

**THE IMPACT OF COMMODITY
DEVELOPMENT PROJECTS ON
SMALLHOLDERS' MARKET ACCESS
IN DEVELOPING COUNTRIES**

CASE STUDIES OF FAO/CFC PROJECTS

by

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SUMMARY

Following the recommendation made by the Committee on Commodity Problems (CCP) of the Food and Agriculture Organization (FAO) to improve the evidence base underpinning patterns of smallholder market participation, the Trade and Markets Division embarked on a series of activities in support of understanding the determinants of smallholder market access. This report is part of this initiative. In particular, it examines the role of commodity development projects, especially those funded by the Common Fund for Commodities (CFC) and supervised by the FAO, in improving opportunities for market participation by smallholders. Four CFC/FAO project case studies were reviewed and analysed, supplemented with field survey evidence. Results from this report should also contribute to advancing the design of project interventions so that they more effectively target different categories of smallholders.

The following general conclusions can be drawn from the study:

1. CFC/FAO commodity projects mostly target better off smallholders, those with relatively better access to productive assets and suitable agro-ecological conditions. This bias towards the better endowed smallholders generates the best economic returns to the intervention, but it implies that the most marginal and poorest rural peoples are likely to be excluded as beneficiaries.

2. Improvements in smallholder market participation are associated with project activities that focus on extension, training and demonstrations, and support to building up private agricultural productive assets. Market participation is also correlated with initial conditions related to household and farm characteristics such as wealth, land size, asset ownership, and prevailing agro-ecological environment. Further, access to credit is found to influence significantly access to market, highlighting the positive role of credit support activities which constitute, in several instances, a core component of CFC/FAO projects.

3. Given the existing bias in the selection of participating smallholders, project activities and policy recommendations need to be specific to the targeted group. For the better-off smallholders, priority should be given to areas addressing standards, quality, and export markets, which

from the field survey appear to be one of the main barriers to expanding market access. For the poorest category of smallholders, priority should be given to activities that build up private productive assets, access to financial services, and the preservation of natural capital.

4. The analysis also suggests that CFC/FAO project activities that specifically address aspects related to the natural, human, social, physical and financial capitals that determine the livelihood opportunities of smallholders contribute significantly to strengthening market linkages. Further, CFC/FAO projects that include on-farm risk management strategies as well as provide for fair, clear, and balanced counterpart contribution arrangement amongst project stakeholders, stand the greatest chance to see gains in market access sustained beyond the lifetime of the project.

1. INTRODUCTION

The Food and Agriculture Organization of the United Nations (FAO) and the Common Fund for Commodities (CFC) have been implementing commodity-specific improvement projects over the last twenty years in the context of the development plans agreed by the FAO Intergovernmental Groups (IGGs), many of which targeted the smallholder sector. About 90 percent of the projects implemented under IGG auspices were in Low Income Food Deficit Countries (LIFDCs) and nearly 70 percent were located in Least Developed Countries (LDCs). Projects undertaken in other developing countries generally addressed problems of low-income disadvantaged areas. These projects aimed to provide farmers with the tools and knowledge to increase productivity and income. Productivity enhancing tools include dissemination of improved varieties, provision of fertilisers and pesticides, training on effective crop management systems, and transmission of information on market trends and prices. In some instances, support to build market infrastructure was also provided, such as pack houses for processing fruits and vegetables, greenhouses, as well as funding for the establishment of institutions such as farmers' cooperatives and associations to take advantage of economies of scale in the marketing of products.

Since the scope to increase income through area expansion remains limited for a number of reasons, among which absence of land deeds and weak land tenure regulations are key, productivity growth through the adoption of new technologies and practices are required to enable smallholders to achieve higher returns by lowering their unit costs. Higher productivity can therefore generate marketable surpluses of food staples, potentially improving market access opportunities for smallholders able to supply higher volumes more consistently. However, the adoption of new technology for productivity gains is not straightforward. Studies have shown the prevalence of constraints to technology adoption and that, in several instances, it is difficult to identify one single factor responsible for technology adoption and/or disadoption (Balgah et al., 2011). In general, smallholders often cite lack of information about the technology, absence of credit market, high risk associated with investments in agricultural technologies, or simply that the technology is not available, as the main causes for non-adoption. Therefore, the success of any commodity development project depends not only on a careful identification of the factors that impede technology adoption, but also on the effectiveness of

the proposed measures to overcome these constraints. Further, widespread adoption is unlikely unless far greater attention is given to the incentives and constraints facing different categories of smallholder producers when deciding whether, and to what extent, to generate marketable surpluses of agricultural products, particularly staple foods.

The definition of smallholders will vary from one region to the next, but it is generally recognised that “small” refers not only to the size of the landholdings but also to the inability to access other factor inputs such as credit, fertilisers, seeds, and labour. Low propensity to adopt new technology is also a characteristic of smallholdings. The land is often divided into several plots among staple foods for home consumption and cash crop to provide for liquidity. Very few small farms manage to consistently produce net staple food surplus for sale. Improved technologies can help generate higher productivity and marketable surplus, but will be successful only if they meet smallholders’ overall household objectives. Therefore, understanding the economic and social environment that drives smallholders’ decision making processes becomes paramount to the success of any commodity development initiative. It is also critical to recognise the heterogeneity of smallholder producers within localities when designing project or policy interventions (see FAO, 2013).

2. OBJECTIVE AND OUTLINE OF THE CASE STUDIES

The objective of this study is to draw lessons on the determinants of successes and failures of CFC/FAO projects in assisting smallholder farmers to participate (and/or participate on more favourable terms) in agricultural markets/value chains. Particular attention is devoted to the role of technology and its uptake amongst smallholders participating in the projects. Technology is defined in its broader sense to include new methods of production, improved marketing techniques, high yielding varieties, and new production activities such as cultivation of fruits and vegetables. As described in the previous section technology adoption and the propensity to generate marketable surpluses are contingent upon market participation decisions.

Four project case studies were selected for the analysis. These were identified following discussions with the Secretaries of the FAO IGGs and officials at the CFC. These projects were chosen as they provided a good representative sample for the purpose of this study. In addition, other aspects were taken into account, including the availability of relevant documentation and national contacts, diversity in terms of commodity and geographical coverage, and logistical arrangements to minimize travel requirements for completion of the case studies.

2.1 BACKGROUND ON THE SELECTED CASE STUDIES

The following section provides a brief summary of the case studies, their objectives and main components.

Case Study 1: Production of Oleaginous Plants and Commercialization of Natural Vegetable Oils as Substitutes for Diesel Fuel for Public Transportation in Peru and Honduras (CFC/FIGOOF/26).

The objective of this project is to promote the cultivation of rape and jatropha curcus by smallholder farmers. The crops are to be processed and subsequently used as a substitute for fuel by private and public commuter transport in cities in Peru and Honduras. The project commenced on 1 April, 2007 and is scheduled to be completed in March 2013. The estimated cost of the project is evaluated at USD 5.6 million. The direct project beneficiaries are smallholder farmers and small public transportation companies. The project consisted of the following 5 main components:

1. Development of production activities/techniques for rape and Jatropha.
2. Production of vegetable oil by oil extraction plants.
3. Substitution of diesel fuel by the extracted vegetable oil by private and public transportation companies.
4. Training activities delivered to various stakeholders (farmers, oil production enterprises, and transport companies).
5. Information dissemination of project results to different stakeholders.

Case Study 2: Establishment of Diversification Programme for Vegetable Export Development in Ethiopia and Sudan (CFC/FISGTF/17).

The purpose of the project was to strengthen the export capacity of smallholder vegetable farmers in Ethiopia and Sudan through the removal of critical supply side constraints in relation to technical, infrastructural, business and market factors. The project was implemented over a 3 year period at an estimated cost of USD 2 million. It had three focus areas:

1. Enhance the productive capacity of smallholders to export vegetable products, namely beans and okra.
2. Improve post-harvest handling skills and infrastructure.
3. Develop marketing and trading systems.

The immediate beneficiaries were farmers and out-growers. Institutions and organisations supporting farmers also benefited from training that was designed to enhance skills.

