

ESSAYS ON MARKET ACCESS THROUGH COLLECTIVE ACTION:  
ANALYSES OF FACTORS AFFECTING THE FORMATION, SUCCESS, AND  
IMPACT OF FARMER MARKETING GROUPS IN KENYA

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## ABSTRACT

### ESSAYS ON MARKET ACCESS THROUGH COLLECTIVE ACTION: ANALYSES OF FACTORS AFFECTING THE FORMATION, SUCCESS, AND IMPACT OF FARMER MARKETING GROUPS IN KENYA

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Many smallholder farmers in developing countries suffer from poor access to vital financial services, improved inputs, and product markets. Collective action (CA), through the fostering of organizations such as farmer marketing groups, is frequently advocated as a solution to these problems. This study looks at the factors that contribute to the ability of such groups in semi-arid areas of rural Kenya to emerge, survive, and grow; the willingness of farmers to join and patronize them; and the impact of these groups on farmers' incomes and price risk.

This work is based on transaction cost economic theory, which explains why economic agents choose different institutional arrangements (“governance structures”) to mediate different types of economic transactions as the structure of transaction costs associated with the exchange vary (Williamson, 1979). We also use the work of Mancur Olson (1965) and Elinor Ostrom on CA to help frame our analysis.

Using household panel and producer-level data collected from Kenya in 2003, 2005, and 2007, the dissertation is organized in five chapters. Chapter 1 reviews briefly the literature on CA and the study area background. Chapter 2 explores in depth the conditions necessary for effective and sustainable producer marketing groups (PMGs) to emerge. The study utilizes both

qualitative approaches (case studies) and quantitative approaches (fractional logit and quantile regression) in the analysis. We develop a Group's Success Index and a Group Analysis Framework to identify intervention areas to improve groups' success rates. Chapter 3 explores the correlates of participation in PMGs (whether or not to join the organizations), patronage (the share of sales through the PMG once one has joined) using a Heckman selection model; and the number of CA efforts a farmer joins, estimated using Poisson regression. Chapter 4 examines the impact of PMGs on members' crop incomes and the price risk they face for their crops. We apply a difference in differences (DiD) model for this impact assessment. Chapter 5 discusses important results throughout the study as well as policy implications of the results and limitations in the study.

The results from chapter 2 show that the presence of an altruistic leader or a "core group", good governance structures, diverse activities and regular financial subscription to the group improves success rate. Using a blend of quantitative and qualitative (methods triangulation) analysis, the results provide a broader and a deeper perspective of producer marketing group dynamics and sources of their success. In chapter 3, we find that households that had received assistance from a development agent were more likely to join a group and increase patronage. Access to mobile phones reduced farmer CA participation. Factors such as a democratic group, diverse membership, reciprocity, and risk-mitigating strategies increased CA participation. In chapter 4, the study finds that PMGs do not reduce members' price risk; however, participation did improve crop incomes for PMG members compared to non-members.

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## **DEDICATION**

To my dear wife, Lilian W. Kirimi  
And our lovely daughters Kendi and Gakii,  
Who cheered me and endured the many days  
I spent away from their lives to finish this work.  
And to my loving mom who sacrificed so much  
for me and prayed for the completion of this work.

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# Chapter 1 : Essays on Market Access through Collective Action

## 1.1 Introduction

In the last few years, we have witnessed many changes in the agricultural sector in both developed and developing countries. In developed countries, there is a push for consolidation and creating bigger farms, whereas production in developing countries continues to rely on smaller and smaller farms (Dimitri, et al., 2005, Gebremedhin and Christy, 1996). The small-scale farms are getting smaller over time due to land fragmentation (Niroula and Thapa, 2006). And access to product markets has been and continues to be a challenge to these small farmers. This is because they produce small quantities per household and have small marketable surpluses that are distributed over huge geographical areas. In the past, in many developing countries, government attempted to control marketing of most crops through marketing boards and cooperatives and built chains of grain collecting centers in the rural areas accessible to the farmers. But following structural adjustment programs in the 1990s, input supply and marketing services shifted from greater government control through parastatals and marketing boards to more private-sector participation (Barrett and Mutambatsere, 2008). Although in some cases producer prices improved after the phasing out of government control through boards<sup>1</sup>, some smallholders who sell through spot market with little competition did not benefit (Fafchamps, 2004). There was lack of an institutional framework to support the small-scale farmers to gain from liberalization benefits. In general, farmers who market through the spot markets and middlemen usually get lower prices than if they were able to sell to the bigger market in the cities (Shiferaw, et al., 2008). Therefore, even with better commodity prices, smallholder farmers

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<sup>1</sup> For instance from 2007 to 2009, the world has witnessed commodity price hikes and some producers have benefited from these high prices (FAO. 2008. "Crop Prospects and Food Situation." *Global Information and Early Warning System on Food and Agriculture* (2, April), -- -. 2008. "Food Outlook " *Global Market Analysis* June

may not be in a position to benefit from these new opportunities. This is because without competitive markets, prices are not passed through the marketing chain efficiently. Also without good access to distant markets that can absorb excess local supply, even the adoption of more productive agricultural technologies will lead to a drop in farm-gate product prices (Barrett and Mutambatsere, 2008). One solution is collective action, where farmers can bulk their products and market as an organization rather than individually.

In Kenya, there are two types of collective action employed by farmers, namely cooperatives and farmers' organizations. In contrast to cooperatives, which are governed by an act of parliament<sup>2</sup> and have a government ministry dedicated to their promotion, farmers' organizations are operated with minimal government regulation or support. This dissertation is geared at exploring the second group. This is because, unlike cooperatives, farmers' groups are found mainly in areas of low agricultural potential. They are characterized by few capital resources and are often led by members with little management training. However, when these organizations are successful, farmers are able to derive similar benefits to those accessible through cooperatives. One type of farmers' group is producer marketing organizations (PMGs), which have the potential to be a tool for improvement of economic welfare of smallholder farmers by providing solutions to market failures that often characterize rural agricultural markets. In the presence of market failure, a PMG may be efficient in any of three ways or a combination of the three: a) marketing the produce at a lower marketing and transaction cost than the alternative channel, which is usually the spot market, b) if the buyer exerts market

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<sup>2</sup> In Kenya, cooperatives societies are governed by an act of parliament (ACT NO. 12 of 1997 - Co-operative Societies Act amended in 2004) relating to their constitution, registration and regulation by the central government. The commissioner of cooperatives can order a probe, audit or even change of management of any cooperative society she feels does not meet the laid down requirements.

power and pays lower prices per unit of a commodity than would prevail under perfect competition, the PMG may provide countervailing power; and c) the PMG may allow farmers to access factors of production at a lower cost (Sexton and Iskow, 1988)<sup>3</sup>.

Previous studies in Kenya have found that collective marketing allows small-scale farmers to pool their produce and spread the costs of marketing over a large amount of marketable surplus. This enables them to reap economies of scale and scope. Collective marketing also enables smallholders to enhance their ability to negotiate collectively for better prices, improving their market power (Shiferaw, et al., 2005, Shiferaw, et al., 2008). The basic functions of farmers' organizations include input supply, storage, processing, bulking or aggregating and selling products provided by their members, credit sourcing, training, member education, and political action (Von-Pischke and Rouse, 2004). Agricultural producer groups have been promoted both in developing and developed countries as a solution to the coordination and marketing failures farmers face. Justification for farmer organizations includes their potential to play a critical role in both the delivery and coordination of services to smallholder producers. It also includes their ability to reduce transaction costs (Dorward, et al., 2005) and deal with problems of barriers to market access and economies of scale (Gonzalez, 2008).

In general farmers' organizations (FOs) and other collective action (CA) can be used to access economies of scale and scope, improve bargaining power, provide inputs, and manage risk in many rural communities in developing countries (Barrett and Mutambatsere, 2008). These actions are in the form of cooperatives or PMGs that can be set up for defensive or proactive purposes. Defensive strategies focus on protecting small farmers from unfair competition, while

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<sup>3</sup> Producer marketing groups also play many other roles such as members' education, access to factors of production, and social interactions.



proactive strategies respond to new business opportunities. Either strategy enables farmers to improve their economic condition by working together in ways that are more productive than working individually (Von-Pischke and Rouse, 2004). Understanding these FOs is therefore an important step in helping smallholder farmers' access factors of production and marketing services. This dissertation is an addition to work done by other researchers and adds to the body of knowledge studies that seek understanding of farmers' organizations. A lot of work has been done on analyzing the impact of cooperatives in developed countries, but little has been done to understand FOs that mainly deal with smallholder farmers growing food crops for local markets in developing countries. Even the little work done in developing countries is largely focused on cooperatives, usually dealing with export crops. In Kenya and many other Sub-Saharan countries, these cash crops are only grown in small parts of the country, whereas most of the country grows cereals, pulses, and legumes for local use, including in areas that grow export crops. Understanding factors affecting smallholder FOs in terms of organization dynamics, operations, and patronage and their impact on farmers' welfare may help policy makers to target this part of society.

## **1.2 Background on farmer collective action in Kenya**

Kenya has a long history of formal cooperatives involving smallholder farmers in high potential areas (Heyer, 1976), which were initiated during the colonial era. Formal<sup>4</sup> or informal collective action groups perform various functions, such as income generation, asset building, commodity marketing and social functions (Place, et al., 2004). However, most of these formal groups were formed in the Kenyan highlands, where cash crops for export are grown. Few formal farmers' organizations emerged in the semi-arid areas of Kenya that mainly grow cereals

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<sup>4</sup> This study refers to groups that have not gone through formal registration as informal.

and pulses. This dissertation is focused on smallholder farmers' organization in semi-arid areas in Kenya<sup>5</sup>. The semi-arid areas are characterized by poor rainfall and lack of irrigation systems. Therefore, farmers mainly grow food crops and market only small surpluses. Despite the need for some form of collective marketing services, few formal organizations were formed in these areas. However, in the recent past, some farmers have started income diversification by growing horticultural crops, and some have formed self-initiated farmers' organizations (Okello and Swinton, 2006). Formation of formal PMGs could enable producers to add value, differentiate their products, and bulk their produce for the market, thus reducing per unit costs. However, it is safe to say that most of the agricultural produce in these areas is marketed through periodic open markets. These markets operate with few formal regulations and lack public goods such as physical infrastructure, contract law, public market price information systems, and codified product grades and standards (Fafchamps, 2001).

In the study areas (the Eastern and Western parts of Kenya<sup>6</sup>), many of the smallholders grow pulses (pigeon peas, groundnuts, cowpeas, beans, and many others) and cereals (such as sorghum, millet, finger millets and maize) under conditions characterized by unreliable rainfall and sandy soils. Farming in these areas is characterized by low inorganic fertilizer and manure use. Because of increased soil erosion due to reduced soil cover and continuous cropping, soils have become nutrient deficient (particularly in regard to nitrogen and phosphorus). Poor soils and low use of improved seeds lead to low crop production per unit area (Gachimbi, et al., 2002). These semi-arid areas are often far removed from markets in major urban areas, and the road

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<sup>5</sup> The dissertation study areas are described later under the data and study area section of this chapter.

