

Influence of smallholder farmers training on project performance: A case of smallholder horticulture farmers under PRICE project, Rwanda

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Abstract

The general objective of this study aimed to determine the influence of smallholder farmers training on project performance by using a case study of horticulture smallholder farmers under the PRICE project in Rwanda. The targeted population comprised 344 farmers under the PRICE project located in Huye and Musanze Districts. The sample of 182 respondents has been chosen using a simple random sampling technique. Primary data was collected by means of administering questionnaires to the respondents while secondary data was collected through analysis of records and documents regarding PRICE progress reports and project assessment reports. The study applied a simple random sampling technique to select respondents to represent the target population. IBM SPSS statistics software was used to analyze data, with descriptive analysis comprising frequencies and percentages used in the analysis. The study revealed that the PRICE project had a measurably positive impact on the smallholder farmers surveyed and their family livelihood. Through training, smallholder farmers improved agricultural production, increased their farm yields, and accessed viable local and international crop markets. This led to improvement in their cash flow and increased their overall quality of life. According to the study, 45.2% of respondents believed that farmers' training influences project performance to a very large level, 37.9% to a great extent, and 16.9% to a moderate extent. The study recommended further follow-up of farmers by the government and other projects similar to the PRICE project in order to fasten the adoption rate of policy

and technical advancement by farmers to boost their agricultural activities. The study further advocated for stronger collaborations of projects targeting smallholder farmers with main stakeholders in the agriculture value chain including extension service providers, input suppliers, and output market buyers to ensure the proper functioning of each component of the value chain.

Keywords: *Farmer empowerment, Project performance, Horticulture smallholder farmer, Training, Inputs*

1. Introduction

According to the World Bank (2016) there is an estimate of about 500 million small holder farmers globally amounting to about two billion people and cultivate less than five acres of land. FAO, (2021) pointed out that the contribution of food supply from small holder farmers varies from country to country, with China being rated the highest with 80% while Brazil and Nigeria being rated the lowest with single digits. Studies also indicate that smallholder farmers have a significant contribution to global food production, supplying 50% of the world's cereal, 75% of dairy, and 60% of the world's meat (Gotor, Usman, Occelli, Fantahun, Fadda, Kidane, & Caracciolo, 2021). By providing gross domestic food, smallholder farmers are evidently crucial in the global efforts toward food improvement and nutrition security. Unfortunately, for a long time, smallholder farmers have been denied primary focus with regard to agricultural development, and their contribution to food security has not been recognized, as it should be (Dioula, Deret, Morel, Vachat, and Kiaya, 2013). The agricultural

transformation of the food system globally requires adaptation to changes in buyer requirements and consumer demand. Smallholders have to increase their reliability in terms of quantity and quality production for them to compete favorably within the agricultural markets (Wortmann-Kolundzija, 2019).

The growth of the agricultural sector plays a key role in towards poverty reduction and overall development in Africa. Agriculture employs 65-70% of Africa's entire labor force and contributes 30-40% of the continent's GDP (The World Bank, 2013). Over 70% of Africa's poorest people live in rural regions and rely on agriculture as their primary source of income. Smallholder farmers play an important role in food production at the local level as nation's progress toward agriculture that aspires for food sustainability and nutritional security. Food consumers in developing countries, both rural and urban, are heavily reliant on local smallholder farmers for their food needs. Agriculture in Rwanda is a major economic sector employing about 43% (NISR, 2020) of the working population (all people aged 16 and above). With the growth of Rwanda's GDP projected at 7% rate since 2014, the agricultural sector contributes 33% of the total GDP nationally. As such, the sector stands out as being one of the key sector contributors to development in Rwanda (FAO, 2021). Export of agricultural products such as tea, coffee, pyrethrum, skins and hides, silk and horticultural products accounts for a very significant portion of foreign exchange earnings in the country. Project for Rural Income through Exports (PRICE) was started in 2011 with the aim of achieving increased sustainable returns among farmers involved in the value chain for export-driven agriculture. This was to be achieved through increased quality and quantity of production, better marketing, and improvement of farmer organizations. The major stakeholders were: Parent Ministry: MINAGRI, NAEB, RAB, Rwanda Development Bank (BRD/BDF), National Sericulture Centre, Districts and Private investors (farmers, cooperatives and companies). The project has 6 components which includes tea development, coffee development, silk development, horticulture development, financial services component and project management and institutional support.