Case Study 3: Strengthening the Productivity and Competitiveness of the Smallholder Dairy Sector in Lesotho and Zambia (CFC/FIGMDP/14).

The project was implemented in Lesotho and Zambia over a 4 year period at an estimated cost of USD 3.3 million. It was aimed at improving the productivity and marketing position of smallholder dairy co-operatives. The direct beneficiaries of the project were the smallholder dairy farmers, but also milk processors and consumers who benefited from increased local milk supplies and better quality milk. Specifically, the project set out to achieve the following main outputs:

1. Promote better and more innovative livestock feeding technologies for local production and conservation of protein-rich feed stock.
2. Enhance milk quality and hygiene to reduce wastage and increase shelf life and safety of milk.
3. Pilot basic processing technologies to increase shelf-life of milk targeted at different consumer groups and large-scale processors.

Case Study 4: Product and Market Development of Sisal and Henequen (CFC/FIGHF/07).

The objective of the project was to develop products and markets for sisal and henequen in Tanzania and Kenya. The project was implemented between January 1997 and December 2005. It had the following 4 components:

1. Development of new sisal varieties and improvement of cultivation practices.
2. Utilisation of fibre extraction waste for animal feed production and for biogas and electricity generation.
3. Market studies and trials to establish the demand for sisal pulp and to identify potential buyers of the products.
4. Information dissemination of project results.

A review of the project case studies reveals the prevalence of three common themes. First, a systematic emphasis is drawn on the importance of introducing new and better technologies to increase productivity and improve cultivation/feeding practices. There is a recognition that technology gaps exist and that bridging the gap is essential if smallholders are to participate in agricultural markets. The fundamental contribution of technology is that it enables farmers to increase profits while at the same time it leads to lower food prices for poor people in both urban and rural areas. Hence, there are substantial potential welfare gains as a result of productivity growth since it enables many groups to benefit: smallholders, poor rural consumers, and labourers.

Second, the case studies articulate different activities and interventions around smallholders. However, it is clear that projects initially implemented through the IGGs did not specifically target smallholders. Aside from some efforts to improve small scale palm oil extraction, the main objective was to improve production and strengthen demand, including through product development and promotion. While some beneficial impacts may accrue to smallholders these programmes did not account for specific characteristics of smallholders. It is only in the last five years that the focus on smallholders was explicitly expressed in the projects.

The last common component relates to improvement of marketing and trading skills. The emphasis on marketing follows from the need in commodity and agricultural development projects for enhanced knowledge in commodity market conditions and outlook.

3. METHODOLOGY AND PROPOSED GUIDELINES

The analytical framework is guided by the objective of the study: assess the impact of CFC/FAO projects on smallholders' market participation and identify factors of successes and failures. As described in the previous section, 4 projects were identified to serve as case studies. If the success of these projects is defined on the basis of improved market participation capacity, it is important to define market participation and elaborate indicators to be able to measure changes in market participation. These indicators can be used to evaluate the effectiveness of projects and eventually contribute to the development of guidelines for the design of future commodity development projects.

3.1 DEFINING MARKET PARTICIPATION

Increased market participation implies the transition from subsistence farming to a market engagement mode, whereby frequent use of markets is made for the purpose of exchanging products and services. Markets refer to both input markets for the exchange of factors of production and output markets for the exchange of agricultural products. The transition from subsistence, or from a lower level of market participation, is generally influenced by three main components. First, the initial conditions related to both farm and farmer characteristics. These include the level of education and endowment, available technology, land size, and stock of productive assets. They also include household structure, consumption needs, risks faced, etc. - i.e. the decision to participate in markets is one of constrained choice (FAO, forthcoming). Second, prevailing physical and institutional infrastructure (road, electricity, communications, market, rules of law, etc.), which drive the price incentive and the decision to invest in technology and generate surpluses. Third, macro and sectorial policies through their impact on prices and trade incentives. Smallholder market participation will be greatly influenced by these three components. Too often, price and trade

policies that seek to increase smallholder market participation fail because of prevailing high transaction costs which limit the pass-through of prices and trade incentives. Research shows that measures to alleviate smallholders' constraints such as access to credit and technology generate a larger supply response than price and trade incentives such as changes in the level of import tariffs (Barrett, 2010).

3.2 DEFINING IMPACT ASSESSMENT IN THE CONTEXT OF FAO/CFC PROJECTS

Impact assessment is intended to determine more broadly whether a programme, or intervention, had the desired effects on project beneficiaries (smallholders, households, institutions, etc.) and if those effects are attributable to the project activities. Impact assessment can also identify any likely unintended consequences, whether positive or negative, on the beneficiaries. Some of the key questions that can be addressed include: how did the project affect the beneficiaries? Were there any measurable improvements as a result of the project? Can the project be upscaled or replicated in other regions? Was the project implemented on a cost efficient basis?

These questions cannot, however, be simply measured by the outcome of a project. They may be influenced by other factors that are related with the outcomes but are not caused by the project. To ensure methodological consistency, an impact evaluation must estimate the counterfactual, that is, what would have happened without the project intervention, technically known as the without scenario. To determine the counterfactual, it is necessary to net out the effect of the interventions from other factors — a somewhat complex task. This is accomplished through the use of comparison, or control groups (those who do not participate in a program or receive benefits), which are subsequently compared with the treatment group (individuals who do receive the intervention).

Determining the counterfactual can be achieved by using a number of methodologies which fall into two broad categories: experimental designs (randomized), and quasi-experimental designs (nonrandomized). Qualitative and participatory methods can also be used to assess impact. These techniques often provide critical insights into the beneficiaries' perspectives,

the value of the programme, the processes that may have affected outcomes, and a deeper interpretation of results observed in quantitative analysis.

3.3 ASSESSING THE IMPACT OF A PROJECT

As described in the previous section, impact assessment aims at separating the welfare benefits accruing to the beneficiaries which can be directly attributed to project activities. There are several methodologies that can be applied for an impact assessment and some of these are briefly discussed below:

3.3.1 *Randomization and quasi-experimental approaches*

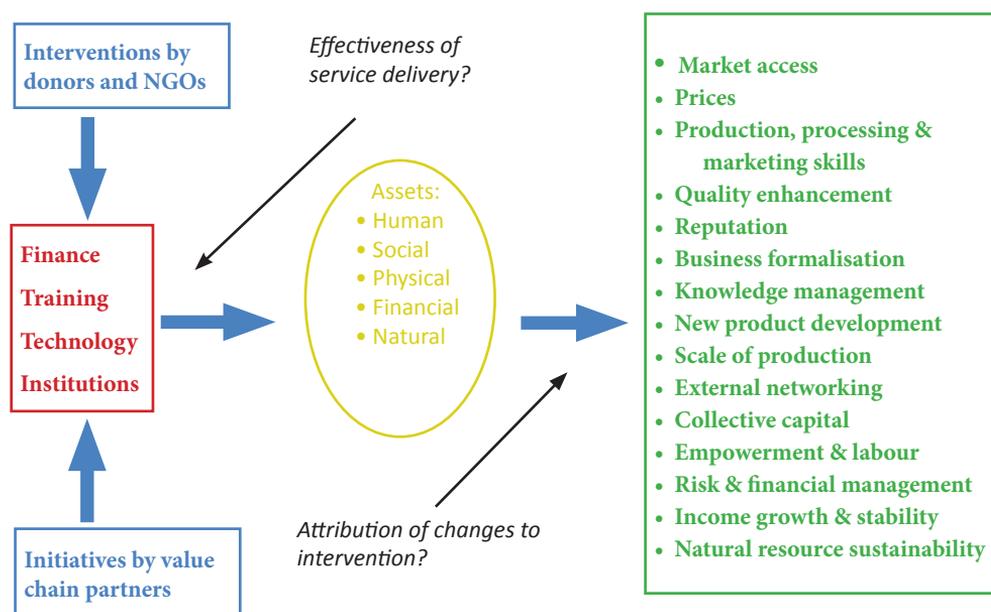
Experimental and quasi-experimental approaches use statistical or non-statistical techniques to make comparisons between ‘control’ and ‘treatment’ groups. Control groups are non-participants which display similar characteristics with those targeted under the project with respect to age, income, education, gender, etc. If the comparison results show significant differences between the two groups, the differences can be attributed to the project. In an experimental approach, random sampling is used in the selection of control groups. However, this is often expensive (partly due to the sample size) and generally not practical. Hence, a ‘quasi-experimental’ approach involving ‘constructed controls’ is usually used. This involves identifying persons or groups who have similar characteristics to those of project participants. It is usually difficult to find suitable controls. Indeed, their observable characteristics may be similar, but often they may have many different unobservable characteristics (e.g., attitude to risk, skills).