<sup>6</sup> In Eastern region, the study was conducted in Mbeere and greater Makueni districts, whereas in the Western region, the survey was in Homabay, Siaya and Teso districts (see the map in a later section of this chapter).

conditions are poor, often becoming impassable during the wet season. To improve food security in these areas, development agencies such as ICRISAT<sup>7</sup> have been promoting improved varieties of some cereals and pulses. But as has been the case with many new agricultural technologies in developing countries, these efforts have encountered low adoption rates (Moser and Barrett, 2006). One way to encourage uptake of new technologies in the semi-arid areas is by linking producers to the market (Feder, et al., 1985, Zeller, et al., 1997). This is the “pull strategy”, which is likely to work only if the technology is profitable (Doss, 2003). Many farmers market their surplus products in local markets or at farm-gate to intermediaries, usually at low prices (Shiferaw, et al., 2005). That is the reason why PMGs are being promoted to address this marketing problem.

However, there is no consensus among researchers that PMGs are the best solution for the farmers’ marketing woes. The debate about the ability of PMGs to address smallholder-marketing problems emanates from their past experiences with farmer cooperatives in developing countries. Cooperatives have had mixed success in developing countries in the past. In Kenya, there were many cooperatives that were used for providing marketing and other services to farmers. However, due to mismanagement, many of them failed. The reasons for their failure are explored further in Chapter 2. Although there are potential problems with any collective action, some researchers have argued that for small-scale farmers to survive there are few alternatives to farmers’ organizations of some sort. This is reflected in what Chirwa et al. (2005) refer to as failure of a critical part of the Washington consensus. Reasons for failure of liberalization have been attributed to halfhearted liberalization and weak or non-existence of

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<sup>7</sup> International Crop Research Institute for Semi-Arid Tropic (ICRISAT), which belongs to the alliance supported by the Consultative Group on International Agricultural Research (CGIAR) and works on crops grown by the poor in semi-arid areas of developing countries.

critical institutions (Jayne, et al., 2002). Therefore, some researchers have argued that smallholder farmers will benefit from increased liberalized output and input markets if a greater role is played by farmers' organizations (Bingen, et al., 2003, World-Bank, 2002). Even researchers opposed to the views of Washington consensus also argue that farmers' organizations are important for access to services (Peacock, et al., 2004) or see them as a new form of economic organization that replaces government agencies phased out by structural adjustment programs (Collion and Rondot, 2001). In their study, Lele and Christiansen (1986) conclude that although farmers' organizations cannot fill the gap left by marketing boards<sup>8</sup>, with enough external support from Government and NGOs to deal with the complex organizational, technological, and financial requirements, FOs can be beneficial to producers in rural areas. These new producer organizations are promoted in developing countries as they move away from welfare transfers toward empowerment for income generation and social development. We argue that liberalization has brought challenges and opportunities, and an individual smallholder farmer often lacks the skill and resources to cope with the resulting uncertainty as well as take advantage of the emerging opportunities. Thus, collective action can be an important vehicle for smallholders to access better markets for their products and other supporting services (Dorward, et al., 2005, Gonzalez, 2008, Omamo, 2005, Shiferaw, et al., 2005). However, the main challenge is getting FOs to succeed, and often they have not been successful, implying that they may not always be a solution to the pesky market access problem.

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<sup>8</sup> Before liberalization, governments created marketing boards as a marketing monopoly for different crops. The aim was to improve a particular crop's production and improve farmers' income. However, most boards failed to deliver on their promise. Usually they paid low prices, which made it unprofitable to grow the crops, and delayed payments were common. This led to a decline in the production of most of the crops they handled. The decline was due to farmers neglecting the affected crops and some outright moving out of the crop production. This is still a thorny issue in Kenya because crops such as coffee and tea are protected by law and cannot be uprooted once planted without government approval.

In Eastern Kenya, three years after the formation of PMGs, there was evidence that the PMGs paid a premium of an average of 6 Kshs/kg (22-24%) above the price paid by intermediaries<sup>9</sup> per kg of pigeon peas (Obare, et al., 2006, Shiferaw, et al., 2008). However, the big concern is that many of the groups in the early part of their lifespan will not have enough volume to move to the flat portion of the L-shaped per-unit cost curve. Such a scenario can lead to their marketing cost being sometimes larger than that of the competition. A solution to this dilemma can be the formation of a bargaining organization rather than a PMG that directly handles the product. Hence, group success will hinge on the organization's ability to control enough products to force a price concession from buyers. Producers must then be committed to the collective bargaining effort and not cheat on the resulting agreement by selling for less than the bargained-for price. This has been achieved by some horticultural PMGs that do not handle any produce but instead are essentially a bargaining entity and virtually control all the produce in a certain geographical area.

### **1.3 Organization of the study**

From the preceding brief discussion of the background on farmers' organizations, especially in Kenya, we find that collective action efforts have the potential to improve the welfare of rural small-scale farmers. It is against this background that this dissertation seeks to extend the work done by other researchers by adding to the body of knowledge more insights into the inner working of FOs in the context of semi-arid agriculture in East Africa. No work we know of has thoroughly looked at operations of FOs at the level of PMGs. Most of the work done has looked at cooperatives, and more so in developed countries and in emerging economies. A major challenge faced in empirically analyzing the performance of farmers' groups in

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<sup>9</sup> Intermediaries are traders and brokers operating the area who sell to the wholesalers.

developing countries is lack of record keeping, which makes it very difficult to analyze them effectively. However, it is important to understand the process of group formation, group dynamics, and management. There is also a need to understand what makes some groups succeed while others fail. These questions are dealt with in chapter two of the dissertation. Members also do not always patronize the groups effectively. This dissertation also seeks to investigate the factors that contribute to group patronage. In doing so, we investigate the factors that are important in the decisions to join a farmer group and to use its services. These questions are investigated in chapter three. There is also the ongoing debate alluded to earlier on the role that farmers' organizations can play in improving their members' welfare. We will investigate in chapter four whether being a member of a group improves a household's revenue from crop income and reduces annual price volatility. From all this work, we hope to contribute to a better understanding of FOs in developing countries and give policy makers information on opportunities to make these organizations more effective and targeted where they are needed. Chapter five concludes the dissertation by giving the overall findings and recommendations.

#### **1.4 Brief description of the project that led to the study**

For smallholder farmers to have food security and market some produce for income, a steady supply of high-quality seed is central for sustainable production. Legumes in particular are an important source of food, feed, oil, and cash for many smallholder farmers in the semi-arid tropics. They fix atmospheric nitrogen biologically into mineralized form accessible for crop nutrition and hence sustain productivity in N-limiting systems. Legumes in Kenya are traditionally grown as subsistence crops, and seed supply is primarily through the informal sector. The yields are low, and subsequently inadequate volumes of marketable quantities make legumes' commercialization difficult. There are several production and marketing constraints

that have contributed to the low legume production among smallholder farmers. These are low quality seed, poor crop management practices, and poor market linkages. A USAID-funded pilot project, Technology Application for Rural Growth and Economic Transformation (TARGET) that ran between 2002 and 2004 in Kenya identified compromised seed quality, poor-quality produce, and price fluctuations as some of the problems farmers face as the consequences of using poor-quality seed (ICRISAT, 2006). Therefore, capacity building of producers, traders, and processors and increased availability of high-yielding, disease-tolerant varieties with both farmer and market-acceptable traits are pivotal for sustained production. A new project to address these shortcomings, called the Lucrative Legumes Project (LLP), was started in 2005.

The objective of LLP was to address identified constraints such as poor seed supply, lack of proper crop production techniques, and inadequate access to markets. LLP was also to develop a seed supply system capable of sustaining innovation beyond the life of the project. The project, which ran from 2005-2007, was funded by the United States Department of Agriculture (USDA). It was implemented by TechnoServe, in partnership with Catholic Relief Services (CRS) and ICRISAT with collaboration with many private and public institutions. The LLP project was implemented in 10 districts in Kenya—six in Western Kenya (Bomet, Homa Bay, Kisumu, Siaya, Suba, and Teso), and four in Eastern Kenya (Machakos, Makueni, Mbeere, and Kitui) (ICRISAT, 2006).

The problem of poor seed stems from the fact that most legumes are self-pollinated, with no clear distinction between seed and grain, so farmers save harvested grain to use as seed in the next season. While this might reduce input costs for smallholder farmers, it has discouraged the development of a commercial legume seed sector, and most seed companies shun the legume business. ICRISAT and its partners have been working to address the legume seed supply

constraint by educating farmers on the benefits of high-quality improved seed and of the potential increased production through modest investments in fresh improved quality seed. The LLP project relied on ICRISAT's breeding technology and extension support and worked in partnership with Kenya Agricultural Research Institute (KARI) for seed multiplication, CRS for extension services to the farmers and TechnoServe to link farmers to the markets. ICRISAT supplied high-quality legumes seeds and trained farmers and local extension staff on seed multiplication and bulking techniques.

To address the problem of access to the markets for the smallholder farmers, LLP encouraged the formation of PMGs through a farmer education campaign. The rationale for encouragement of PMGs was to reduce marketing costs for individual farmers and help them to establish links with reliable product markets. In Western Kenya, TechnoServe also helped establish an umbrella farmers' trading company, named the Kenya Smallholder Farmer Investment Company (KESFIC). Launched in July 2006, the company was to be wholly owned by smallholder farmers and was expected to become the vehicle for facilitating input supplies and collecting and bulking grain for collective marketing from the smaller PMGs. It was envisioned that KESFIC was to provide farmers with extra services after the life of the LLP project, such as training, sourcing of credit, and transport services. However, by the time of the survey that generated the data for this study, in 2007, the trading company was still struggling to stand on its feet and provide services to farmers. In Eastern Kenya, no such trading company was formed, and each individual PMG had to market its members' produce on its own.

This study was conducted in sample of the districts in which the LLP project operated from 2005 to 2007, and drew upon earlier surveys that ICRISAT carried out with farmers in these areas.