The PRICE main target group consisted of smallholder farmers producing or seeking to produce the major export crops of tea and coffee, and those producing emerging crops namely silk, essential oils, fruits and vegetables. The project target household farmers with low income having less than 0.5ha of land under cultivation, and whose predominant source of livelihood is agriculture. The target groups was households with RWF 130,000 (USD217) as their average annual income. Medium and high-income earning farmers were also targeted as key drivers of value chain development. The projected

average annual income for this group of farmers was RWF 220, 000 (roughly USD 366) (PRICE Report, 2020). The project has three phases whereby the initial phase was from 2011 to 2015. The first additional was in 2016 and 2017 and the second additional financing was in 2018 to 2020. This study focuses mainly on the second additional financing face in order to obtain recent information.

2. Review of Literature

2.1 Smallholder farmers training and project performance

Training places emphasis on influencing transfer of skills and knowledge to farmers. The training content either might be very new to the farmer or has been in existence but not widely adopted. There should be demand among the farmers for the training interventions in order for them to be effective. Additionally, the programmes should be appropriate to the local contexts in order for the farmers to truly benefit. By adopting the interventions, the farmers' should be able to experience changes in inputs and outputs of their agricultural practice (Stewart *et al*, 2015). They conducted a study assessing the effects of innovation, training and technology on food security and economic outcomes of African smallholder farmers. The study was carried out using academic databases relating to agricultural development. Grey literature highlighting effects of training or African smallholder farmers' introduction to new approaches for the period 1990-2014 from 39 source was analyzed. Data was analyzed using statistical meta-analysis employing standardized mean differences. The study found that agricultural input innovations had some positive effects on food security levels of smallholders. The findings also indicated income benefits of training interventions on farming households arising from increase in farmers' harvests' monetary value, though without much statistical significance. The study advocated that more rigorous research of smallholder farmer interventions in Africa be undertaken for better impact-evaluation, (Stewart *et al*, 2015).

Martey *et al*. (2015) investigated how involvement in the Agricultural Value Chain Mentorship Project affected soybean farmers' income and agricultural productivity in Northern Ghana. Propensity score matching was used to analyze the data from 200 smallholder farmers. The results showed that involvement in farmer mentoring projects increased farm technical efficiency by 28%. However, the increased agricultural revenue brought about by farmer engagement was not considerable. The study concluded that though farmers' exposure to agricultural development projects might lead to direct increase in their technical ability in the short-term, higher income was not guaranteed. The study recommended incorporation of specific farmer needs in designing an agricultural development project in

order to ensure increased participation, ownership and sustainability.

In Gujarat, India, Collette and Gale (2009) investigated the effects of training for rural development that focused on agricultural and entrepreneurial skills for women smallholders. They discovered that providing agricultural instruction alongside entrepreneurial training helped women smallholders manage and sell their farm products more effectively. Training also enables farmers to take risks with regard to progressive production technologies. They established that training geared towards enterprise skills such as analysis of the market, business management, distribution, supports small-scale farmers to identify the technologies that would be of most benefit to them, and enable them to take part in agricultural innovation.

Mgendi, Mao and Qiao, (2021) analyzed the effect that training programs have on smallholder farmers' yield in Tanzania. Data was collected from a household engaged in rice farming in Mvomero district, with empirical analysis employed for the sample data. The findings revealed a yield outcome that was significantly more than double among both trained and untrained farmers who had access to irrigation water. The difference in yields for trained and untrained farmers on irrigated plots was found to be insignificant. The study concluded that training must be supplemented by other farm and non-farm factors for it to lead to improvement of productivity among smallholder farmers.

2.2 Project performance

Kureshi (2013) argued in his study that projects are the vehicles of organizational strategy that convey the company from its current condition to its intended future state. According to a body of other literature that has been conducted to assess the importance in an organization, there is a body of literature and empirical studies that have been conducted critiquing the influence of certain variables on project performance (Critical Success Factors- CSF) based, and few organizations and project managers use them to improve their project performance. Several factors and tools were utilized to assess the project's performance. To different degrees of success, practitioners have used a range of hard and soft project performance techniques, such as earned value management, project management knowledge areas, and other standards such as PRINCE2 and the vital dozen, (Kureshi, 2013).