Furthermore if members of the control groups are close to the project area there is a risk of project spill-over effects, e.g. project information affecting behaviour of the controls; and if more distant control groups are selected, this increases the risk that other factors, such as market access, agro-ecological factors, could affect the comparison. Other problems include low motivation of control groups to cooperate, the tendency for people to change their behaviour when being part of a study group, and the ethical problem that controls cannot participate in any project expansion.

3.3.2 Theory based evaluation

Theory based evaluation involves the identification of key inputs as well as expected project outcomes, and the analysis of the underlying assumptions about how these inputs would lead to the desired outcomes. It implies examining the assumptions underlying the causal chain from inputs to outcomes and impact. The various links in the chain are analysed using a variety of methods, building up an argument as to whether the theory has been realized in practice. It traces how the (short-term) project activities and outputs will cause (short to mid-term) outcomes and how these will lead in turn to (longer-term) social impacts. This approach is illustrated in the figure below:

Figure 1: Theorising change: inputs, assets and outcomes



One of the reasons for applying the causal model, or theory of change approach, is that it helps tackle the attribution problem, mainly through the selection of appropriate indicators of change.

3.3.3 *Qualitative impact evaluation*

This type of evaluation usually draws inferences from reviewing project implementation processes, interviewing project beneficiaries to gather feedbacks and opinions, conducting focus group discussions, analysing supportive secondary data, etc. An example of the qualitative approach is the techniques used in participatory impact assessments, which draw input from participants' own knowledge about the project implementation process, activities, coverage, and outcome. While qualitative evaluations allow first hand discussion and collection of information from the stakeholders, they often lack analytical rigor.

3.4 SELECTING AN APPROPRIATE METHODOLOGY

Clearly, the selection of a methodology is contingent to several factors, the most important being resources, the scope and nature of the study. Large surveys are costly¹ and time binding. The randomisation approach would not be appropriate for assignments which present the characteristics of an ex post analysis, whereas the randomisation approach is mainly suited for ex ante analysis. Hence, there are constrained choices to be made. The current study uses a combination of two evaluation approaches: the theory-based approach, and the qualitative, participatory approach, as described in the previous section. This dual approach involves a close collaboration amongst the evaluation team, the projects' funders, supervisory bodies, executing agencies and a sample of project beneficiaries.

The dual approach outlined above was applied through a three step process. First, a review of project documents (appraisal reports, baseline surveys, market analyses, etc.) as well as other supporting studies, and a review of relevant literature, was undertaken for each of the case studies. The review supported the development of project causal chains and the identification of possible weak links within these chains, as prescribed under the theory based approach. In addition, a series of interviews were held with

1 According to the OECD guidelines on Impact assessment, a survey is the largest cost of an impact evaluation. If primary data is being collected then the total cost of a survey is approximately US\$100 per household in Africa and Latin America, US\$40-60 in East Asia and US\$25-40 in South Asia.

various project stakeholders, including project implementers, government officials, market participants (intermediaries, input suppliers, etc.), project beneficiaries, and experts from CFC and FAO. This led to the elaboration of a causal chain for each project.

An analysis was also performed to understand the global context underpinning each of the projects, most notably looking at the performance of the agricultural sector. This is to compare the performance of the project beneficiaries with the overall sectorial achievements. For example, has the level of milk production per cow improved in Zambia, and if so, how does it compare with that of the project beneficiaries? This fits into the impact assessment analysis which seeks to evaluate the extent to which welfare changes can be attributed to the project.

Since project impact can be greatly influenced by the beneficiaries' characteristics, or the socioeconomic setting, understanding the context helps explain possible sources of heterogeneity. Context is made up of the social, political and economic settings in which the projects take place, all of which can influence the structure of the causal chain. The impact of an identical project can differ in varying contexts. Data for this is generated by reviewing various international and national reports covering the socio-economic and political issues in Ethiopia, Peru, Tanzania and Zambia.

Step two involved the identification of indicators and the development of data gathering instruments. The development of the indicators facilitates the task of measuring to what extent the project contributed to the improvement in market participation. It also allows a comparison of achievements within and across case studies. The selection of the indicators remains a subjective exercise, but still, it is recommended that it be guided by the causal linkages identified in step 1. Ideally, both qualitative and quantitative indicators about market participation status of the smallholders for the before and after the implementation period should be collected. A list of indicators is outlined below:

- Changes in producer/beneficiary incomes
- Changes in the distribution of income, e.g. between men and women (likely to be derived from qualitative data)

- Changes in total product sales (quantity)
- Proportion of product sales through new market outlets, compared to 'traditional' or alternative (status quo ante) outlets
- Product prices received through new market outlets, compared to 'traditional' outlets
- Prices and income stability
- Proportion of income from new economic activities, compared to 'traditional' activities
- New income earning opportunities e.g. labour markets, associated services

A second set of indicators which relates to market participation capacity of smallholder farmers was elaborated. A livelihood approach was used to assess changes or how the projects benefited the market participation capacity of smallholder farmers. Livelihood change results in an increase of livelihood assets (natural, human, social, physical and financial). The following key capacity indicators were selected for the four projects.

Natural Assets:

- Scale of production, increases in livestock numbers or new land brought into production
- Uptake of new production technologies such as new varieties
- Investments in resource conservation and management
- Human Assets:
 - Improved technical skills for production and managerial skills
 - Improved quality control protocols
 - Development of skills in new product development and exploitation of new markets

Social Assets:

- Access to markets and information
- Participation in collective activities – product sales through intermediary organizations
- Participation in collective activities – organizational and membership and governance activities
- Formalization of contractual linkages with value chain intermediaries

Physical Assets:

- Technology, buildings, equipment, machinery and housing improvements
- Investments in processing and marketing infrastructure – individual and/or collective

Financial Assets:

- Access to credit
- Income benefit from product sales

Finally, the third step is to determine a suitable sample size and develop a strategy for collecting data. The size of the sample is influenced by the population size of the project beneficiaries, their geographical dispersion, willingness to participate in the survey, and available resources. For this study, four focus group discussions per project were held in different locations (these employed meta cards to collect information from farmers to reduce peer influence and bias). A survey tool consisting of questionnaires for each case/project was developed. The survey is composed of several sections, covering farm characteristics, production activities, and information on market outlets. Visits to the project areas were also carried out. The field trip visits enabled the collection of data, conduct of interviews, and assessment of projects' results and outcomes first hand. It was also an opportunity to discuss with government officials and the private sector operators to see if

support would be likely to be provided for the sustainability of the project beyond its lifetime.

4. ANALYTICAL MODEL

In addition to a set of descriptive statistics to describe and compare variables, this study used a logit model to test factors affecting improvements in market access. These factors refer to the five participation indicators developed in the previous section. Improved market access was defined as an increase in the price received for the produce as well as improvements in terms of quality and quantity. All this information was collected from the field surveys.

