 118 USD to 250 USD in Kinshasa during 2013 (Table 6.3). The amount borrowed for agricultural production was much higher, averaging 71 USD in Bandundu, 83 USD in Bas-Congo, and 122 USD in Kinshasa. The average amount of borrowing decreased from 2010 to 2013 in Bandundu and Bas-Congo but increased in Kinshasa. The average amount borrowed among beneficiaries and nonbeneficiaries decreased between the two periods, but the decline was more substantial for FPPM beneficiaries. These results seem to suggest a limited ability of the FPPM project to promote access to and use of credit for agricultural production.

Table 6.3 Amount of credit borrowed, 2010 and 2013

Province		N	USD					
			Mean	Std. Dev.	Min	Max		
All borrowing								
Bandundu	2010	156	58	78	0	450		
	2013	186	45	63	1	500		
Bas-Congo	2010	127	74	101	2	500		
	2013	140	58	69	3	500		
Kinshasa	2010	11	102	123	20	415		
	2013	14	118	90	10	250		
For agricultural production only								
Bandundu	2010	18	145	137	10	450		
	2013	15	71	60	5	200		
Bas-Congo	2010	39	127	145	2.4	500		
	2013	33	83	74	5	300		
Kinshasa	2010	5	78	97	20	250		
	2013	7	122	95	30	250		
For agricultural production only								
Bandundu	FPPM villages		2010	10	191	162	10	450
	Control villages		2013	9	71	73	5	200
	FPPM villages		2010	8	88	73	20	250
	Control villages		2013	6	70	36	20	105
Double difference (in USD)			-102					
Double difference (in percent)								
For agricultural production only								
Bas-Congo	FPPM villages		2010	23	157	168	2	500
	Control villages		2013	8	100	81	5	250
	FPPM villages		2010	16	84	92	12	400
	Control villages		2013	25	78	72	10	300
Double difference (in USD)			-51					
Double difference (in percent)								
Kinshasa	FPPM villages		2010	3	103	127	20	250
	Control villages		2013	6	134	99	30	250
	FPPM villages		2010	2	40	14	30	50
	Control villages		2013	0	n.o.	n.o.	0	0

Source: IFPRI/MINAGRI survey (2013-2014).

Note: N = number of observations; n.o. = no observation.

Access to Market Information

The majority of sample households report having access to information on market prices. Eighty-three percent of beneficiaries in Bandundu, 66 percent of beneficiaries in Bas-Congo, and 87 percent of beneficiaries in Kinshasa reported having access to information on market prices (Table 6.4a and b). A slightly lower proportion of nonbeneficiaries in the three provinces had access to market price information. We also asked about different types of market information, such as what and when commodities are being demanded, what is supplied in different markets, and what services are available and where to get them, but the same pattern exists.

There is a positive impact in terms of percentage of farmers accessing price information in Bandundu and Kinshasa, although the change in Kinshasa is not significant. We observe a negative impact in Bas-Congo (Table 6.4a and b). In Bandundu, the proportion of beneficiary households accessing market information increased from 77 percent in 2010 to 83 percent in 2013. In Kinshasa, the increase was smaller, from 84 percent in 2010 to 87 percent of sample beneficiary households in 2013; and the proportion of nonbeneficiaries accessing market information decreased slightly from 64 percent in 2010 to 61 percent in 2013.

No FPPM household in Bas-Congo reported experiencing a change in access to commodity market demand and supply information (Table 6.4a and 6.4b). Overall, the FPPM intervention did facilitate increased access to market information in Bandundu but had no significant effect in Kinshasa and Bas-Congo.

Table 6.4a Proportion of households having access to information on commodity prices and demand in different markets (% of total households)

Year	Price information (%)			Market demand (%)		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size:						
FPPM	669	579	221	635	551	208
Control villages	619	700	163	615	659	151
FPPM villages						
- Average 2010	77	66	84	62	58	76
- Average 2013	83	66	87	65	57	76
- Change (2010–2013)	7	0	3	3	0	0
Control villages						
- Average 2010	83	57	64	66	49	65
- Average 2013	82	60	61	67	49	58
- Change (2010–2013)	-1	3	-3	2	1	-7
Paired student t-tests FPPM vs. Control	***	**				*
Double difference (in % of households)	8	-3	6	1	-1	7

Source: IFPRI/MINAGRI survey (2013–2014).

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; blank cells in this row indicate lack of statistical significance.