According to Takim and Akintoye (2002), performance of a project is indicated by measurable evidence proving that an effort that was planned has led to the desired result. Measuring performance entails evaluation of inputs and outputs in a systemic way in order to inform continuous future improvement. Project performance can be measured by analyzing commercial performance, technical

performance and overall performance. Measuring of outputs and resources at different levels of the project also provides a good measure for the project performance. Outputs are measured to assess whether they help in accomplishing objectives while and resources help in determining use of minimum resources to achieve desired production outputs.

3. Materials and Methods

The research design is a guide for the study that ensured set objectives were attained within the conceptual framework of the research. This study used a descriptive research design because it allowed the study of phenomena without manipulating variables in a case study setting (Kombo & Tromp, 2006). Descriptive research design creates the structure for collecting, evaluating, and analyzing data. The research design was suitable for evaluating how smallholder farmer empowerment affected the success of the PRICE project. The design was effective in gathering information describing characteristics of the target population by concentrating on the "what" aspect of the research subject.

According to Polit and Hungler (1999), a population is the sum of all subjects who meet a set of criteria. It includes all of the people who are of interest to the researcher and to whom the research findings may be generalized. PRICE project covers 30 districts in Rwanda. This study delimited itself to Musanze and Huye as the study variables were specific to them fully. The accessible population was 191 from Musanze and 153 from Huye making a total of 344 respondents. The sample size was computed using the formula of Slovin indicated below:

$$N = N / \{1 + N(e)^2\}$$

Whereby:

N represent the target population; n represent the sample size; e represents the margin of error with 95% degree of confidence.

$$\text{Hence; } n = 344 / [1 + 344(0.05)^2] = 182$$

The study selected respondents using a simple random sampling technique to represent the target population. Both primary and secondary data were collected. The primary data was collected using interview and questionnaire. Secondary data was collected from review documents that were already published and through analysis of records and documents regarding PRICE progress reports and project assessment reports. The study used questionnaires which were administered to the respondents to address specific objectives and answer research questions. The questionnaire structure involved open-ended questions that gave the respondents a chance to add information and express their opinions or views more objectively. The farmers' interviews took place within a duration of two weeks in both Huye and Musanze districts. Interview guide was used to collect views of project

staff who were directly involved in stallholder empowerment.

Inferential analysis and descriptive analysis methods created with SPSS were used to analyze quantitative data. Frequencies and %ages were included in the descriptive analysis. Based on the study's objectives and relationship to its central theme, qualitative data was analyzed. The effectiveness of the PRICE project was compared to the relationship between smallholder farmer empowerment using regression and inferential analysis correlation. Multiple regression was used to measure the relationship and coefficient analysis was used to determine the effective size.

The formula $Y = \beta_0 + \beta_1 X_1 + \epsilon$

Y is the probability showing the performance of the project

X= are independent variables

X1= Training

β_0 = Constant

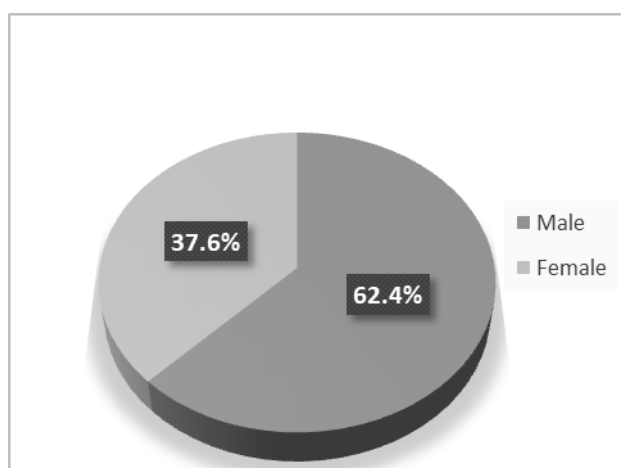
β_1 = regression coefficients or change included in Y by each X value.

ϵ = error term

4. Results and Discussion

4.1 Demographic characteristics of respondents

Figure 4.1 Gender of respondents



Source: Primary data, (2022)

Majority of respondents were male 62.4 % compared to female respondent who were 37.6%. These findings indicates that men participated more in small scale farming activities than the women. There is a need to sensitize more female for their involvement in farming activities and to support

them in a way that ensures sustainability. This way, both genders can actively strengthen and encourage each other in small-holder farming and in so doing contribute to uplifting their living standards and those of the rural community.