Smallholders are assumed to make decisions based on the principle of utility maximization. Assume that market is indexed by m , where m is equal to 1 and refers to non-participation in markets, and 2 for participation, or improved participation, in markets. Also, assume that a linear relationship exists between the utility derived from market participation, or non-participation, and a vector of observed farm/household-specific characteristics X_i such as land size, soil type, family size, level of education, etc., and a zero mean random disturbance term e_i :

$$U_{mi} = X_i \gamma_m + e_{mi}, m = 1, 2; \text{ and } i = 1, \dots, n. \quad (1)$$

Under the above specification, smallholders are assumed to choose to engage in market transaction if the utility derived is strictly higher than the utility of not participating in markets. In other words, farmers will participate in markets if $U_{2i} > U_{1i}$. If the decision is indexed by a qualitative variable such as M_i , the farmer's decision can be written as a binary outcome of the form:

$$M_i = 1 \text{ if } U_{2i} > U_{1i} \text{ and } M_i = 0 \text{ if } U_{2i} < U_{1i}$$

Therefore the probability that the smallholders will participate in markets can be expressed as a function of farm and household-specific characteristics:

$$P_i = P_r(M_i = 1) = P_r(U_{1i} < U_{2i})$$

$$\begin{aligned}
&= P_r(X_i\gamma_1 + e_{1i} < X_i\gamma_2 + e_{2i}) \\
&= P_r[e_{1i} - e_{2i} < X_i(\gamma_2 - \gamma_1)] \\
&= P_r(\varepsilon_i < X_i\alpha) = F(X_i\alpha) \tag{2}
\end{aligned}$$

where $P_r(\varepsilon_i < X_i\alpha)$ is a probability function, $\varepsilon_i = e_{1i} - e_{2i}$, a random disturbance term, $\alpha = \gamma_2 - \gamma_1$, is a vector of coefficients, and $F(X_i\alpha)$ is a cumulative distribution function for ε_i measured at point $X_i\alpha$. Equation (2) stipulates that the probability that a smallholder will access a market is equal to the probability that the utility of non-participation is less than the utility of participation or the cumulative distribution function measured at $X_i\alpha$. The marginal effect of an independent variable on the probability of participating in markets can be expressed as:

$$\frac{\partial P_i}{\partial X_{ij}} = f(X_i\alpha) \cdot \alpha_j$$

where $f(X_i\alpha)$ is the marginal probability density function at α_j . The sign of the marginal effect will depend on the sign of α_j , which in turn depends on $\gamma_2 - \gamma_1$. Therefore α_j will be positive if $\gamma_2 > \gamma_1$.

Assuming the transformation function F follows a logistic function, the probabilities of participation in markets is given by:

$$P_r(M_i = 1 \text{ given } X_i) = \frac{e^{X_i\alpha}}{1 + e^{X_i\alpha}} \tag{3}$$

Equation (3) is not linear in X and α , but it can be linearised by taking the natural log of the odds ratio in favour of participation in markets. In other words, the ratio of the probability that a farmer participates in markets to the probability that he/she will not. The resulting estimation equation is referred to as the logit regression. Hence, the probability of participating in markets can be assessed by (Rahm et al., 1984):

$$P_r(M_i = 1) = F\left(\alpha_0 + \sum_{j=1}^6 \alpha_j X_{ij}\right), \tag{4}$$

Equation (4) is used in this study to evaluate the combined impact of X_p , a vector of selected market participation indicators, in preventing or stimulating market access.

As can be seen from the above methodology, market participation choices are similar to technology adoption choices and as such can be studied from a similar analytical approach. For example, a number of studies on technology adoption apply logit, probit, or tobit models² to single out variables that contribute significantly to technology adoption (Waithaka et al., 2007; Freeman et al., 2003; Adesina et al., 1995). For the purpose of this study, a logit regression is applied to the data. The model is written as:

$$\ln \left[\frac{P}{(1-P)} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_n X_n + e \quad (5)$$

Where:

$X_1 = Hous_asset$: refers to changes in household assets associated with the project; 1 if changes are positive, 0 otherwise.

$X_2 = Acc_ext$: refers to whether or not extension services were adequately provided through the project; 1 if adequately provided, 0 otherwise.

$X_3 = Acc_credit$: refers to whether or not credit was adequately provided through the project; 1 if adequately provided, 0 otherwise.

$X_4 = Ag_asset$: refers to change in agricultural assets associated with the project; 1 if changes are positive, 0 otherwise.

$X_5 = Skills$: refers to how adequately farming skills were delivered; 1 if adequately provided, 0 otherwise. Since farm management skills were disseminated through cooperatives, the variable skills can also be seen as a proxy for participation in collective activities.

2 Logit and probit models generate relatively similar results. The difference resides in the assumption they make regarding the distribution. Logit assumes cumulative standard logistic distribution, while the probit is associated with the cumulative standard normal distribution. Tobit model, on the other hand, is used when the dependent variable is censored.

X_n = Farm and household characteristics (*farm size, district, age, education, and wealth*).

e = error term.

The dependent variable is the natural log of the probability of improved access to market divided by the probability of no improvements (1-P). Given that the left hand side variable is dichotomous, OLS estimation produces estimates that are statistically biased and inefficient. In this case, a maximum likelihood estimation is preferred as it yields consistent, efficient, and asymptotically normal estimators. With respect to the expected signs of the independent variables entering equation (5), it was hypothesised that positive changes in household assets as a result of project activities are positively related with the probability of improved market access of the project participating smallholders.

Household assets such as radio, bicycle, motorbikes, increase farmer's access to information and the likelihood of participating in markets. Extension services delivered under CFC/FAO projects cover a wide range of activities ranging from crop husbandry to diffusion of input and market information. Thus, access to extension services is foreseen to influence positively the probability to participate in markets. Similarly, smallholders who have access to credit are more likely to hire factor inputs and thus more likely to participate in output markets. For example, the establishment of a revolving loan fund, is expected to be positively associated with the probability that project participating smallholders improve their market integration. Access to productive assets such as planters, cultivators, and technology, enhance the ability of farmers to generate marketable production surplus. Thus, a build up of productive assets through CFC/FAO projects will increase the probability of successful market integration. Likewise, project activities which develop skills in cropping, marketing, and farm management are likely to create enabling conditions for smallholders to integrate markets. Variable *Skills* is therefore expected to relate positively with the dependent variable. Finally, farm and household characteristics, such as *education, wealth, age, farm size, and location* are assumed to influence positively the probability of improved market access. The *location* variable captures regions with higher potential as a result of, for example, more suitable soil types, climate, and local market structure.

5. RESULTS FROM THE CASE STUDIES

A number of lessons can be drawn on the determinants of successes and failures of CFC/FAO projects in assisting smallholder farmers to participate in agricultural markets/value chains. In total, 131 responses were collected from the field survey carried out in the four country case studies. Table 1 shows the breakdown of questionnaire response by country. About 82 of the respondents were male, while 45 percent of the participating smallholders were aged over 50 year old, with the average years lived in the community area amounting to 33 years. The next section discusses some of the key findings based on qualitative and quantitative analysis.

Table 1: Questionnaire response by country

Country	Frequency	Percent	Cumulative
Ethiopia	23	17.56	17.56
Peru	29	22.14	39.69
Tanzania	40	30.53	70.23
Zambia	39	29.77	100.00
Total	131	100.00	

5.1 ACCESS TO PRODUCTIVE ASSETS

The evidence from the literature and case studies abounds on the importance of stimulating market participation capacity of smallholders. Results from this study do not differ from the evidence. Without an enabling environment that enhances their natural, human, social, physical, and financial assets, smallholders do not have the appropriate incentives to participate in markets. The results of the field survey carried out in the four case study regions, showed that project activities targeting the five market participation capacity indicators, described in the methodology section, contributed to strengthening market linkages. Table 2 shows summary results from the livelihood assessment approach broken down into five livelihood assets: natural, human, social, physical and financial.