## **1.5 Brief description of the study areas**

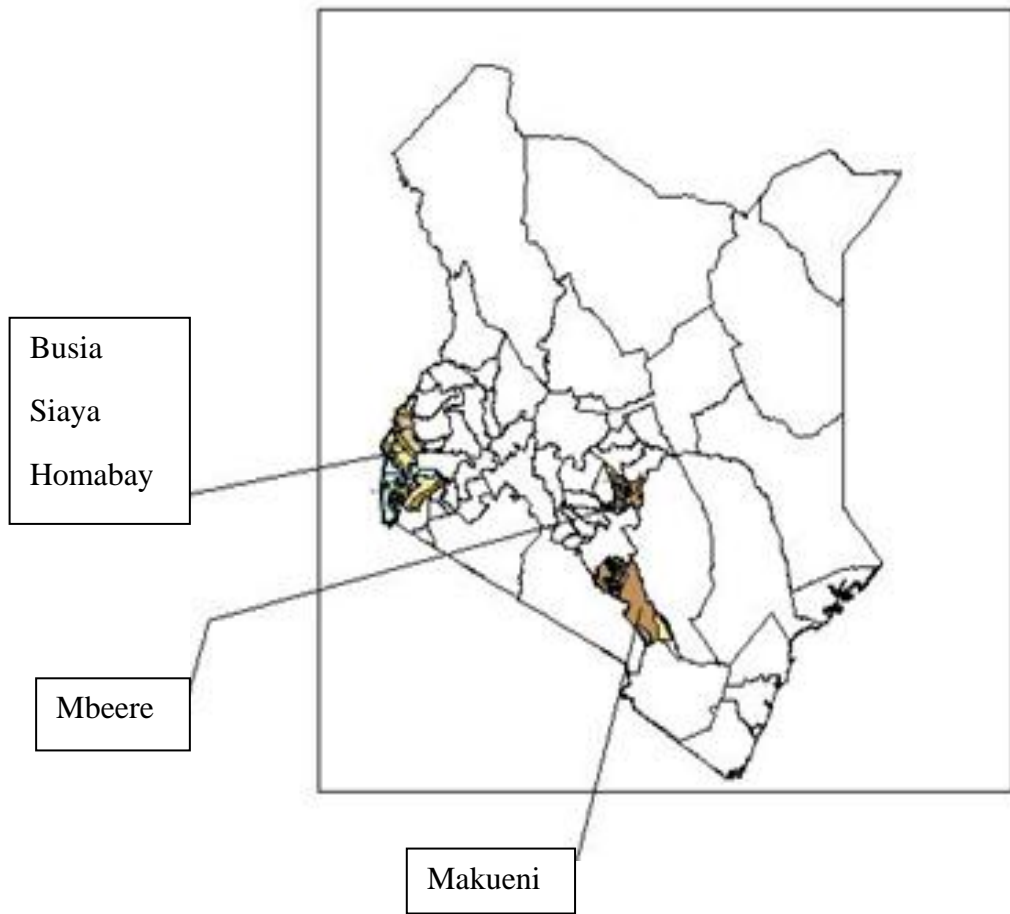
The study is based in Kenya, with all the districts surveyed being in semi-arid lands. They have low density of paved roads and limited access to major marketing centers. Semi-arid areas in Kenya are characterized by low and highly variable bimodal rainfall that varies on average between 500 and 800 mm per year. Soils vary in depth depending on the parent rock material and slope. They are generally low in organic matter and deficient in nitrogen and phosphorus, but with adequate levels of potassium. Low infiltration rates and susceptibility to sealing making the prevailing soils prone to erosion, as heavy rains fall mainly at the beginning of the growing seasons when the land is bare (Gachimbi, et al., 2002). Farming systems in these areas are based on rain-fed crop production integrated with varying levels of livestock rearing, and where water supplies permit, there is limited furrow irrigation. The main rain-fed crops are maize, beans, pigeon peas and groundnuts. Depending on the district, these are grown in monoculture or as mixed crops complemented by smaller areas of chickpeas, cowpeas, sorghum, and millet. These semi-arid lands have experienced increasingly frequent droughts in the last two decades. Households in these areas have not had sufficient time to recover from previous droughts before the next one hit. Consequently, farmers produce limited marketable surplus, increasing their vulnerability to food insecurity and poverty.

This dissertation uses both household- and producer-level datasets. Three sets of household data sets were obtained in 2003, 2005, and 2007. The producer-organization level dataset used was collected in 2007. The author participated in collecting all the 2007 data both at the household and group levels through a grant by Collective Action and Property Rights institute (CAPRI) in conjunction with ICRISAT and conducted most of the PMG-level interviews. We also drew information from the previous rounds of survey conducted by ICRISAT in order to have multi-year comparisons.

The data was collected by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Mbeere, Makueni, Homabay, Siaya, and Teso<sup>10</sup> districts in Eastern, Nyanza, and Western Provinces of Kenya (see figure 1-1). ICRISAT targeted the areas because it believed that dry-land legumes like groundnuts, pigeon peas, and chickpeas could be exploited in these areas to reduce poverty and food insecurity.

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<sup>10</sup> Teso district was a part of greater Busia district. It was curved out of Busia district recently and the actual map has not been input into the GIS map software used to create fig 1-1 below.



**Figure 1-1:** Map of the areas where the survey was conducted in Kenya

## **1.6 Data description**

In 2003, a total of 400 households were surveyed in Mbeere (240) and Makueni (160) to form the baseline dataset. This was before the PMGs were established as part of a research project that aimed to pilot alternative institutional innovations for improving market access for smallholders. Farmers were sensitized to form PMGs through voluntary participation.

Initially, ten PMGs, mostly based on existing local social networks of different types, were established in Eastern Kenya. These groups were formally registered as welfare societies (self-help groups) under the Ministry of Culture and Social Services.

From the initial sample of 400 households, some households joined the PMGs, but others did not. This necessitated the re-sampling of the study sample to get an even distribution of members and non-members in subsequent surveys. From the original sample, a total of 250 households remained and were re-interviewed in 2005 and 2007.

An additional 150 households were added during the 2005 survey period in Eastern Kenya. In 2005, data was collected from 400 households (210 from Mbeere and 190 from Makueni districts) in the ten PMG villages, comprising of 250 members and 150 nonmembers.

In 2007, households interviewed in 2005 were re-interviewed, in addition to added households in Western Region. As shown in table 1-1 (below), 208, 189, 162, 152, 149 households were interviewed in Mbeere, Makueni, Homabay, Siaya, and Teso districts, respectively. Two households in Mbeere and one in Makueni dropped out of the survey because the households either were dissolved or could not be traced. Also 23, 21, 16, 15, and 15 PMGs were surveyed in Mbeere, Makueni, Homabay, Siaya, and Teso districts respectively in 2007.

The districts were purposely chosen to get locations where the project was to start in 2003 or had already been started for the additional areas in 2007. However, care was taken to

include districts that cover a wide variety of zones representing semi-arid areas. A stratified sampling procedure was followed at the district level. First, the divisions<sup>11</sup> were randomly sampled, then the locations, then groups in the chosen locations. Two lists of all households were compiled within the group service area, one with group members and the other with non-members, and from those lists equal numbers of households were chosen at random. If for any reason a particular person chosen could not be located, then another name was chosen as a replacement at random from the list.

For the repeat interviews, care was taken to get all the households previously interviewed, and only 3 households dropped out of the survey between 2005 and 2007. A total of 850 households were interviewed in the 2007 survey. These included the 250 that were followed from the baseline survey in Mbeere and Makueni districts; hence, the data has a short panel from the three rounds.

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<sup>11</sup> In Kenya, the local government administration is divided starting from a province at the highest level, followed in descending order by the district, the division, and the locations, with the smallest units of administration being villages.

**Table 1-1 Distribution of households and groups surveyed in the panel**

	Districts				
Year	Mbeere	Makueni	Homabay	Siaya	Teso
	Households surveyed				
2003	240	160			
2005	210	190			
2007	208	189	162	152	149
	Groups				
	23	21	16	15	15

Information obtained at the household level included data on socioeconomic characteristics, assets, credit and savings, production, buying and selling, and participation in other groups or social networks and in PMG collective marketing. In the 2007, data was collected regarding the previous history of households' involvement in earlier collective action efforts, since this data was not collected in earlier surveys. Because we hypothesized that involvement with other development agencies affects the households' decision regarding whether to participate in collective action, we also collected information on the history of the household's involvement with development agencies operating in the area. The previous surveys did not ask any question about social networks of the households prior to the introduction of PMGs and before the households' decision to join or not join the groups. In the 2007 survey, households were asked a series of social network questions regarding current and pre-existing networks (retrospectively before the PMGs were introduced). Households were asked if they belonged to another collective action effort before 2003. They were also asked whether they had friends who participated in collective action before introduction of the PMG, followed by a

question about whether their friends, and how many, had joined the PMG. There were also general questions to measure the trust in the community as well as communal risk management strategies.

At the PMG level, all ten PMGs formed after the 2003 sensitization in Eastern Kenya were interviewed, plus an additional 80 PMGs covering the entire study area. About five to seven respondents selected from the PMG management and ordinary members served as key informants. A focus-group approach was employed, guided by a semi-structured questionnaire. The data obtained included objectives and aspirations of the groups when they were formed; general group characteristics (e.g., size and composition, frequency of meetings, capital, etc.); asset ownership (e.g., store, weighing scales, operating capital, etc.); credit access; bulking and marketing; governance; and perceptions about major constraints limiting the PMGs' success. The initial questions were general in order to allow respondents to talk about their PMG, such as, "Tell us the history of the PMG. How successful do you think the PMG is?" These were followed up with the "why" questions that led to more follow-up questions. The approach elicited information to construct the histories of the PMGs. A structured question followed to record specific information from all the groups.

## **Chapter 2 : Pre-conditions for emergence of successful collective action for improving farmer access to markets: Evidence from semi-arid areas in Kenya**

### **2.1 Introduction**

Structural adjustment programs and increased globalization that took off in the 1990s increased hardships for many smallholder farmers in developing and transitioning countries (FAO, 2002, Motiram and Vakulabhranam, 2007). Specific reasons for this hardship vary from one place to another, but adverse trends in global markets, poorly organized credit markets, and weak supporting marketing institutions have been cited as major causes (Baffes, et al., 2003, Jayne, et al., 2002, Rao and Storm, 2003). Collective action has been touted as a way to improve smallholder farmers' access to necessary services (Omamo, 2005). However, the history of collective action through cooperatives in East Africa is characterized by failures, in spite of a few isolated successes. Yet policy makers and development agencies still look at farmer organizations (FOs)<sup>12</sup> as a vehicle to use for small-scale farmers to access markets and other supporting services. Although there is little debate about the ability of successful FOs to help farmers in the presence of market failures, the key questions are when should they be used and how to make them successful? If FOs are to be promoted as an alternative to government direct action for assisting small-scale farmers, then it is important to increase understanding of their formation, operation and sources of success.