Table 4.1 Age distribution of respondents

	Frequencies	%
18-35 years	107	60.1
Above 35 years	70	39.9
Total	177	100

Source: Primary data, (2022)

Majority of respondents were aged between 18-35 years (60.1%), with those above 35 years being 39.9%. This indicates active participation of youths in quick win horticulture farming activities compared to traditional cash crops like coffee and tea. As

opposed to the traditional dictums that farming is an outdated process suitable for older people, the youth have embraced farming as a viable and profitable enterprise as seen from the higher youthful age range of respondents as compared to those above 35 years.

Table 4.2 Education of respondents

	Frequencies	%
Primary level	53	29.8
Secondary level	83	46.6
Post-secondary level	4	2.8
Other	37	20.8
Total	177	100

Source: Primary data, (2022)

Respondents who had attained secondary level education were the most at 46.6%, followed by those with primary level education (29.8%). Those in the ‘others’ bracket which includes informal training or no formal education were 20.8%. Finally, respondents with post-secondary level education were 2.8%. This points to a willingness of the educated population to undertake horticulture

farming activities and is contrary to the traditional set-up where farming activities were viewed as being specific to those without formal education. It may also later provide a positive growth in overall agricultural practice by virtue of having educated people in farming who are better able to implement acquired knowledge and skill for the betterment of the sector.

Table 4.3 Respondents’ number in farming

	Frequencies	%
1-5 years	61	34.3
6-10 years	79	44.4
11-15 years	21	11.8
16-20 years	11	6.8
More than 20 years	5	2.7
Total	177	100

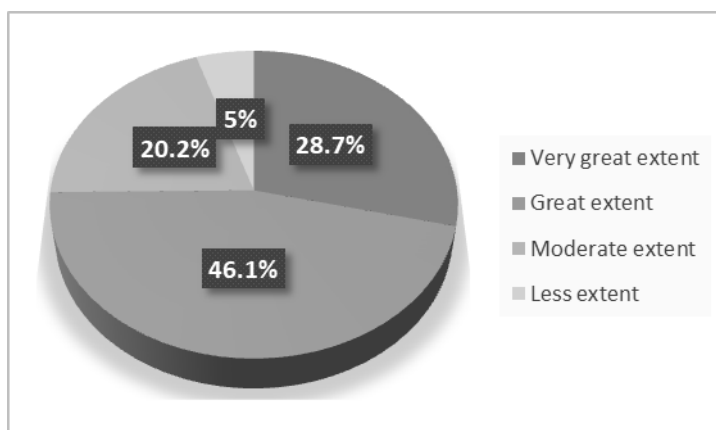
Source: Primary data, (2022)

The research results discovered that most respondents have been involved in farming activities for a considerable period of time. The farmers found to have engaged in farming activities for 6-10 years were 44.4%, followed by 1-5 years (34.3%), 11-15 years (11.8%), 16-20 years (6.8%), and finally more than 20 years 2.7%. The results indicate that there is a considerable number of new entrant farmers in the sector. This could be as a result of the numerous

incentives given by the government in recent years to support agriculture sector through government institutions and projects like PRICE project empowered smallholder farmers in rural area.

4.2 Influence of providing training to smallholder farmers on project performance

Figure 4.2 Effect of trainings on farmer’s empowerment



Source: Primary data, (2022)

The PRICE Project during implementation of horticulture component had empowered the smallholder farmers through trainings comprising production technics, post-harvest handling, price negotiation and access to the market. The study focused on general perception of training effect on smallholder farmers’ empowerment, training effects on quality of harvest, increasing selling price of produce, increased storability/ shelf-life of produce, increasing product demand and marketability, improved competitiveness and positioning in the

market, improving product brand in the market and training effect on reducing cost of production. The research results revealed that 46.1% of respondents indicated that PRICE project has supported farmers to a great extent through training. 28.7% scored the level of support through training as being to a very great extent, with 20.2% scoring it as moderate extent, and 5.0% as less extent. This indicates an overall positive impact of farmers’ trainings provided by PRICE project.