Table 2: Impact of CFC/FAO projects

INDICATORS	Ethiopia	Peru	Tanzania	Zambia
Natural Assets	Positive. Land devoted to green beans production expanded.	Positive changes in natural asset. The scale of jatropha production increased.	Access to land was increased and farmers adopted a new sisal variety hybrid 118648	Overall, there was an increase in natural assets for most of the dairy farmers. 82% of the respondents attributed the increase in the number of dairy cows to the project.
Human Assets	Positive changes in human asset building. Farmers acquired new skills in green beans production and quality control and a new market for green beans was exploited.	Positive changes in human asset building. Farmers acquired new skills in crop husbandry practices that include pruning, use of agronomic manure, bio-insecticides and use of bees that pollinate the crop.	Limited changes in human asset building as farmers had limited production skills and extension support.	Positive changes in human asset building. Farmers improved their skills in milk production and post harvest handling.
Social Assets	None. There was no access to the market beyond the project. There was no market linkage established with other markets (local or regional).	Positive changes in social assets building. Farmers have formed agricultural associations and social interaction has improved among farmers.	Positive social assets built. Smallholder farmers were able to organise themselves into cooperative groups and unions.	Positive social assets built were noted. Farmers are organised into cooperatives and sell their milk in bulk for processing.
Physical Assets	Positive changes in physical assets building. An increase in agricultural assets (cattle, sheep, goats) and household assets (radio, bicycle, cart) were recorded for most households.	Positive changes in physical assets building. There has been acquisition of new agricultural assets and improvements in housing infrastructure.	There was an increase in agricultural assets (cattle, sheep, goats) and 66% of the households increased their household assets (i.e. radio, bicycle, TV).	Ownership of physical assets increased (radio, bicycle, TV, dairy cows) were recorded for most households.
Financial Assets	Positive changes in incomes were noted.	There has been income gain for some farmers. More farmers are expected to make higher incomes after the sixth year of production where jatropha achieves optimum production and farmers start to recover their investment.	There was income gain for most of the smallholder farmers.	There was income gain for most of the smallholder farmers.

Overall, project activities had a positive impact on market participation capacity indicators. In order to assess empirically how changes in market capacity indicators influenced market participation, a logit regression analysis

was applied to the entire set of survey data. The selected independent variables covered the five market capacity indicators as described in table 2. Household and farm characteristics contributing significantly to the model were added on the basis of the resulting goodness of fit measured by the log likelihood chi-square. Also, variables with multicollinearity were identified and dropped from the model.

The variables *education, wealth, farm size, district, and age of the household* were found to improve the explanatory power of the model. The resulting odds ratios and standard errors are shown in table 3³. The likelihood ratio chi-square of 46.4 with a p-value less than 0.05 shows that the resulting model as a whole fits significantly better than a model with no independent variables. This means that the included explanatory variables contribute jointly towards explaining smallholders' market participation patterns. Access to extension services and training, expansion in private productive agricultural assets, access to credit, district, farm size, age of the household, and wealth had significant influence on market access. All these variables were significant at the 10 percent level, except for both variables access to credit and district, which were significant at the 5 percent level.

A positive and significant relationship ($P = 0.066$) was found between improvements in market access and the provision of extension services and training. A shift from inadequate access to extension ($X_2 = 0$) to adequate access to extension ($X_2 = 1$) increases the probability of improvements in market access from 0.280 to 0.865, which corresponds to a 58.5 percent increase (Table 4). This result underlines, once more, the importance of extension services and training for dissemination of knowledge, technology such as new crop varieties, and farm practices. The key challenge is to maintain funding to extension units beyond the lifetime of the project, so that gains in market access are sustained and further developed.

Similarly, a positive and significant relationship was found between changes in agricultural assets associated with the project and market participation. The probability of improvements in market access increased by a factor of 1.1 for smallholders who built up productive assets, such

3 The coefficients of the logistic regression were exponentiated so that they can be interpreted as odds-ratios.

as livestock and planters, as a result of their involvement in the CFC/FAO projects (in comparison to those who did not manage to build up productive assets). In many cases, livestock sales provide smallholders with the liquidity necessary to purchase fertiliser, high yielding varieties, and other technologies to increase marketable surplus. Domestic asset building programmes can therefore generate significant returns to smallholders.

The variable credit was found significant ($P = 0.032$) and had the expected positive sign. This result is not surprising, it only underlines the stimulating effect of project activities that include provision of financial services. An example would be the revolving loan fund for smallholders established in the case of the project in Ethiopia, as discussed earlier. The analysis of partial effect of the variable credit shows that a shift from having inadequate access to credit ($X_3 = 0$) to adequate access to credit ($X_3 = 1$), through a revolving fund, for instance, increases the probability of improvements in market access from 0.348 to 0.924, or by 57.6 percent (Table 4).

The result from the logit regression also showed that the likelihood of an improvement in market access increased with the geographic location, or *district*. Smallholders located in district with a tradition for commercialisation were more likely to engage in market transactions themselves. The variable *district* was found to be positive and significant ($P = 0.004$), with the probability of improvements in market access increasing by a factor of 1.51 for smallholders located in districts with prevailing favourable agro-ecological conditions, socio-economic structure, and/or other related agriculture and local factors. A positive and significant ($P = 0.089$) relationship was also found between market access and *wealth* of the smallholders. Wealthy and better endowed smallholders are likely to benefit from project activities and further raise their level of market integration. In fact, a shift from being a poor smallholder to a middle-income smallholder increases the probability of improvements in market access from 0.121 to 0.729, or by 61 percent.

The variable farm size was found significant and with an unexpected negative sign. This means that smallholders with large farm size felt that project intervention did not enable them to improve on their market participation. A possible reason to explain this inverse relationship is that gains in land productivity and/or market sales were not large enough to

offset the costs associated with the increase in production. This result implies that efforts to expand farm size should be accompanied by similar efforts to raise land productivity. Finally, the variable *age* of the household head was found significant ($P = 0.006$) and negatively related to market participation, suggesting project interventions tend to benefit younger farmers, in terms of gains in market participation, than older ones. This is probably due to the ability of younger farmers to assimilate new technologies and practices more efficiently⁴, enabling them to overcome quickly fixed market access costs (e.g. transaction costs). Other variables such as change in *household assets*, *skills*, and *education* were not significant at the 10 percent level. However, their inclusion was found to improve the logit model, suggesting that their association with other independent variables contributes jointly to explaining smallholder market participation patterns.

Clearly, there are synergies amongst the different market participation indicators due to spillovers that exist across the various dimensions of market participation – i.e. stimulating access to credit is likely to lead to greater access to inputs, improved technology adoption, higher production, and better market linkages. The challenge for policy and project interventions is to adequately select and prioritise major constraints that appear to be the most limiting factors. The identification of barriers to entry should be based on a participatory approach where stakeholders are the main target and source of input, as discussed in the methodology section. Generally, evidence from the literature demonstrates that weak household endowment and inadequate private productive assets constitute the greatest barriers to commercial farming (Cadot et al., 2006; Barrett, 2010), in addition to investments into institutional and physical infrastructures such as roads, wholesale markets, financial services, and energy plants.

4 Returns from the survey showed that younger farmers, those aged between 25 and 35, have on average a higher level of education (at least a secondary level education) than the higher age category.

Table 3: Influence of market capacity indicators on market participation

Logistic regression	Number of obs	=	84
	LR chi2(7)	=	46.4
	Prob > chi2	=	0.000
Log likelihood = -34.16435	Pseudo R2	=	0.4044

Acc_Market	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Hous_asset	0.985783	0.0644948	-0.22	0.827	0.8671446	1.120653
Acc_ext	1.018478	0.010142	1.84	0.066	0.9987927	1.038551
Acc_credit	5.175038	3.96757	2.14	0.032	1.151646	23.25456
Ag_asset	1.090396	0.0504127	1.87	0.061	0.9959332	1.193818
Skills	1.850582	1.608039	0.71	0.479	0.3370295	10.16129
Farm_size	0.8925918	0.0557532	-1.82	0.069	0.7897416	1.008836
Age	0.1754997	0.1121787	-2.72	0.006	0.0501409	0.6142723
District	1.506748	0.2122073	2.91	0.004	1.143297	1.985738
Education	0.9928677	0.2933997	-0.02	0.981	0.556359	1.771853
Wealth	10.88761	15.27058	1.7	0.089	0.6967348	170.1366

Table 4: Probability changes for selected discrete explanatory variables

Survey response	Probability	Change in probability
Access to extension		
Inadequate	0.28	
Adequate	0.865	0.585
Access to credit		
Inadequate	0.348	
Adequate	0.924	0.576
Wealth		
Poor	0.121	
Middle-income	0.729	0.601

Note: For example, a shift from inadequate access to extension to adequate access to extension raises the probability of improvements in market access from 0.280 to 0.865, or 58.5 percent increase.