To date, most studies geared to understanding of farmers organizations have been focused on cooperatives. Though understanding cooperatives is important, they have been most effectively employed in developed countries. Yet most smallholder farmers in rural areas in poor

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<sup>12</sup> In this study, we use farmers' organizations (FOs) as a generic term for all types of farmers' collective action effort.



countries use smaller informal FOs and not cooperatives for services. Usually FOs are initiated and organized differently from many cooperatives. Unless there is better understanding of these smaller FOs, then efforts by policy makers and development agencies geared to helping rural smallholder farmers might not deliver the intended benefits. And the cycle of group formation and failure will continue.

### **2.1.1 Research questions**

This study contributes to literature on collective action by identifying conditions necessary for PMGs<sup>13</sup> to emerge, which could be similar to the findings regarding the conditions leading to the emergence of cooperatives, but not necessarily identical. In particular, the study focuses on identifying what ingredients were lacking in the semi-arid areas in Kenya that prevented PMGs from emerging before TARGET and the Lucrative Legume Program launched by ICRISAT and its partners in 2003-2004. The study attempts to determine the success and sustainability of smallholder collective action efforts in these areas. In this regard, the study focuses on addressing the following research questions for these areas:

1. What are the conditions necessary for smallholder farmers' organizations to spring up?
2. What are the key ingredients of success for smallholder farmers' organizations?
3. Is it possible to develop a series of questions that helps to analyze the success rate of a farmer organization and identify intervention areas?

### **2.1.2 Hypotheses**

We test the following propositions based on the theories and literature reviewed:

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<sup>13</sup> Producer marketing groups (PMGs) are the forms of FOs mainly used by the smallholder farmers to access various services such as marketing, inputs, new technology, and information.

1. Collective action will emerge where there is high asset specificity and, in particular, commodity perishability.
2. Producer marketing groups will be more successful if they operate in a small geographic area for ease of coordination.
3. PMGs will be more successful where they have an informed leadership that is able to articulate the members' aspirations.
4. Strong social networks are important for group success.

### **2.1.3 Methods**

Different approaches have emerged over the years that contribute to the understanding and modeling of the internal organization of collective action. This essay follows mainly the transaction costs economics framework (Williamson, 1985, 1975). We also use game theory to explain some phenomena. The advantages of applying a transaction cost approach to PMGs or business firms in general is the understanding it offers about organizational strategy and of why the market is organized as we see it.

In this chapter, we extend the work done by Shiferaw, et al. (2008) by developing an index for measuring the PMGs' success. Then we evaluate how well each group has performed in meeting its members stated objectives and expectations. The study further develops a new group analysis framework that we use to predict group success as well as identify intervention areas to improve the success rate, based on the identified success factors. This is the first time to our knowledge that such a framework has been developed.

Most studies on collective action analyze their data using qualitative approaches. In this study, we apply both quantitative and qualitative methods. First, using the developed index of

success, we propose a model that analyzes PMGs' success rating. Then we estimate a fractional logit regression using the index as the dependent variable. We also disaggregate the index further into its constituent components and run fractional logits on each. A case study approach is next used to peer deeply into selected groups to find out if identified factors in the model are corroborated by individual cases. A case-study approach adds more insights that are not easily captured by an econometric model. The last section is a brief quantitative testing of the group analysis framework followed by a qualitative analysis of two archetype groups.

#### **2.1.4 Data and study areas**

The study was conducted in Western and Eastern regions of Kenya. In Western Kenya, PMGs were promoted, and a new overarching trading body was created to market produce bulked by the PMGs. PMGs as well as individual farmers marketed their produce through this new trading company. In contrast, in Eastern Kenya only PMGs were promoted without a similar trading company. The study is therefore focused in these two areas and in particular actual areas where PMGs were formed.

This study uses data from both household and group surveys collected in 2007 by ICRISAT. In the randomized survey, a total of 850 households were interviewed in Eastern and Western Kenya. And a total of 90 group interviews were conducted using a focus group approach in the same areas. The focus groups were comprised of seven individuals drawn from management and ordinary members of the PMGs, and care was taken to include both genders as much as possible in the interviews. Most of the analysis in this essay utilizes data gathered from the discussions conducted in these meetings, which involved both structured and unstructured questions. For more information about how both surveys were conducted, see chapter one of this dissertation.

### **2.1.5 Organization of the chapter**

This chapter proceeds with the following sections. First, we provide a brief review of the literature on collective action, and in particular, studies that target factors influencing the success of cooperatives and farmers' organizations. Second, the chapter discusses the methods used in the chapter. Third, results of both quantitative and qualitative analysis are presented and discussed. Finally, a brief conclusion of the findings is presented.

## **2.2 Literature review and theoretical framework**

### **2.2.1 Literature review**

Farmer groups, cooperatives, and other farmers' collective efforts under different names are all a form of collective action used by farmers to access various services or address a local problem. We define collective action as voluntary act taken by a group of individuals or entities to achieve common interests (Meinzen-Dick and Di-Gregorio, 2004). As mentioned earlier, studies on farmers' collective effort have focused on cooperatives. A cooperative is an association or corporation established for the purpose of providing services on a nonprofit basis to its shareholders or members who own and control it. A key characteristic is that residual claims are distributed in accordance with patronage, not capital investment.

In Kenya, cooperatives are governed by an act of parliament that provides close monitoring of the operations by the relevant government agencies. Cooperatives go through stringent government scrutiny before registration. There is a yearly auditing by government-approved auditors to ensure good governance for all cooperatives, and strict following of the cooperative constitution is usually enforced. This paper deals mainly with farmers' organizations formed in rural areas of developing countries and referred to as producer marketing groups (PMGs) or community-based organizations. Registration of PMGs in Kenya is required by the

government. However, there are few requirements for registration of PMGs, and the major obligations are to provide minutes of an agreement by a group of individuals agreeing to work together, open a bank account to safeguard any members' finances and provide a copy of the group's constitution. Once these conditions are fulfilled, the only possible source of monitoring is a requirement to file a yearly report to the relevant government agency—a requirement that is usually not enforced. Based on these differences, we claim that there are fundamental distinguishing features between cooperatives and PMGs in the manner of formation, membership composition, and operation. To meet the government requirements, cooperatives are usually formed by leaders who are more educated, have better management capacity, and are probably wealthier members of society. Usually cooperatives are also managed by professionally hired staff, whereas PMGs are operated by members on a volunteer basis. Therefore, factors that are necessary for a cooperative to emerge and succeed might be different from the factors that are necessary for a PMG. As a PMG grows, it might evolve into a cooperative, which enables it to benefit from favorable government incentives and professional management.

As in many developing countries, the history of cooperative performance in Kenya has had mixed results. Some cooperatives, like the *Kenya Tea Development Authority* (KTDA), have been generally successful, while others, like coffee cooperatives, have witnessed spectacular failures. The dairy industry was plagued with failure of the big cooperatives such as the *Kenya Cooperative Creameries*<sup>14</sup> (KCC) but has been successful with small cooperatives like the Githunguri and Meru dairy cooperatives. Nyoro et al. (2005) found some general success and failure factors in dairy and coffee cooperatives. The success factors identified were vertical

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<sup>14</sup> The current government revived KCC in 2003, which had been inactive for many years, and now it is operating as a successful business (Atieno and Kanyinga, 2008).

integration, volume of membership, proper record keeping, level of manufacturing technology, skills of management committee and staff, timely dissemination of appropriate information, diversification into profitable enterprises, adoption of a strategic plan, and credit availability<sup>15</sup>. Conversely, the failure factors identified were credit burden, conflicts, external forces, investment in non-income generating activities, non-skilled board members, poor or lack of communication between board members and farmers, unfair competition, dishonesty by staff and representatives, and deceitful businesspersons. Another contributor to failure was the extraction of rent by corrupt officials (Mude, 2006). Rent seeking by officials led to lower prices than would prevail in the spot market. Others have attributed poor performance to technological problems and poor management (Lele and Christiansen, 1989, Wolf, 1986). These broad findings are attributed to cooperatives but apply to any business concern.

A few studies have argued that farmers' organizations among the poor get into problems when external agencies start supporting them. These studies, generally found in the sociology literature, have found some evidence that support the view that once there is external support, elite members of the community join the groups, become leaders, appropriate the benefits to themselves, and marginalize the poor. This is the so-called "Rockefeller Effect" (Garforth, 1994, Gugerty and Kremer, 2004, Howes, 1997, Stiles, 2002).

Collective action outcomes could be a function of the initiation history. In Europe, the United States and Canada, cooperatives and other rural people's self-help organizations were established in the 19<sup>th</sup> and 20<sup>th</sup> centuries as farmer-initiated and financed self-help actions.

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<sup>15</sup> However, it is not very clear from Nyoro's work if some of the factors mentioned are the results of collective action or are necessary precursors for success. We hope to get more evidence of the causality in the analysis later in this chapter.

Governments usually provided enabling legislation and technical assistance. By contrast, in developing countries, this largely was not the case. Colonial and independent governments were the main actors in initiation and driving the agenda. Cooperatives were therefore viewed more as government-driven entities than as independent, farmer-owned, and financed self-help organizations. They were used to push for government policies and objectives,<sup>16</sup> and government officers often controlled them (Birchall, 1997, Laidlaw, 1978). In the past, cooperatives were privileged with monopoly and or monopsony powers on agricultural inputs and produce in the local areas. And governments used cooperatives as mechanisms for taxing rural producers to finance national development projects (Munkner, 1992). This prevented farmers' ownership of the cooperatives, and politicians used them to advance their political ambitions. Consequently, many failed when government withdrew support (Simmons and Birchall, 2008). The bad experience left many producers suspicious of any form of collective marketing effort (Anderson and Henahan, 2003). PMGs therefore have an uphill task educating members on the benefits of Collective Action (CA) while changing their management styles to erase the past negative image and heritage. However, as in the western world's experience, governments still have a role to play in the success of farmer organizations through provision of a favorable enabling environment (Soedjono, 2002).

The need to exploit economies of scale, improve bargaining power, and play a coordination role leads to some of the arguments in the literature that collective marketing needs a critical mass of members for success (Chamberlin, 1974, Esteban and Ray, 2001, Maxwell and Oliver, 1993, Oliver and Maxwell, 1988, Sandler, 1992). However, developing the initial

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<sup>16</sup> Most government wanted to keep the food prices low while using agriculture to fund the growth of other sectors.

coalition is a major problem because it may require some selfless producers to be the initial entrepreneurs. Reaching agreement between large numbers of producers at the initial stages can be a challenge. This is because of differences in bonding and social networks that keep individuals together or apart. In a situation where there is a mass mobilization, the entrepreneurial costs are spread among many individuals (Sexton and Iskow, 1988), making it easier to initiate group action. About 50% of the groups in this study were formed after mass mobilization by government agents and non-governmental development agencies. To overcome initial inertia problems, some groups start with few individuals who have common interests. Then they proceed to accept new members in order to achieve economies of scale, but only after establishing some foundations for success. This is referred to as ‘concentrated social ties’, which is the extent to which social ties are concentrated in a few individuals rather than being spread more evenly across the whole group (Marwell, et al., 1988). Olson argued that success was more likely in groups with members in a small geographical area, having similar economic and demographic characteristics, and in frequent contact with each other (Olson, 1965). A strong social network in the early stages of PMG formation is important because the process is costly.<sup>17</sup> Some farmers will play the game of ‘*wait-and-see*.’<sup>18</sup> However, many successful groups interviewed instituted measures like higher entry fees for late entry and long vetting procedures

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<sup>17</sup> Joining a PMG is costly in terms of opportunity cost of time spent attending meetings, traveling costs to meeting venues, membership fees, and regular contributions.