Table 4.4 Effect of training on quality of harvest

	Frequencies	%
Very great extent	114	64.0
Great extent	10	28.1
Moderate extent	13	7.9
Total	177	100

Source: Primary data, (2022)

The improvement of quality of harvest has been one of topics covered during empowerment of smallholder farmers by PRICE Project. The research illustrated the perception of trainees about an increasing of quality of their produce. A great number of respondents (64%) indicated that training offered by PRICE project had led to improved quality of their harvest to a very great extent. 28.1%

of respondents indicated that the quality of their harvest had improved to a great extent, with 7.9% indicating moderate extent of quality improvement. This shows great impact of training on aspects such as pre-harvest handling of produce, harvest techniques, and post-harvest handling on improving the overall quality of produce harvested by the farmers.

Table 4.5 Effect of training on increasing selling price of produce

	Frequencies	%
Great extent	29	16.9
Moderate extent	63	35.4
Less extent	62	34.8
No extent	23	12.9
Total	177	100

Source: Primary data, (2022)

Production of good quality according to the market requirements was among of training package given to the smallholder farmers during PRICE project implementation. Basing to the previous selling prices for different produce. In terms of selling price of the produce, 35.4% of respondents indicated that training had a moderate extent of impact on the selling price of produce, with 34.8% indicating a less

extent of impact, and 16.9% pointing to a moderate effect. Though clearly there was a positive impact of training on product selling price, it was to an average extent. This could be attributed to other market forces such as demand and supply that play a role in determining the pricing of the final product.

Table 4.6 Effect of training on increased storability/ shelf-life of produce

	Frequencies	%
Very great extent	23	13.5
Great extent	96	53.9
Moderate extent	52	29.2
Less extent	6	3.4
Total	177	100

Source: Primary data, (2022)

To maintain the quality of produce and keeping the produce till getting market for good price was one of themes developed during training of stallholder farmers' empowerment. With this subject, the trainees benefited the adequate skills on handling and post harvesting technologies aiming to minimize the losses in various value chains. In terms of produce shelf-life, 53.9% of respondents indicated an increase in produce storability to a great extent. This

was followed by 29.2% indicating moderate extent increase, 13.5% indicating a very great extent impact, while only 3.4% indicated a less extent of impact. This points to effectiveness of the training in teaching farmers better ways of preserving their produce and minimizing damages during farm activities in order to extend the shelf-life of harvested product.

Table 4.7 Effect of training on increasing product demand and marketability

	Frequencies	%
Very great extent	98	55.6
Great extent	53	29.8
Moderate extent	21	11.8
Less extent	5	2.8
Total	177	100

Source: Primary data, (2022)

Before PRICE Project, the respondents produced the crop without considering the market demand and any effort was used to market their produce. They produced often for local market. To ensure that the produce got after getting performance grant provided by PRICE project, the smallholder farmers were trained on marketing. In assessing the increase in demand and marketability of product as a result of

training, 55.6% of respondents indicated that training had achieved this to a very great extent, 29.8% to a great extent, 11.8% moderate extent, and 2.8% to a less extent. This could be attributed to the training leading to improvement of the quality of the product whereupon there was a consequent increase in demand and marketability.

Table 4.8 Effect of training on improved competitiveness and positioning in the market

	Frequencies	%
Great extent	117	66.3
Moderate extent	39	21.9
Less extent	21	11.8
Total	177	100

Source: Primary data, (2022)

The study also sought to assess the extent to which smallholder farmer training can improve the potential for a farmer to become competitive in terms of improving the quality of their products and services while also remaining competitive especially in pricing in the long-run. In competitiveness and positioning in the market, 66.3% of respondents contended that there was improvement to a great

extent in this regards. This was followed by moderate extent 21.9%, with 11.8% of respondents indicating improvement to a less extent. This might allude to training offered incorporating market feasibility assessment for farmers to determine planting times and hence take advantage of periods of low supply and acquire better market penetration.

Table 4.9 Effect of training on improved product brand in the market

	Frequencies	%
Great extent	34	19.1
Moderate extent	101	56.7
Less extent	27	15.8
No extent	15	8.4
Total	177	100

Source: Primary data, (2022)

Similarly, the study sought to find out the extent in which smallholder farmer training can affect the product brand in the market. This is because majority of smallholder farmers may not be able to improve the brand of their products through value addition. In improvement of the product brand in the market, 56.7% of respondents agreed that training achieved

that to a moderate extent, 19.1% to a great extent, 15.8% to a less extent, and 8.4% to no extent. The majority leaning towards moderation may be explained as there are being other factors such as packaging and marketing which alongside quality improvement play a role in brand perception and reception in the market.