5.2 IMPACT OF PROJECTS ON SMALLHOLDERS' LIVELIHOODS

Looking at some of the main results of the case studies, it emerges that project activities did have relatively significant positive effects on smallholder livelihoods. In Ethiopia, it was not possible to compare income changes in the absence of a baseline, but project beneficiaries acknowledged that revenues and livelihoods improved, a situation they associated with the implementation of the project. Returns from the survey also showed that farmers were able to increase the scale of agricultural production overall, while analysis of assets suggested a number of benefits through re-investment of income in minor household assets and improvements in housing infrastructure as well as acquisition of new agricultural assets. Capacity building among farmers was also positive: significant skills in production and post harvest handling were gained. The construction of two pack houses was a major investment for the cooperatives, enabling smallholders to process value added products and local communities to benefit through the creation of new employments both at the farm and processing levels.

In Peru, smallholders learned new techniques for the production of *Jatropha curcas*, including pruning, use of organic manure, bio-insecticide use, and use of bees that help to pollinate the crop. Beekeeping became a source of additional income and improved livelihoods for farmers who consumed and sold the honey in the market. The project also helped the development of a bio-insecticide made from *Jatropha* oil. This organic product has fungicidal properties and can be used as an insect repellent. Given the opportunities created by the expansion of organic agriculture, smallholders participating in the project were able to generate extra income through the sale of organic fertilisers. Analysis of assets suggest that farmers were also able to make some investments in household assets and minor improvements in housing infrastructure as well as acquisition of new agricultural assets. Also, with financial support from the project, a tractor was purchased to assist smallholders with the farming operations. Finally, the demand for agricultural labour increased in the community spurred by the project activities.

In Tanzania, given the semi-arid area, sisal cultivation provided low income farmers with an alternative agricultural activity that generates a



sustainable income to supplement on farm food production. In addition, access to land was increased, allowing some farmers to expand their land holdings and the overall scale of production. Results from the survey showed that sisal project activities to build up productive assets, led to income gains for most of smallholders. Smallholder farmers were also able to organize themselves into groups and cooperatives. This strengthened their position to lobby for better input and sisal prices. At the community level, demand for labour rose in response to sisal planting, weeding and harvesting operations. The dairy project in Zambia showed that strengthening market participation of smallholder milk producers could be achieved through the diffusion of innovative livestock feeding technologies and the conservation of protein-rich feed stock with a focus on the dry seasons (May-June). Returns from the field survey showed that milk yields and quality was increased allowing for longer shelf life and improved product safety. Milk production per cow rose significantly from a mean of 4.1 litres to 8.4 litres of milk per cow per day, a 104 percent increase. About 82 percent of the respondents attributed this change to the project. Also, milk losses were eliminated, from a mean loss of 30 percent, as a result of the installation of generators funded by the project. At the community level, there was an increase in employment prompted by higher production and processing of milk.

In the four case studies, improved access to privately held assets and technology, along with knowledge of new production and post-harvesting skills, helped raise overall productivity and access to markets. As shown in table 5 and table 6, responses from the questionnaire indicated that both households and farm productive assets increased. In the case of agricultural assets, the number of owned assets was higher following the implementation of the project activities, with the difference statistically significant at the 5 percent level (see Table 5). Similarly, smallholders reported an increase in household assets due to their involvement in the project, with the difference statistically significant at the 5 percent level (see table 6). Transfer of technology was also considered adequate. About 69 percent of the respondents believed that transfer of technology was appropriately provided the project.

Table 5: Paired t test on access to agricultural assets

Paired t test

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
agAsset2	132	10.36364	1.823944	20.95552	6.75544	13.97183
agAsset1	132	6.621212	1.299279	20.95552	4.050929	9.191495
diff	132	3.742424	1.131153	12.99596	1.504734	5.980115
mean(diff) = mean(agAsset2 - agAsset1)				t =	3.3085	
Ho: mean(diff) = 0				Degrees of freedom =	131	
Ha: mean(diff) < 0		Ha: mean(diff) != 0		Ha: mean(diff) > 0		
Pr(T < t) = 0.9994		Pr(T > t) = 0.0012		Pr(T > t) = 0.0006		

Note: agAsset2: Frequency of agricultural assets after project implementation - agAsset1: Frequency of agricultural assets prior to project implementation.

Table 6: Paired t test on access to household assets

Paired t test

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
hAsset2	132	2.621212	0.371543	4.268704	1.88621	3.356213
hAsset1	132	1.962121	0.1715361	1.970799	1.62278	1.36817
diff	132	0.6590909	0.3584397	4.118159	-.0499883	5.980115
mean(diff) = mean(hAsset2 - hAsset1)				t =	1.8388	
Ho: mean(diff) = 0				Degrees of freedom =	131	
Ha: mean(diff) < 0		Ha: mean(diff) != 0		Ha: mean(diff) > 0		
Pr(T < t) = 0.9659		Pr(T > t) = 0.0682		Pr(T > t) = 0.0341		

Note: hasset2: Frequency of household assets after project implementation – hasset1: Frequency of household assets prior to project implementation.

One of the key initiatives to expand privately held assets by smallholders is to improve access to financial services (e.g. credit, savings, etc.). Often, high interest rates and the need for loan collaterals prevent smallholders from accessing credits necessary to build up assets and generate production surplus. The existence of market failures does not allow private sector actors to offer financial instruments catered to smallholders, especially those living in remote rural areas. Although microcredit institutions represent a viable solution to market failures in credit markets, they still fail to reach all poor farmers. Failure to reach smallholders can be attributed to significant cost of

transactions in remote areas, and high interest rates which these institutions need to charge to cover their costs. In the case of the project in Ethiopia, the establishment of a revolving loan fund as part of the project actions enabled smallholders to purchase inputs necessary for profitable commercial green bean production. The vast majority of respondents felt that provision of credit was adequate in the case of Ethiopia. However, when aggregating the results across all four projects, 50 percent of the surveyed smallholders felt that the issue of lack of credit was not adequately addressed through project activities.

On the other hand, access to extension services and technology was considered adequate (see table 7 and table 8). In aggregate, improved access to technology was associated with better market integration for 67 percent of the survey respondents. The impact of technology adoption can be assessed by looking at changes in productivity levels. For example, table 9 compares yields for green beans before and after project implementation in Ethiopia. It shows that yields were relatively higher following the project intervention, with the difference between yield levels statistically significant at the 5 percent level. Similarly, in Zambia, milk production per cow expanded more than 100 percent. About 82 percent of the respondents attributed this change to the project (Table 10).

Table 7: Access to extension services through projects

Ext. support	Frequency	Percent	Cumulative
Inadequate	30	29.41	29.41
Adequate	48	47.06	76.47
No response	24	23.53	100.00
Total	102	100.00	

Table 8: Diffusion of technology through projects

Technology	Frequency	Percent	Cumulative
Inadequate	8	20.51	20.51
Adequate	22	56.41	76.92
No response	9	23.08	100.00
Total	39	100.00	

that 112 out of 128 (87.5 percent) targeted smallholders are middle income households with an average landholding of 5.3 hectares, which is 208 percent more than households classified as poor. Middle income smallholders also have a higher level of education (table 13) and reported, on average, more household assets than poor households (table 14).

Second, the field survey revealed some weaknesses in the design and implementation of the marketing component of FAO/CFC projects, which include building sustainable supply chain linkages. Participating smallholders generally felt that skills in marketing and negotiation still needed to be improved, and that prices received for their produce could have been higher. In the case of Ethiopia, Peru and Tanzania, lack of better prices was associated with limited market outlets; for these projects, there was only one buyer. The failure to build sustainable supply chain linkages was more evident in the case of Ethiopia. Little attention was paid to capacity building at the cooperative level and there were no enduring supply chain linkages and business networks established between producers, cooperatives and sustainable export partners. For some of the smallholders, the short-term benefits of exporting green beans was outweighed by losses incurred following the decision by the exporter associated with the project to halt its green bean operations. Clearly, the loss of the export channel meant that none of the direct benefits generated at the beginning of the project were sustained. Farmers who invested in green beans specific assets eventually found themselves with limited, or no returns, on these new assets.