<sup>18</sup> We refer this as a free-rider problem. It emerges when property rights cannot be traded, or are insecure, or unassigned (Cook, 1995). Royer (1999) referred to it as “a type of common property problem that emerges when property rights are not tradable or are not sufficiently well defined and enforced to ensure that individuals bear the full cost of their actions or receive the full benefits they create.” Both internal and external free-rider problems are often associated with conventional cooperatives.



to discourage these types of members joining at a later date. This was a largely successful strategy.

When a group shows signs of success, more producers are typically willing to join. With higher volumes, a group is able to exploit economies of scale, lowering its per unit marketing and transaction costs. Simultaneously, these same costs may increase for the non-members, inducing a cascading effect leading to more producers joining the effort. There are even instances where some farmers who join due to the cascading effect might have a higher cost of marketing with the group than they faced in the initial period as non-group members. However, they cannot revert to that initial cost structure because the mere presence of a collective marketing effort raises the cost of non-membership. In such case, producers who refuse to join the farmers group could be hurt by the PMGs if their cost of independence increases (Leathers, 2006).

A study in Québec showed that 60% co-operatives survive more than five years and 40% survive more than 10 years (Bond, et al., 2000). Banaszak (2007) conducted a very similar study on cooperatives in Hungary applying transaction costs and game theoretical approaches. In his study area, 20% of the cooperatives had failed, and of the surviving ones, about 80% were performing their core function of produce marketing. In a recent study of a sample of 54 registered cooperatives in Limpopo province in South Africa, Van der Walt (2005) found that 65% of these were not operational. Reasons provided include poor management, lack of training, conflict among members, lack of funds, and operations never started after registration (Ortmann and King, 2007). This suggests that for PMGs, the first few years are likely to be marked by uncertainty and struggle for survival since they are a business concern amidst other functions

they perform. The majority of the PMGs in our study areas had existed for fewer than 5 years at the time of the study. About 67% of the groups interviewed were not more than 6 years of age.

Another constraint is the lack of managerial capabilities among the potential members. Due to lack of formal job opportunities in the rural areas, many young educated members of the communities migrate to the cities to look for better opportunities. The only migration to the rural areas of educated members of the society is through retirements and those in the education sector who have to work in the rural areas. This robs the rural communities of dynamic leadership that could steer farmer groups to success. Therefore, the few educated people in the communities are often involved with multiple group leadership, leading to conflicts of interests, spreading their time too thinly between these responsibilities and their own personal commitments.

Based on the foregoing literature reviewed, we came up with questions on location, membership characteristics, group history, operations, members' perceptions, and organizational aspect of the PMGs. We concentrated on these because such a focus is consistent with previous studies on collective action (Garforth, 1994, Gugerty and Kremer, 2004, Howes, 1997, Stiles, 2002). Researchers such as Elinor Ostrom (1990) and Olson (1982) have looked at more general conditions for the emergence and sustainability of collective action by farmers. We used these factors as questions posed in the focus group meetings.

## **2.2.2 Theoretical Framework**

### **2.2.2.1 Transaction cost economics theory**

Transaction cost economics (TCE) theory seeks to explain the nature of governance that trading partners choose from a set of possible institutional alternatives. The theory posits that efficient organization necessitates matching transactions that require higher levels of

coordination with organizational governance forms that provide the necessary levels of coordination in a cost-effective manner. For a more detailed treatment of this topic, see Boerner and Marcher (2003) and Joskow (1985), who have done extensive reviews of TCE theory and its applications. The choice of the governance form depends on the nature of the transaction in terms of degree of transaction-specific assets involved, level of environmental and behavioral uncertainty, complexity of the transaction arrangement and frequency of the exchange (Williamson, 1985).

Cooperatives were formed in the Kenyan highlands as a way to safeguard farmers' specific assets. The perennial bushes producing cash crops like coffee or tea, once established, are very specific to the transaction, with limited alternative use. In contrast, semi-arid areas grow mainly annual crops, which could easily be stored as the market required, and the cost of shifting to another enterprise is low since the crops are annuals. However, the extent of that flexibility is constrained by the climate in these areas and the capital constraint of individual producers. In addition, limited capacity or scale of operations of most traders hinders their ability to handle risks due to price fluctuations and ability to negotiate a contract. Therefore, at harvest time, cash-constrained traders are not able to buy large quantities of produce to reduce supply significantly, leading to product glut in the rural markets. Farmers usually sell most of their produce to meet their family financial requirements since they are usually cash-constrained. As long as cash-constrained farmers rely on rain-fed agriculture, they have little flexibility in terms of timing of when crops are ready for the market to limit oversupply. Without strong collective action, it is not possible for smallholder producers to regulate a commodity supply in the market to influence prices through supply control.

From TCE theory, we postulate that asset specificity and spatial location of farmers may favor some other form of governance other than a spot market. Farmers may form PMGs to act as a competitive yardstick in the market with few buyers (Staatz, 1984). Based on transaction cost theory, we conclude that PMGs will emerge in the presence of high transaction costs. However, for farmers to vertically integrate through a PMG, the overall gross benefit (both monetary and social) they derive from collective action must be higher or at least equal to benefits they would derive in the alternative marketing channel in the long run. We can express this as:

$$VB_{pmg,i} - TC_{pmg,i} - MC_{pmg,i} - C_{pmg,i} \geq VB_{sm,i} - TC_{sm,i} - MC_{sm,i} \quad (2.1)$$

Where:  $VB_{pmg,i}$  is the total value of gross benefits a farmer  $i$  gets from joining a PMG;  $TC_{pmg,i}$  is the transaction costs farmer  $i$  faces while operating within a PMG;  $MC_{pmg,i}$  is the total marketing costs the farmer  $i$  incurs when marketing through a PMG (with the exception of transaction costs);  $C_{pmg,i}$  are all the other contributions (both opportunity cost of time and monetary contributions) to the PMGs;  $S_{pmg}$  is any subsidy the group gets from other sources;  $VB_{sm,i}$  is total value of gross benefits farmer  $i$  gets from participating in the alternative marketing channel (for example, the spot market);  $TC_{sm,i}$  is the transaction costs an agent  $i$  faces in the spot market;  $MC_{sm,i}$  is the total marketing cost the farmer  $i$  faces in the spot marketing channel (except for transaction costs).

The first scenario is where the inequality is true even when there is no subsidy ( $S_{pmg}=0$ ).

This is akin to what is referred to as the Haystack Model that has been used to study evolutionary dynamics. In our case, this would be a situation in which farmers recognize cooperators and are ready to partner with them and all prosper (Bergstrom, 2002, Frank, 1988, Maynard Smith, 1964, Schmid, 2004). In this case, cooperating will produce more benefits for the cooperators when working together in the long run than would non-cooperation. There is higher probability of cooperators working together in this model if matching is assortative<sup>19</sup> rather than random. With cooperators having a higher probability of playing with another cooperator, there is therefore increasing prospect of each cooperator reaping a higher payoff.

The second scenario is where inequality 2.1 is only true in the long run and not in the short run due to the initial cost of organizing a PMG and the lack of enough volume moving through the PMG without external subsidy. In the short-run, some PMGs will emerge and survive only in the presence of an external agent's promotion or selfless individuals in the community subsidizing ( $S_{pmg} > 0$ ) the initial costs of collective effort. In the field, it was common to see this situation in some organizations. These groups had at least one individual who seemed to take lots of interest in the success of the group and spent his or her resources on collective activities. In such instances, groups might emerge and succeed through such influence even if they face a reversed benefits regime without the subsidy.

The third scenario is where there is a differential in members' benefit stream flow. Game theory analysis would predict that producer groups often would not emerge, since free riders' choices would lead to a low-level Nash Equilibrium of non-cooperation as the dominant strategy,

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<sup>19</sup> Sewall Wright (1921) defined the assortativeness of mating with respect to a trait as "the coefficient of correlation  $m$  between two mates with respect to their possession of the trait."

referred to as social trap (Platt, 1973).<sup>20</sup> However, in the presence of at least one altruistic<sup>21</sup> individual in the group who will accept less short-run benefit from collective action compared to their proportional contribution, groups might still be formed and survive. These altruistic members of the society forego opportunities for gain in the short-run or long-run out of sense of moral obligation, care for others or even a desire to be approved or liked by other members of the society (Schmid, 2004). They must contribute a significant amount of resources to make the pay-off of other members in equation 2.1 positive. Therefore, different individuals face different benefit flows. In this third scenario, farmer  $i$  in the group subsidizes the PMG operations to the point of significantly decreasing her own returns for the benefit of the success of the group. In the short run, this agent might get a reversed inequality in expression 2.1 because to him or her  $S_{pmg}=0$ . The monetary net returns might be reversed but the net returns in terms of utility will be positive. We refer to this as an asymmetric benefit model in monetary terms. In this case, the farmers with small interests will exploit the large who can afford to contribute and has much to lose if the group is not formed or fails (Olson, 1965). These types of group might succeed in the short-run if the altruistic individual has long-term goals of positive monetary returns. Therefore, this individual is not fully altruistic in the sense of the definition provided earlier. Hence she will endure short-term monetary losses in the hope that the group will succeed and she will get

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<sup>20</sup> Social traps are negative situations where people, organizations, or societies get caught in a direction or relationship that later proves to be unpleasant and they see no easy way to back out of or avoid.

<sup>21</sup> Altruism is selfless concern for the welfare of others. It is a traditional virtue in many cultures, and central to many religious traditions. It is the opposite of selfishness. Altruism is different from a feeling of loyalty and duty. An altruistic individual focuses on a motivation to help others or a want to do good without reward, while duty focuses on a moral obligation towards a specific individual a specific organization or community, or an abstract concept (for example, patriotism). Some individuals may feel both altruism and duty, while others may not. Pure altruism is giving without regard to reward or the benefits of recognition.

eventual positive returns in the long run. However, there is another category of truly altruistic individuals who gain utility just by helping others, even at a material cost to themselves. In this situation, the individuals will continue supporting the group in the long run even if their monetary benefits are not positive.