Table 6.4b Proportion of households having access to information on when commodities are demanded and market supply (% of total households)

Year	When commodity demanded (%)			Market supply (%)		
	Bandundu	Bas-Congo	Kinshasa	Bandundu	Bas-Congo	Kinshasa
Sample size:						
FPPM	629	547	210	626	547	200
Control villages	611	656	149	610	657	149
FPPM villages						
- Average 2010	57	53	69	45	45	62
- Average 2013	61	52	71	47	45	65
- Change (2010–2013)	5	-1	2	1	0	3
Control villages						
- Average 2010	62	47	61	52	36	48
- Average 2013	63	48	59	53	38	45
- Change (2010–2013)	0	1	-2	2	2	-3
Paired student t-tests FPPM vs. Control	***			*		
Double difference (in % of households)	4	-2	4	0	-2	6

Source: IFPRI/MINAGRI survey (2013–2014);

Note: *, and *** indicate statistical significance at the 10% and 1% levels, respectively; blank cells in this row indicate lack of statistical significance.

The most commonly reported sources of market information are other farmers and relatives and friends. More than half of the sample households acquired market information through other farmers or relatives and friends in the three provinces (Figure 6.3). A quarter of the sample households in the three provinces acquired information from agricultural traders. A small proportion (4 to 6 percent) accessed market information through SMS messages in the three provinces. A greater proportion of households in Bandundu and Kinshasa (7 and 8 percent, respectively) accessed market information from radio or TV than in Bas-Congo (3 percent). Almost no households (none in Bandundu and Kinshasa and two households in Bas-Congo) reported accessing information from extension agents or agricultural monitors.

Figure 6.3 Sample households' sources of market information

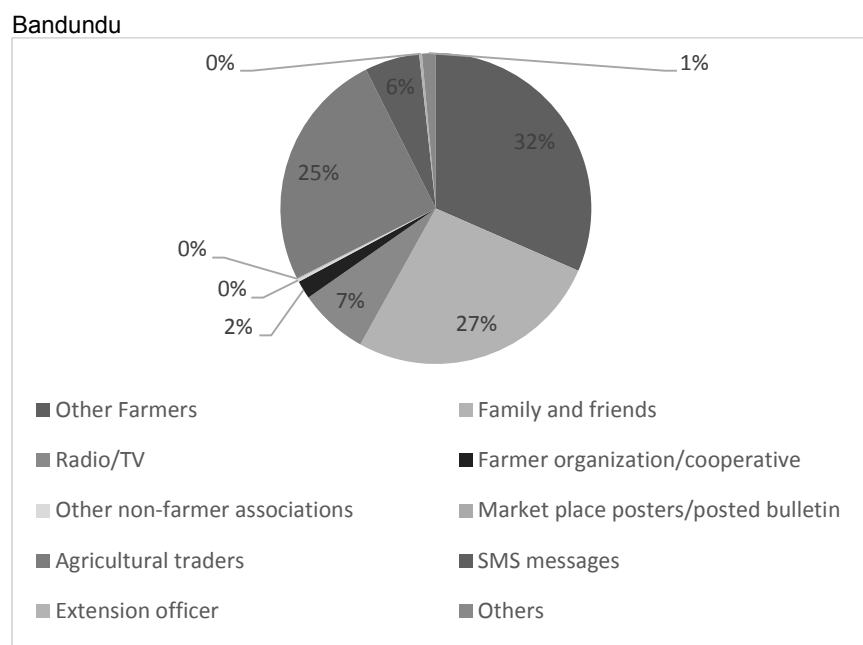
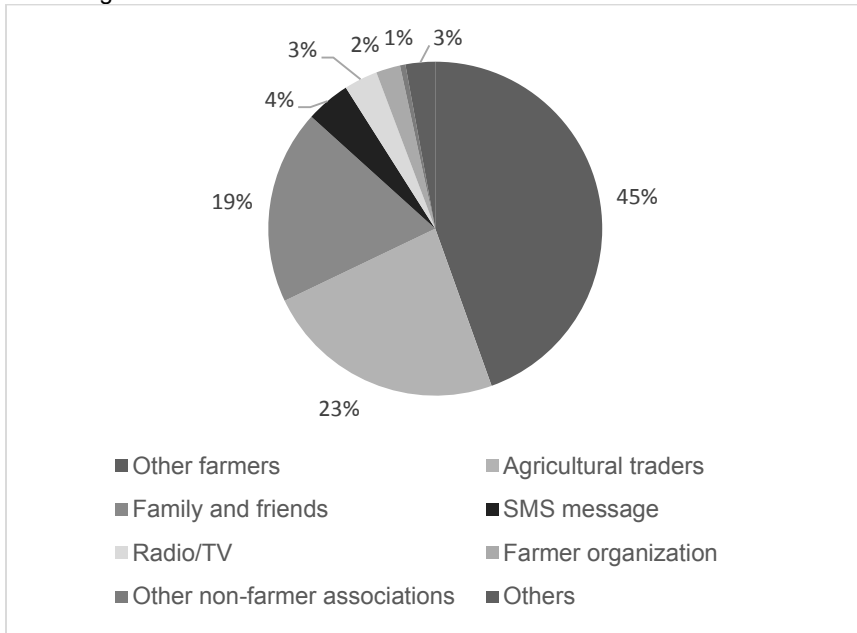
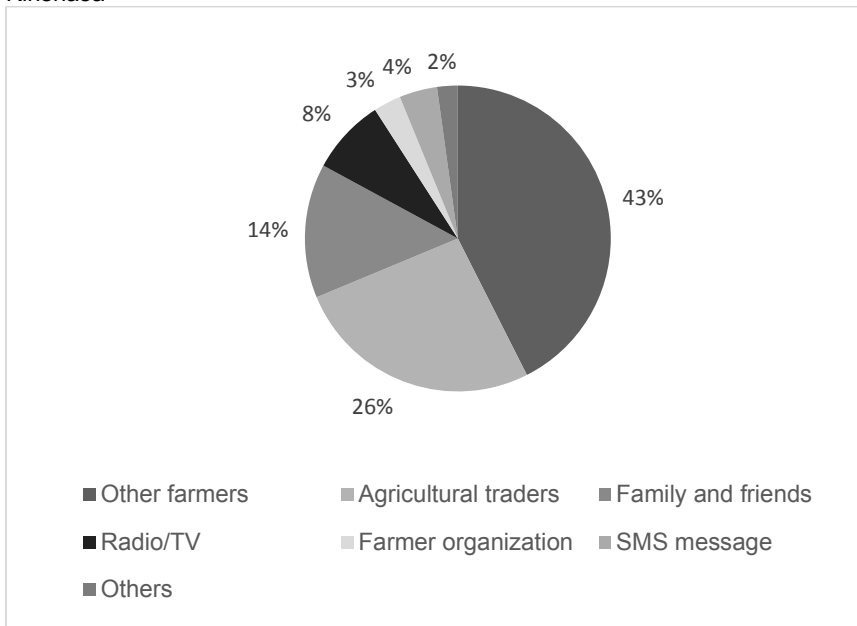