Third, project agreements should include detailed breakdown and an assessment of the counterpart contribution, so that risks are well balanced amongst the stakeholders. One specific example is the case of the project in Ethiopia where the participating exporting company suspended its green bean exporting operation, leaving smallholders associated with the projects with no export channel for their produce at the termination of the project. Risks related with the project needed to be carefully evaluated to minimise possible welfare losses on smallholders. One of the options in the case of Ethiopia would have been to expand the commodity portfolio addressed by the project along with setting up contractual agreements with more than one green beans exporting company.

Table 11: Smallholders' wealth distribution

Wealth	Frequency	Percent	Cumulative
Very Poor	3	2.31	2.31
Poor	11	8.46	10.77
Middle Income	114	87.69	98.46
Rich	2	1.54	100.00
Total	130	100.00	

Table 12: Smallholders' land holding by wealth

Wealth	Summary of Farm size		
	Mean	Std. Dev.	Frequency
Very Poor	0	0	3
Poor	1.7272727	2.1489955	11
Middle Income	5.3035714	11.47257	112
Rich	1	1.4142136	2
Total	4.8046875	10.827292	128

Table 13: Smallholders' level of education by wealth

Wealth	Summary of Education		
	Mean	Std. Dev.	Frequency
Very Poor	3	1.7320508	3
Poor	2.6363636	0.50452498	11
Middle Income	4.5614035	12.708464	114
Rich	3	0	2
Total	4.3384615	11.912181	130

Note: 1: None; 2: Primary; 3: Secondary; 4: High school; 5: Diploma; 6: University

Table 14: Smallholders' level of education by household assets

Wealth	Summary of Household assets		
	Mean	Std. Dev.	Frequency
Very Poor	0	0	3
Poor	1.2727273	1.1908744	11
Middle Income	2.0614035	2.0056782	114
Rich	3.5	3.5355339	2
Total	1.9692308	1.976366	130

Note: Household assets refer to the frequency of household assets prior to project implementation.

6. LESSONS AND GUIDELINES FOR FUTURE PROJECT INTERVENTIONS

A number of lessons can be drawn on the determinants of successes and failures of CFC/FAO projects in assisting smallholder farmers to participate in agricultural markets/value chains. In the following section, four key lessons from the study are discussed.

6.1 PARTICIPATION OF SMALLHOLDERS IN COMMERCIALY-ORIENTED PRODUCTION AND MARKET ACTIVITIES

Project activities aimed at improving smallholders' market participation capacity lead to positive outcomes for farmers and local communities. Building up market participation capacity, such as farming skills and private productive assets, are necessary requirements to greater market access. The empirical evidence from the four country case studies shows that smallholders' access to markets improves following the implementation of specific private assets and skills enhancement activities. For example, the dairy project in Zambia provided training to smallholders on how to grow and preserve feed for dairy operations. As a result, milk yield per cow increased and the seasonality of supplies to the milk collection centres had decreased significantly, contributing to higher returns to smallholders. In Tanzania, the release of land deeds by the Government to the Tanzania Sisal Board (TSB)

for allocation to smallholders to engage in sisal cultivation and supply the processing mills, was a determinant in ensuring smallholder integration into the sisal value chain. Similarly, for the vegetable export development project in Ethiopia, local authorities allocated land plots for the construction of two privately managed pack houses, which was determinant in enhancing smallholders' access to markets.

However, sustaining market participation means that consideration must also be given to reinforcing market related institutions and infrastructures (e.g. roads, electricity, the rule of law, physical markets, etc.). These elements can have a significant influence on the decision to participate in markets, and underpin the key role of Governments, as a provider of public goods, in ensuring the success of projects. The responsibility of the public sector in commodity specific projects must be clearly defined to identify its roles and expectations. The public sector often provides start-up support to projects in terms of financial and human resources along with specific services in the fields of research, infrastructure, extension and training and capacity building.

Institutional support in relation to the establishment and strengthening of organisations such as cooperatives and producers' organisations, appears to be a very important component of successful projects. In the case of Zambia, Tanzania, and Peru, farmers pointed out that collective marketing secured farmers with remunerative market outlets. Smallholders' organisations are more likely to achieve economies of scale in production and purchasing of inputs, facilitating their integration into commercial farming.

The selection of specific market channels may constrain smallholders into a particular value chain, as the case study in Ethiopia and, to a certain extent, in Peru showed, which tends to shift a significant share of market risks onto smallholders themselves. The use of formal written contracts between producers and buyers is likely to reduce transaction cost risks inherent in commodity specific projects.

Capacity development must also encompass training of smallholders (and extension agents) on such issues as evaluation of market conditions and outlook, and negotiations on pricing and payment terms. This is an area which survey respondents felt that more needed to be done to better equip

them to face the challenges of operating in the market on a sustainable manner. Such requests were formulated in all four country case studies.

6.2 RECOMMENDATION FOR SELECTING PROJECT PARTICIPATING SMALLHOLDERS

The basis, or process, for selecting project participating smallholders is critical and needs to be clearly formulated. The first step is to agree on a set of criteria that define a smallholder. The definition may vary from project to project and also within a project itself depending on the country context. It is also equally important to identify a methodology which enables the identification and targeting of smallholders. Evidence from the country case studies showed that the selection of smallholder participants was not sufficiently defined and articulated. Targeting of smallholder farmers seemed to have been more successful in Ethiopia, where farmer cooperatives were involved in identifying and selecting project participants from within their own membership. In Tanzania, where the selection of beneficiaries was on a voluntary basis, this resulted in having project participants who were not necessarily in need of support. A similar situation can be reported in the case of Zambia and Peru. Clearly, in many instances, targeting is fraught with ethical issues that are not frequently discussed openly. Targeting involves explicit biases. Many projects in effect target their interventions at the producers most likely to respond, which creates a productivity bias. Often, targeting is based on a minimum or threshold concept of asset endowments that project participants must meet:

- level of human capital, e.g. education
- financial capital – access to credit and loan collateral
- physical and natural assets – scale of production
- social – level of organisation, supply chain management, geographical proximity to markets
- psychological – propensity towards market orientation and innovation

Such an approach is likely to generate the best economic returns to the intervention. A consequence is that the most marginal and poorest rural people are likely to be excluded as beneficiaries. However, they may benefit through second round effects. For example through increases in demand for labour, as was the case in the case study in Ethiopia with the establishment of the pack houses, which generated demand for labour.

The threshold concept implies the exclusion of the poorest smallholders within a community, or region, and is likely to give rise to increasing inequality. Increasing inequality between regions is also a likely consequence where specific localities are targeted. Adopting a productivity bias is therefore an effective approach for boosting the local agricultural economy and not a conducive approach for reducing poverty among the poorest.

An alternative method is to target the poorest, as is the case in micro-finance projects. This is a poverty bias, based on common methodologies such as wealth ranking and more-or-less readily available household income data or per capita conceptions of wealth/poverty. The capacity of the poorest people to respond to opportunities may indeed be constrained with lower returns to interventions. However, even small impacts on poverty may result in significant benefits to participants. Other potential, and combined approaches, involve targeting women or single-headed households or younger people or collective organisations. The targeted population is, therefore, a choice variable. The decisions and the consequences should be clearly articulated. Project design must involve explicit discussion and negotiation between donors and host government bodies, implementing agencies and potential beneficiary populations.

Project design must ensure that the objectives of the intervention are consistent with the targeting, and the objectives preferably should be limited in number and scope. Thinking in terms of livelihood assets and outcomes is a helpful way of ensuring that objectives, targeting, types of intervention and expected outcomes are coherent. Thus, investment in human, social, financial and physical assets (and maybe natural assets by way of land tenure measures and reforms, and investments in ecological sustainability) are proximate objectives for economic development and poverty reduction.

6.3 COMMITMENT OF STAKEHOLDERS TO FULFIL THEIR OBLIGATIONS UNDER THE PROJECT

Working through existing institutional structures (extension services, cooperative unions, etc.) that farmers are already familiar with is important in securing buy-in to the project by the beneficiaries. This was particularly successful in Ethiopia and Zambia. In Ethiopia, the project worked through the existing extension services and farmer cooperatives which the farmers were already familiar with. In Zambia, the project built on earlier initiatives that were already in existence for the smallholder farmers: the dairy cooperatives and the milk collection centres. Hence local institutional and organisational context is important. Stakeholder mapping and analysis is a necessary part of the project design process, identifying and making explicit the conflicting, competitive and cooperative interrelationships.