#### **2.2.2.2 Moral hazard and adverse selection**

Producer organizations usually elect an executive committee on a pro bono basis that directs the organization's operations. This is because they have little operational capital to employ paid staff. It is very difficult to attract and retain good managers providing voluntary services since their opportunity cost is high, and some managers have an incentive to convert their PMGs into personal firms. For some of the groups interviewed, there were few options in terms of human capital to elect as management. Due to low level of education, they had to elect the only educated members, even when those individuals had low management skills. We postulate that lack of management skills within the rural farming society coupled with moral hazard makes it very difficult for PMGs to emerge and succeed. In cases where there is significant remuneration for managers, abundant supply of human resources and repeated games, we can design a contract that can take care of the problem. However, in PMGs, these conditions are rarely present, and it becomes very difficult to solve leadership problems. Also due to the lack of capital market discipline, a clear profit motive, and the transitive nature of ownership, PMGs may have a greater difficulty of designing incentive schemes for managers that will align their personal objectives with those of the farmer group (Ortmann and King, 2007). For example, the survey revealed cases of leaders inappropriately using group resources. In a pilot program on the use of ICT technology for marketing services, some groups had cell phones. In two of the

groups provided with the free phones, the phones turned out to be a major problem, as the groups could not agree on who had the right to operate and keep the phones in their possession. This issue, among other problems, led to the demise of one of the groups interviewed.

However, a farmers' group formation is a dynamic process that takes place within a multiplayer repeated games framework. If groups could restrict entry and players' types were observable, cooperators would not admit defectors to their groups, the two types would be strictly segregated, and only cooperators would be allowed to join an organization. But in a real-life situation, type detection is imperfect. After group formation, subsequent failures will be observed, usually resulting from the non-cooperators' free riding. In the field, the dynamic group formation phenomenon was observed. We refer this to dynamic formation of groups as "reinforcement learning." Individuals initially meet at random and play a game. The payoffs determine which interactions are reinforced, and a social network emerges. In case of failure (extinction of a group), different farmers will have revealed their dominant type. Out of this learning, new groups are formed by fission of existing groups. The new groups have better coordination of strategies and are composed mainly of cooperators, which can support cooperative outcomes.

### **2.2.2.3 Social capital**

Putnam (1993) defines social capital as those "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions." From this definition social capital has two components: it is, first, a resource that is connected with group membership and social networks. Hence, the volume of social capital possessed by a given agent depends on the size of the network of connections that she can



effectively mobilize (Bourdieu, 1986). Bourdieu states that it is a quality produced by the totality of the relationships between actors, rather than merely a common "quality" of the group. Membership in groups and involvement in the social networks developing within these and in the social relations arising from the membership can be utilized in efforts to improve the social position of the actors in a variety of different fields. It is the differences in the control of social capital that may explain why the same amount of economic and cultural capital can yield different degrees of returns and different powers of influence to different actors (Siisiäinen, 2000). Other studies have shown that group memberships creating social capital have a "multiplier effect" on the influence of other forms of capital such as capital goods, land or even human resources that affect the quantity or quality of production (Bourdieu, 1986, Cohen, 1999, Joppke, 1986).

Development of economic organizations does not occur in a social vacuum. The local social institutions, farmers' personal relations, and the structure of the network of relations affect PMGs' economic activities and their probability of success. Social capital literature states that certain features of a social group, such as networks and norms and trust, can improve the society's efficiency by facilitating the coordination (Putnam, 1993, Putnam, 2001). According to Granovetter (1985), the economy is socially embedded, and the farmers' personal relations, the structure of the social networks and local institutions will affect group economic activities. The success of the groups will also depend on their capability to link with formal institutions. This type of social capital could have a net effect of reducing transaction costs (Woolcock, 1998). Interaction among economizing agents creates trust, and trust facilitates better future interaction. In dynamic repeated games, where farmers' actions can be observed and remembered by others, almost any pattern of individual behavior, including behavior that maximizes group payoff, can

be sustained by social norms that include obligations to punish norm violations by others. However, we note that while reciprocity and the presence of norms can support a great deal of cooperation, much of the individual farmer's activity motivation is impossible for others to observe and, hence, lies beyond the reach of punishment or reward (Bergstrom, 2002). Hence, even the groups with greatest number of cooperators will still have issues as they move on the path to success due to imperfect assortativeness.

### **2.3 Why PMGs did not emerge in semi-arid areas in Kenya**

From the above arguments discussed under the literature review on transaction costs theory, moral hazard, adverse selection, and social networks, we conclude that it was very difficult for collective action in the form of a PMG to emerge and succeed in semi-arid areas in Kenya on its own. This is due to the fact that the main goods produced (grains and legumes) were not highly specific or perishable and that the villages exhibited low social capital, lack of appropriate human and capital resources, and the presence of moral hazard. In spite of the difficulties identified that discourage PMG groups from emerging, some farmers in the study areas were able to initiate some farmers' groups without external agent support. In the results section, the study highlights a few archetypical groups, focusing on their history of formation and their prospects of success for both self- and externally initiated farmers' organizations.

## **2.4 Methods**

### **2.4.1 Group performance**

Some researchers have evaluated performance of cooperatives based on financial ratios (Gentzoglani, 1997, Hind, 1994, Lerman and Parliament, 1990). For example, based on financial data for cooperatives operating in 36 states between 1994 and 2003, Boyd et al. determined variables that are determinants of profitability in local farm supply and grain

handling cooperatives. They tested for statistical significance of variables affected by director and manager decisions including liquidity, asset size, risk, the ratio of assets to equity, net profit margin, asset turnover, the times interest earned ratio, total assets, and lagged average return on equity. They found that business size, as measured by assets, was not a determinant of profitability (Boyd, et al., 2007). This study is very similar to a recent one conducted on North Dakota farm supply and grain handling cooperatives between 2002 and 2006 (McKee, 2008). Financial statements from 120 cooperatives were used in this study. Various financial variables were tested as determinants of profitability. Financial ratio analysis was used to observe trends in liquidity, solvency, and efficiency. Comparisons in ratio trends were made based on relative profitability. No statistical relationship was found between business size and profitability. The approach of using of financial ratios to evaluate the performance of cooperatives is not consistent with cooperatives' operation model (Sexton and Iskow, 1993). Since cooperatives represent a vertical integration between the farmer and the cooperative, using financial ratios of only part of an entity fails to account for all of the financial effects of management decisions on the joint entity. We also argue that accounting performance, i.e., returns on investment (ROI) or other measures, is hard to measure and interpret in the case of cooperatives or PMGs. This is because their aim is to pay the members the highest price for their produce and charge the lowest price for their services and goods, while still remaining financially viable. Even when possible to use financial measures, it might be only applicable to sophisticated cooperatives and not PMGs in developing countries.

Other authors follow some overall evaluation process for cooperatives as proposed by Deshpande et al. (1993) based on marketing and management science that focuses on customer satisfaction. In our study, most groups did not have good financial records that could be used for

analysis. Also, it was difficult to collect data on customer satisfaction due to time and financial constraints. Therefore, this study cannot adopt this approach. Many had also operated for a short time and were only starting to put into place proper record keeping measures.

Bruynis et al. (1997) define success in terms of longevity, business growth, profitability, and members' satisfaction. Evaluating group performance may require knowledge of members' well-being before the group was formed and their well-being after joining the group. That type of analysis is beyond the scope of this chapter, where our unit of observation is the group. However, the measure of success defined below takes into account the purpose of group formation and if those objectives have been accomplished (Berne, 1963, Zander, 1994) . This is in line with other recent studies in group performance (Banaszak, 2007, Sexton and Iskow, 1988).

We define success of any group as dependent on the objectives of the group and its self-assessment. Some groups interviewed were not set up as a marketing concern but have added this aspect as part of a diversification of their activities. Hence using volume of sales as a success benchmark alone may not be appropriate for these groups. However, we use the volume bulked as one of the measures of success. Extending the work done by Shiferaw (2008) on a subset of the groups interviewed in this study, we use five indicators of collective action to measure group success. These included:

- The number of elections conducted since formation divided by the number of years the group has been in existence. This measure is justified by the fact that bylaws require elections to be held annually.
- Per capita cash contributions to the group in 2006

- Per capita group assets owned
- Per capita value of agricultural produce bulked, and
- The percentage of the members who adhere to the group's by-laws

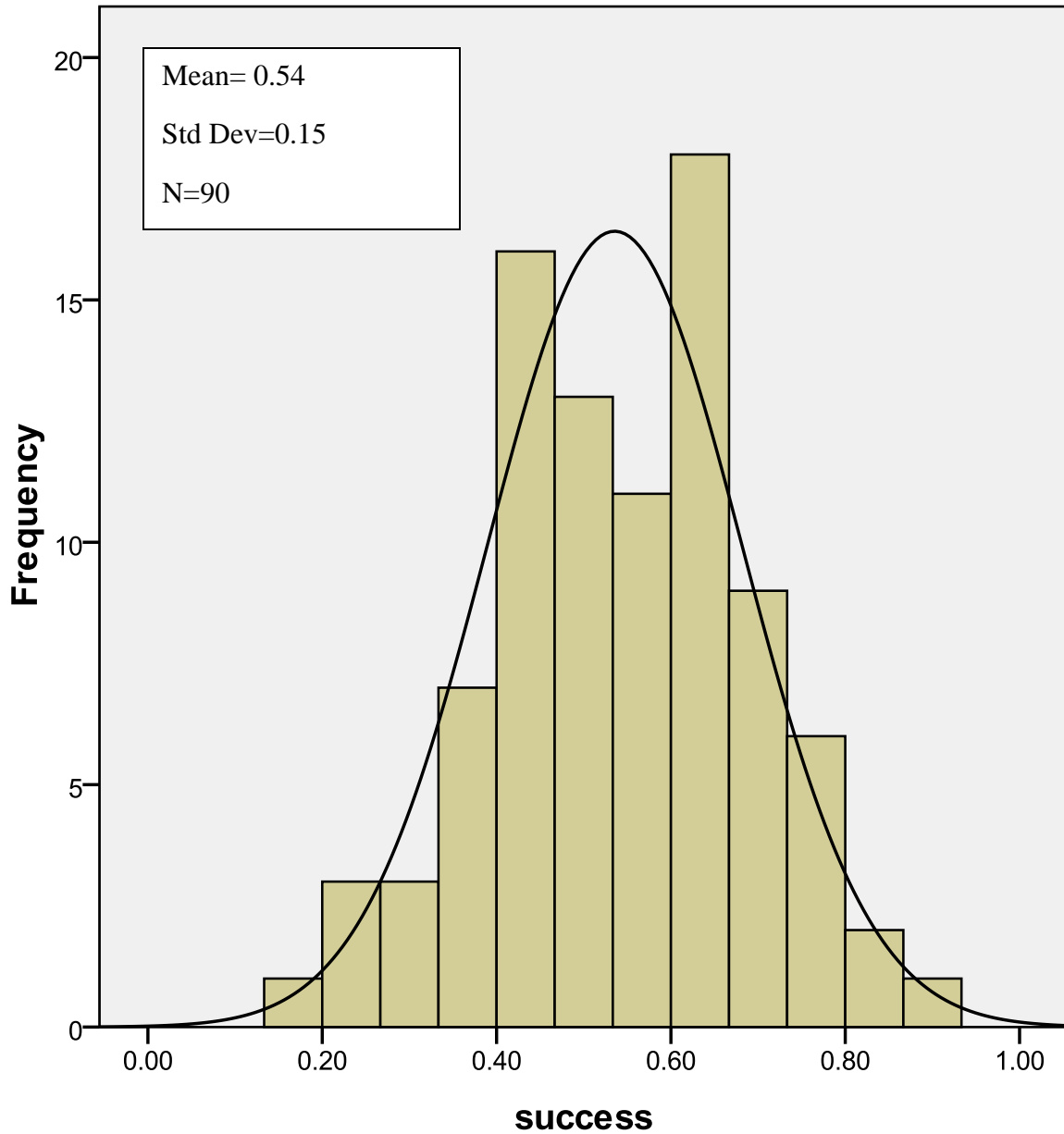
By using per capita measures, we take into account the size of a group to avoid a bias that might tilt the index to favor bigger groups in terms of membership. To aggregate these measures into an overall index between zero and one, we converted the per capita values to an index<sup>22</sup> that gives the highest value to 1. We then summed up all the indexes and divided the sum by 5 to standardize it to have a value between zero and one. A score of zero is defined as complete failure and one is defined as complete success. Formally:

$$success = \frac{\sum_{i=1}^5 (contrindex + bulkindex + assetindex + memcomitindex + electindex)}{5} \quad (2.2)$$

The mean value of the success index for the groups studied is 0.54, with a standard deviation of 0.15 (see figure2-1 below). We classified further the groups into four quartiles for better disaggregation between the more successful groups and least successful. This classification is used in the cross-tabulation part of analysis and in testing the group analysis framework.

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<sup>22</sup> The success index components are equally weighted since there is no way to justify one component as having more weight than the others have in measuring the success of a group.



**Figure 2-1: Group success histogram**

However, for the regression analysis we will use all the variations computed in the success index. The success index ( $y$ ) is a fractional response, that is,  $0 \leq y \leq 1$ , that is fundamentally continuous. We start by fitting a fractional model:

$$Y_i = f(H_i, A_i, S_i, F_j, TC_i, M_i, L_j) \tag{2.3}$$

Where:

- $H_i$  is the level of human resources available in a particular group. We use the mean education of the focus group that was interviewed. The rationale is that the group usually sent the most educated of their members to a meeting, particularly if it involves meeting with potential donors;
- $A_i$  is a vector of the size of a group and spatial dispersion. The number of villages the group members come from is used as an indication of spatial dispersion, and a variable that measures the number of members registered is also included in the vector;
- $S_i$  is a vector that measures the level of group diversification in terms of activities it undertakes. An actual count of the group's activities is used. Then a dummy variable that indicates if the group buys produce from non-members for resale later is also included in this vector;
- $F_j$  is a variable that captures the way the group was initiated--that is, if it was self- or externally initiated, with external initiation taking the value of 1;
- $TC_i$  is a vector of transaction costs a group faces. Two variables are used to estimate TC. These are the group categorization according to the nature of the good, as explained later, and distance to the village market;
- $M_i$  is a vector of group internal management. This is measured by two dummies: one dummy that captures whether the group has measurable performance targets, one that indicates whether the group has agreed-upon conventions, and the third that captures the

management quality of the leadership by having self-assessed good management being one.

- $L_j$  is a location dummy. We use the district where the group is found as a dummy. This variable captures the unobserved site-specific factors not controlled for in the model.

To estimate the success model, we use General Linear Model (GLM) to estimate a fractional logit regression. The latter model estimates  $E(y|x)$  as a logistic function (Wooldridge, 2002):

$$E(Y | X) = \exp(X\beta) / [1 + \exp(X\beta)] \quad (2.4)$$

The model ensures that predicted values of success ( $y$ ) are in  $(0,1)$  and that the effect of any  $x_j$  on  $E(y/X)$  diminishes as  $X\beta \rightarrow \infty$ .

#### **2.4.2 Case study**

The study also applies a case study approach to further analyze the 90 groups. By combining multiple data sources, we can help overcome the weakness or intrinsic biases and problems that come from single data source (Yin, 1994). The use of multiple sources of evidence in this study allows us to address a broader range of historical, attitudinal, and behavioral issues that are not easily modeled in a quantitative econometric analysis. It enables the development of a converging line of inquiry through triangulation. Thus, the findings or conclusions in the study are likely to be more convincing and accurate when based on several different approaches.

#### **2.4.3 Producer marketing group's classification/stratification**

According to the nature of the goods they handle, we classified PMGs into two kinds: food-crop-based PMGs and commercial-crop-based PMGs. The basis for this classification derives from transaction cost concepts of asset specificity in agriculture arising from the



perishable nature of the products and immobility of the farm assets associated with the transactions (Staatz, 1984). The number of times the farmer and buyer meet to transact business affects transaction cost. The more frequent the transaction, the higher the transaction cost. Transactions that are more frequent will encourage greater PMG patronage to safeguard the transactions. The nature of groups' governance structures decreases or increases the transaction cost. The implication is that a group will succeed or fail based on whether the PMG reduces or increases transaction costs in the long run.

Farmers who are members of food-crop-based PMGs grow and market mainly cereal and pulses. These crops are easy to store in the absence of storage pests, and farmers sell the produce slowly as the need arises. Farmers also use the crops they grow as a major portion of their diet. Therefore, these crops are for food security first, and farmers sell their surplus stock on as-needed basis. In particular, pigeon peas are sometimes the only crops harvested in an area like Makueni in cases of a drought. Most households will market the produce to meet certain household cash-flow needs, while the rest is stored. Hence, we can conclude that for these crops, the transaction costs specific to the transaction in the sale of the crops are low since they are not very perishable. Then PMGs are not likely to emerge in these areas without external interventions.

The second category consists of the commercial crop producers. In the study area, we encountered groups dealing with horticultural crops, ranging from fresh vegetables to tree crops like mangoes and citrus fruits. Some PMGs organized themselves around these crops. Horticultural produce has high transaction costs due to the perishable nature of the product. Common perishable products grown in the study areas are mangoes, citrus, pineapples, and vegetables. Usually, buyers are few. For instance, mangoes grown in Eastern Kenya are mainly

for export, and two traders based in Nairobi dominate the market. They have more information about the market prices than individual producers do. Traders set the quality parameters based on their market needs as well as the availability of the products. When mangoes are plentiful, the traders are very finicky about quality considerations, but in times of shortage, they relax the quality considerations. All these variable rules and quality requirements can be very bewildering to a smallholder producer. Once the crop is ready to harvest, an individual farmer has a very small window of time to find a buyer, negotiate price and pick the fruits. In many of the areas interviewed, only a single exporter operates. The risk of being stuck with produce with no alternative market is always a threat to a farmer. Therefore, Individual farmers producing such crops are more vulnerable to opportunistic action by their trading partners, who may have substantial market power. In Eastern Kenya, the buyers insist on going to pick from the tree the produce from an individual farmer and will pick only what they consider to be good quality. The traders also have the power to prevent the producer from selling the unpicked fruits to an alternative market by threatening not to buy their produce if they deal with another local buyer.<sup>23</sup> Hence, producers with a high proportion of sunk-assets are vulnerable to unfair trading terms from powerful trading partners. Patronizing the PMGs may reduce the transaction costs, giving farmers better control of their market process that increase their perceived value of collective effort.

We disaggregated the groups further into self-initiated and externally initiated groups. This was important to test the proposition posited by some researchers that chances of survival of collective action depends on the mode of initiation.

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<sup>23</sup> Usually there is only one export buyer operating in an area, and a threat for exclusion from selling to the trader is credible and can lead to heavy losses. In the study areas, the main crop under this arrangement is mangoes, usually for export.

#### **2.4.4 Design of a group analysis framework**

To set the stage for analyzing any group and predicting its success potential or identifying intervention areas, we developed a group analysis matrix. Guided by the literature reviewed, focus group interviews, and theory, we came up with a group analysis framework (see figure 2-2 below). Using this framework, producers, policy makers, and development agencies can predict success potential of a group and pinpoint necessary intervention areas. The matrix is similar to the decision-making framework for changing vertical coordination strategy, as developed in Peterson, Wysocki and Harsh (2001) and in Wysocki, Peterson and Harsh (2003), hereafter referred as to PWH framework.