Figure 6.3 Continued

Bas-Congo



Kinshasa



Source: IFPRI/MINAGRI survey (2013–2014).

7. RECOMMENDATIONS

This midline assessment is done only three years into implementation of the FPPM project. Overall, the survey results suggest a weak impact of the project on most of the outcome indicators and highlight challenges in implementing small-scale farmers' capacity building within the context of weak institutions and a fragile political context. Given the long-term nature of the FPPM objectives of increasing crop productivity, market efficiency, and farmers' capacity to respond to market signals, we did not expect that significant impacts of the FPPM intervention would be evident in the early stages of the project's implementation. The recommendations we present below are intended to guide project managers' decisions aimed at improving project performance.

A major focus of the project is on seed multiplication and distribution as reflected in the bulk of activities during the first two to three years of its implementation. However, there seems to be weak impact to date, with only a modest increase in adoption of improved varieties of maize in Bandundu and beans in Bas-Congo and no impact in the other focus province or on the other focus crops. The project has run into problems related to the foundation seed purchase and certified seed production and multiplication components in the earlier years of implementation. To fix this, efforts should focus on better selection and enforcement of contracts among seed multipliers and stricter monitoring of services and seed quality. Traders, extension agents, and farmers interviewed expressed the need for more certified seeds to be distributed. The promotion of productivity-enhancing inputs other than improved seeds, such as fertilizer and mechanization, is also critical. Interviews with traders, extension agents, and farmers also suggest the need for more training for extension workers, more training on cassava processing, and training among farmers on good management and production practices such as buying new seeds or planting materials (and not mixing different varieties and colors).

The FPPM project aims to strengthen farmers' access to credit, market information, and training in business skills development. No impact was observed on access to credit and training, although market information access may have improved in Bandundu but not in Kinshasa and Bas-Congo. There is a need to intensify activities geared toward setting up the village savings and loan cooperatives and linking farmers with formal credit institutions. More training activities on business management skills development are also needed. SMS messaging and radios can be used more for market information provision. Farmers, extension agents, and officers have expressed the need for more training and skills development for extension service provision and in the latest technologies available.

To improve market efficiency, our findings suggest the necessity of intensive investment in developing collective marketing by linking producers and traders. Building partnerships with transporters, exploring different transport schemes, and rehabilitating aggregation centers to reduce transport costs and better support the marketing activities of local producers, traders, and consumers will also improve market efficiency substantially.

Even though we use quasi-experimental approaches that help address negative or positive effects outside the control of a project of this nature, the results described in this paper should be interpreted with care and taken as initial indicators of performance.

Indeed, given the complex nature of the factors required to achieve the FPPM project's objectives and the consequent high cost of achieving them, it is imperative to coordinate the program with other development programs funded by the government and other development partners. Scaling up observed successes will require using resources to leverage strong partnerships with rural faith-based and other organizations and SMEs that have survived the social upheavals of the last decade and have evolved into well-established operating centers with relatively transparent management structures and track records of delivering economic results in rural DRC.

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