Table 4. 10 Effect of training on reducing cost of production

	Frequencies	%
Very great extent	118	66.3
Great extent	52	29.8
Moderate extent	7	3.9
Total	177	100

Source: Primary data, (2022)

The smallholder farmers and at the same time beneficiaries of PRICE Project, learnt through trainings how to determine the production cost. According to the financed crops, the detailed data were considered with trainees in order to define the production cost. Basing to the knowledge received; the farmers claimed a positive impact on reducing cost production of various crops financed. Respondents overwhelmingly acquiesced to training having had the effect of reducing the cost of production, with 66.7% indicating that it did so a very great extent, followed by 29.8% to a great extent, and only 3.9% agreeing that it did so to a moderate extent. This could be attributed to training leading to more efficient operations with less resource wastage which ultimately led to a reduction in the cost of production.

An interview with key staff of PRICE project in charge of training was scheduled in order to assess

the influence of smallholder farmer training on project performance. Specifically, the researcher wanted to establish how PRICE project empowered farmers through training. The respondent stated that some of the methods they use for training farmers include farm demonstrations and on farm-trials and also training of specific farmers who will then their train their peers. The respondent also affirmed that trainings influenced project performance in a number of ways. This includes boosting the productivity and quality of harvest, increasing the volume of sales and profitability of farm produce, increase in storability/shelf-life of produce, increase in product demand and marketability of farm produce, improved competitiveness and positioning in the market, improved product brand in the market and finally but not least is reduction in cost of production.

Table 4. 11 Relationship between small holder farmer’s empowerment and project performance

		Effect of training
Project sustainability	Pearson Correlation	.749**
	Sig. (2-tailed)	.000
Timely project completion	Pearson Correlation	.913**
	Sig. (2-tailed)	.000
Cost effectiveness	Pearson Correlation	.748**
	Sig. (2-tailed)	.000
Overall project quality	Pearson Correlation	.915**
	Sig. (2-tailed)	.000
Coverage of project scope	Pearson Correlation	.866**
	Sig. (2-tailed)	.000
N		177

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Primary data, (2022)

The study wanted to establish the relationship between the effects of small holder farmer empowerment and overall project performance. Correlation analysis was preferred to be conducted in order to statistically evaluate the relationship between the above-mentioned variables by measuring their strength. The study sought to find out the relationship between training of small holder farmer and project performance by looking at five main parameters of measuring project performance namely, the project sustainability, timely project completion, cost effectiveness, overall project quality and coverage of project scope. The results indicates that effective training on small holder farmer improves the project performance specifically on the project sustainability (74.9% or 0.749**), timely project completion (91.3% or 0.913**), cost effectiveness (74.8% or 0.748**), overall project quality (91.5% or .915**) and coverage of project scope (86.6% or 0.866**) respectively. The p-value which shows the significance of the correlation was below 0.001. The study indicates that training of small holder farmers plays a critical role in improving smallholder farmers' yields and productivity, in turn, addressing hunger and poverty in rural Africa. Studies have suggested that about 80% of the food supply in most developing countries including Rwanda comes from small family farms, but most of these farms are producing only a fraction of their potential.

5. Conclusions

Overall, the study reveals that the PRICE project had a positive impact on the smallholder farmers surveyed and their family livelihood. By attaining access to financial services and agricultural resources provided through PRICE, smallholder farmers were able to improve their cash flow and increase their overall quality of life through better agricultural production, increased yields, and being able to access viable local crop markets. The resultant effect was families of farmers under the PRICE project being able to access necessities such as food, healthcare, and education.

Hard investments and the building of productive infrastructure and assets were seen to have had a major impact. Additionally, soft interventions by way of technical extension services also went a long way in defining the success of the project. Loans provided enabled farmers to improve crop production. It also facilitated efficiency in buying and selling of produce. Smallholder farmers were able to use the finances allocated to them to purchase inputs, pay labor, and generally maintain their farms. Providing farmers' access to financial services enabled farmers to have funds for farm investments in productivity, smooth household cash flow, improved post-harvest practices, better market

access, and better management of risks. The production also increased, enabling farmers to meet market demands. This led to an increase in revenue for the farmers. Financial facilities provided by PRICE project allowed farmers access to working capital, an extension of processing lines, acquisition of new equipment, and purchase and aggregation of products.

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