There is also a need for strong support and commitment by stakeholders to fulfil their obligations under the project. Contractual responsibilities should be clearly negotiated and specified. Where required, counterpart contributions must be quantified as well as fair and balanced. The case study from Ethiopia demonstrates that contractual commitments by stakeholders must be given the utmost attention to ensure that project results extend beyond the life of the project.

6.4 CAPACITY DEVELOPMENT

Capacity development through participatory approaches and training are necessary to increase smallholder productive capacity and these were successfully implemented in the Zambia and Ethiopia case studies. At the institutional level, there is a need to create/enhance capacity of national implementing institutions. In Ethiopia, there was no capacity development at the cooperative level and no sustainable supply chain linkages between producers, cooperatives and export partners. In Tanzania, there was no provision made for the development of commercial scale distribution of improved sisal planting material.

Where smallholder farmers are developing associations, it is essential to provide training to the associations, particularly in price formation,

negotiation, financial management and other business skills to help them better fulfil their roles. Returns from investments in organisational capacity building as well as human and social capital may appear relatively small, but in the long-run greater benefits can be expected, reinforcing smallholders' market linkages and increasing their ability to react to new market opportunities.

It is important to recognise the need for public and private sector partnerships. The involvement of Governments, private sector, and donors, contributes to the effectiveness of project implementation and reinforces project delivery. The involvement of the public sector ensures continuity, and the scaling up of successful projects. It also provides the private sector and donors with greater assurances of continuity, which in turn strengthens commitment.

7. CONCLUSION

The purpose of this study was to draw lessons on the determinants of successes and failures of CFC/FAO projects in assisting smallholder farmers to participate (and/or participate on more favourable terms) in agricultural markets/value chains. On the basis of four country case studies, and using both qualitative and quantitative methods, a series of lessons and best practices in designing and implementing commodity development projects were identified. First, survey data revealed that CFC/FAO projects mostly targeted better off smallholders, those with relatively better access to productive assets and suitable agro-ecological conditions. Only a few poor and very poor smallholders were selected as participants in the projects. This bias towards the better endowed smallholders generates the best economic returns to the intervention, but it implies that the most marginal and poorest rural people are likely to be excluded as beneficiaries - although some benefits may accrue to them through second round effects, mostly in terms of increased opportunities in local labour market. Smallholders are a heterogeneous group facing different types of constraints to market access, and as such, the initial objective of a commodity development project should be to articulate clearly the nature of those constraints relevant to each category of smallholders, so that project execution is well focused and likely to benefit the intended beneficiaries.

In order to assess the ability of smallholders to participate sustainably in markets/value chains, five market capacity indicators were developed for this study. These market capacity indicators evolved around five livelihood assets: natural, human, social, physical and financial. The results of the field survey data suggested that CFC/FAO project activities addressing all five market participation capacity indicators contributed to strengthening market linkages. Further, improvements in smallholder market participation were associated with project activities that focused on extension, training and demonstrations, and support in building up private agricultural productive assets. Gains in market participation were also correlated with the initial condition related to household and farm characteristics such as wealth, land size, asset ownership, and prevailing agro-ecological environment. Access to credit was not found to influence significantly access to market, highlighting the positive role of credit support activities which constitute, in several instances, a core component of CFC/FAO projects.

Results from the case study surveys showed that technology adoption had a significant impact on smallholders. Yields per hectare were improved significantly in the case of projects involving crop activities (Ethiopia, Tanzania, and Peru), while milk yield per cow were increased two fold on average in the case of Zambia. Project specific activities were clearly a factor behind the increase in productivity. These involved providing training to smallholders on good crop and livestock production practices, provision of planting materials (e.g. high yielding seeds), market information, and subsidised fertilisers. In the case of Ethiopia, the project instituted a revolving loan fund to be used by the smallholders' cooperative for the purchase of inputs. As a result, smallholders managed to successfully grow and export green beans, at least during the lifetime of the project. In the case of the *Jatropha curcas* project in Peru, farmers learnt new production techniques, including pruning, use of organic manure, bio-insecticide use, and utilisation of bees to pollinate crops. Increases in earnings from commercial farming triggered additional incentives to generate production surpluses, notably during the initial years following the implementation of project activities.

Given the existing bias in the selection of participating smallholders, project activities and policy recommendations need to be specific to the targeted group. For the better-off smallholders, priority should be given to areas addressing standards, quality, and export markets. In other words,

policy interventions need to put the emphasis on marketing issues, which from the survey data appeared to be one of the main barriers to expanding market access. Note that government policies on prices and trade are most likely to have the largest impact on this sub-group of smallholders, given that most of them already participate, to varying degrees, in local, national, and to a certain extent, international markets. For the poorest category of smallholders, priority should be given to activities that build up private productive assets and the preservation of natural capital, so that poorly endowed smallholders are able to accumulate assets necessary to sustain a commercially oriented farming strategy. This can be achieved through transfer of technology, skills in farm management practices, including sustainable land management practices, and access to credit and financial services. For the latter, the creation of a credit revolving fund with farmers' organisations can assist smallholder farmers integrating input markets on sustainable basis, as illustrated by the case study for Ethiopia. The case study also illustrates the importance of institutions. In the four case studies, there were considerable gains in social assets building and networking as smallholders organised themselves into cooperative groups, associations, and unions. Research and empirical evidence into technology diffusion recognises the positive impact of networking and social interaction on the decision to adopt technology (Doss R., 2006). For example, Bandiera and Rasul (2002) showed that individuals' social networks are an important source of information which influence the adoption of production technology.

The provision of reliable, affordable, and easy to access market and trade information is essential to sustain integration into both input and output markets. However, despite the importance of market information, market-related activities are generally implemented only during the final stages of the project life. Often project implementers are not experts in marketing and economics or trade issues, which naturally lead them to put more emphasis on agronomic and production aspects. There is a pressing need to integrate marketing issues into project activities right from the initial stages of implementation so that smallholders, both women and men, are able to access and use market information including market analysis on current crop situation and outlook. Another related issue is the ability of smallholders to manage risks in the face of fragile ecosystems, and volatile markets. Excessive risk discourages farmers from adopting new technologies and practices. The case studies evidenced a lack of consideration for risk



management issues, which if proposed as a major component of a project, can provide useful risk management strategies such as crop and market outlet diversification, crop insurance schemes, financial inclusion, and on-farm genetic diversity. These strategies enable farmers to withstand shocks and preserve production systems in the face of adverse factors, which is conducive to technology adoption and capital accumulation. Also, systemic risk can be reduced through public investments into infrastructure, improving governance of agricultural markets as well as natural resources. Hence, the importance of involving the public sector in the development of risk management outputs for commodity development projects.

A key factor ensuring the success of a project is whether gains can be sustained beyond the lifetime of the project. There are two main lessons that can be drawn from the case studies. First, gains are most likely to be sustained when project beneficiaries rely on more than a single commodity and/or a single market outlet. For example, in the case of Ethiopia, when the participating exporting company halted its green bean exporting operation, it left out smallholders associated with the projects with no export channel at the termination of the project. Similarly, in Peru, reliance on a single buyer rendered project beneficiaries vulnerable to market shocks, especially those without complementary activities. This leads to the second important aspect related to sustainability and that is the nature of the counterpart contribution in projects. Counterpart funding needs to be clearly defined and quantified, as well as be fair and balanced between CFC/FAO and other stakeholders. Special attention should be devoted to situations where a participating private firm holds a monopoly or monopsony power since it may leave smallholders in a vulnerable position, as shown by the case studies of Ethiopia and Peru. It is suggested that project appraisals contain elaborated details on commitments made by stakeholders to fulfil their obligations under the project, and beyond, with proposed options in case of contingency situations. Sustainability of market access depends not only on the ability of smallholders to access input and output markets, but also on how these markets operate – adequately functioning markets are the foundation of sustainability.

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