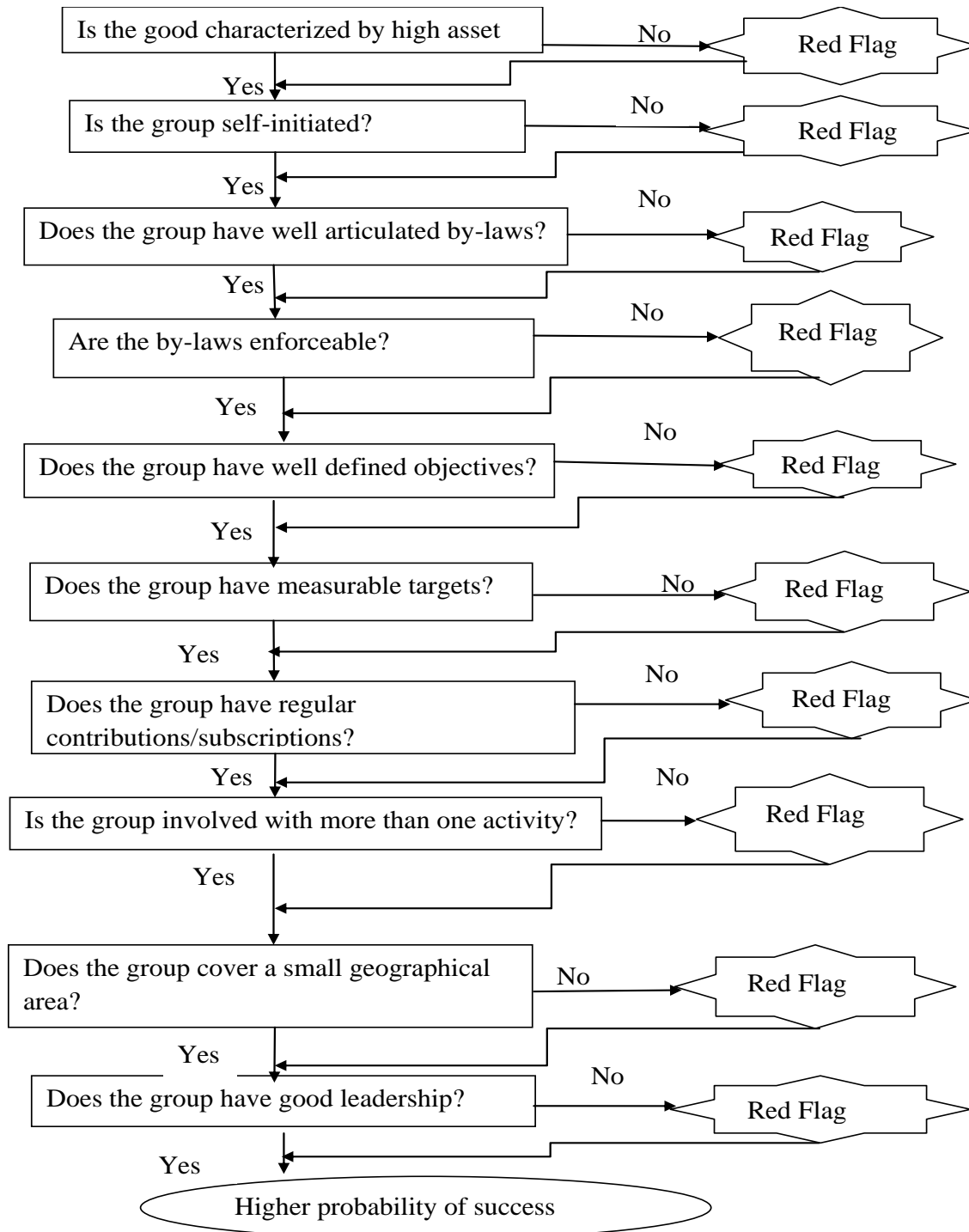
The first thing potential members do is to analyze their situation and come up with a decision regarding whether to adopt a form of vertical coordination. The framework analyzes groups composed of individual farmers who choose to vertically coordinate through PMGs. It is structured as a series of questions any researcher or a group of individuals intending to start a group can follow. A basic rule is that when the answer to any question is yes, one proceeds to the next question.<sup>24</sup> However, when the answer is no, it raises a red flag regarding the viability of the group, and indicates need for attention. The more red flags are raised, the higher the likelihood of encountering difficulties and hence a subsequent need for commensurate intervention to increase the probability of success.

This framework's assumption is that members have gone through the PWH framework unknowingly and come up with the decision to shift from spot market to another form. The rationale for the questions included in the framework and cross-tabulation with success score

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<sup>24</sup> A yes implies that in the area in question the group is on sound footing and improves the chances of overall success.

will be discussed later in the results section 2.6.2.



**Figure 2-2: Group Success Rate Analysis Framework**

## 2.5 Results and discussion

### 2.5.1 Geographical location of the groups according to their categorization

Before we discuss the results of regression analysis and the case studies, we briefly look at the geographical distribution of groups as categorized by the nature of good they market.

**Table 2-1: Regional location of groups according to their categorization**

Location	Categorization	Quartile group of success†					Somers'D (Directional Asymptotic significance)
		1 (%)	2 (%)	3 (%)	4 (%)	Total (%)	
Western Kenya	Food crop	40.7	25.9	14.8	18.5	100.0	0.327** (2.120)
	Commercial crop	10.5	31.6	31.6	26.3	100.0	
	Total	28.3	28.3	21.7	21.7	100.0	
Eastern Kenya	Food crop group	38.5	15.4	38.5	7.7	100.0	0.347** (2.009)
	Commercial crop	12.9	25.8	25.8	35.5	100.0	
	Total	20.5	22.7	29.5	27.3	100.0	

\*Significant at 10%; \*\* Significant at 5%; \*\*\*Significant at 1%  
t statistics in the parentheses  
† a 1=lowest scores on success index; 4=highest score

In general, irrespective of the region a group is located in, food marketing groups tend to be clustered in the lower two quartiles of the success index rating (see table 2-1 above). In Western Kenya, 19% of food crop groups are in the top quartile and 41% in the lowest quartile. In Eastern Kenya, the food groups have only 8% in the top quartile and 39% in the bottom quartile. Commercial crop groups are skewed more to the upper quartiles, with 26% and 36% in the fourth quartile for Western and Eastern Kenya, respectively. The bottom quartile has 11% and 13% for Western and Eastern Kenya, respectively.

## 2.5.2 Regression results

### 2.5.2.1 Test of the success index score

We tested the success index score against the focus group self-assessment of their group success rating. The focus group members were asked if they feel that their group has achieved its objectives and the answer was either a 'Yes' or 'No'. A 'No' was coded as 0 and a 'Yes' as 1. Therefore, we ran a probit regression with group self-assessment being the dependent variable and the success score being the independent variable. Table 2-2 below gives the results of the analysis.

**Table 2-2: Test of the success score index against self-assessed success rating**

Group self-assessment of success is the dependent variable	
	Success index test (Marginal effects)
success	0.001* (1.89)
LR chi2(1)	10.48
Prob > chi2	0.0012
Pseudo R2	0.5462
Observations	90
Positive predictive value	98.88%
Negative predictive value	100%
Correctly classified	98.89%
Absolute value of z statistics in parentheses	
* significant at 10%; ** significant at 5%; *** significant at 1%	

From the test of the success score index against the self-assessment, we find that the score correctly identifies a group that the focus group members classified as successful 99% of the times, and correctly identifies 100% of the times the group classified as not successful. Therefore, this gives us confidence in moving on and using the score to classify the groups' success standing in the study.

To test the model, we estimated several quasi-maximum likelihood estimation (QMLE) fractional logit regressions. The first regression utilizes the composite success score index

developed. Then to identify the contribution of each component to the success rating, we ran disaggregated fractional logit regressions with each of the success score index elements being the dependent variable but retaining the same independent variables. Later, in section 2.6, we will present a model focusing on the factors of interest to the group analysis framework alone. In section 2.5, we use quintile regressions that assist us investigate the tails of the success score to help us understand how each covariate affects the less successful and more successful groups separately.

Table 2-3 shows the results fractional logit models estimated. In table 2-4, discussed later, we present results of cross tabulation and univariate regression of the important factors applied in the analysis framework. This section presents result of multivariate analysis that controls for other factors.

In this section, the variable of interest, success score ( $y$ ), is a proportion, being defined and observed only on the standard unit interval, i.e.,  $0 \leq y \leq 1$ . The bounded nature of the indexes and the possibility of nontrivial probability of mass accumulating at one or both boundaries raise some interesting estimation and inference issues. Therefore, the standard practice of using linear models to examine how a set of explanatory variables influence a given proportional or fractional response variable is not appropriate in general, since it does not guarantee that the predicted values of the dependent variable are restricted to the unit interval. Papke and Wooldridge (2008) point out that even in cases where the variable is strictly inside the unit interval using traditional log-odds transformation, it may not be possible to recover the expected value of the fractional response from a linear model for the log-odds ratio without making strong independence assumptions. Also, a linear functional form for the conditional mean might miss potentially important non-linearities. Therefore, we apply the fractional regression estimation procedure that

takes into account the specific characteristics of fractional response variables (Papke and Wooldridge, 1996, Papke and Wooldridge, 2008). Applying quasi-maximum likelihood estimation (QMLE) we are able to obtain robust estimators of the conditional mean parameters. This method has been applied in several studies after its application in the seminal paper by Papke and Wooldridge (1996). Hausman and Leonard (1997) applied fractional logit to panel data on television ratings of National Basketball Association games to estimate the effects of superstars on telecast ratings. Wagner (2003) analyzes a large panel data set of firms to explain the export-sales ratio as a function of firm size. And the recent paper by Papke and Wooldridge (2008) extends their earlier work and shows how to specify and estimate fractional response models for panel data of fourth grade math pass rates with a large cross-sectional dimension and relatively few time periods.

The results below (Table 2-3) are for fractional logits, and we present only the marginal effects. However, we only discuss the significant variables in the estimated models. The number of villages the group serves has a negative sign and is significant at the 1% level in the success model. As posited earlier, operating in a large geographical area decreases the group's success index. It is difficult for members to be committed to a collective action ideal unless they know one another well, which has a negative relation with spatial location of individual membership.

The ratio of men to women results show that as men increase compared to women members in a group, there is decrease in their ability to follow their election calendar, contribute less to the group finances and there is less commitment to the group bylaws by the membership. However, the amount bulking in the group per capita increases. Men control majority of the productive access and are usually commercially oriented. Therefore, it is expected that the bulking amount per member increase as the ratio of men to women rise.



**Table 2-3: Factors determining group success**

	(1)	(2)	(3)	(4)	(5)	(6)
	Success	Commitment	Election	Contribution	Bulking	Asset
Education	0.006 (0.89)	0.004 (0.30)	-0.001 (0.06)	0.001 (0.09)	0.021 (1.52)	0.001 (0.09)
Men to women	-0.002 (0.77)	-0.033*** (3.00)	-0.021** (2.03)	-0.024*** (2.98)	0.098*** (2.79)	0.023 (1.45)
# villages	-0.014*** (2.63)	-0.005 (0.59)	-0.021* (1.84)	-0.026* (1.91)	-0.024** (2.16)	-0.003 (0.26)
# activities	0.028*** (3.63)	-0.002 (0.14)	0.030 (1.61)	0.047** (2.23)	0.021 (1.26)	0.060*** (3.27)
Membership	-0.0004** (2.05)	-0.001 (1.23)	-0.000 (0.75)	-0.001* (1.65)	-0.000 (0.60)	-0.000 (0.69)
Commercial	0.043 (1.59)	0.113* (1.92)	-0.062 (0.89)	0.093 (1.29)	0.134** (2.44)	-0.028 (0.50)
Conventions	0.035 (1.07)	0.059 (0.87)	0.016 (0.20)	-0.038 (0.51)	0.036 (0.53)	0.102 (1.32)
Targets	0.012 (0.34)	0.057 (0.95)	-0.037 (0.50)	-0.041 (0.61)	0.052 (0.83)	0.031 (0.46)
Altruistic	0.066** (2.55)	0.083 (1.57)	0.047 (0.70)	0.141* (1.89)	-0.035 (0.58)	0.104* (1.72)
Buy produce	0.093*** (2.65)	-0.057 (0.92)	0.092 (1.10)	-0.005 (0.07)	0.309*** (6.24)	0.143** (2.19)
Distance	0.000 (0.30)	0.001 (1.10)	-0.000 (0.15)	0.000 (0.31)	0.000 (0.95)	-0.001* (1.76)
Leadership	0.031 (0.92)	0.073 (1.32)	-0.036 (0.41)	0.124* (1.75)	-0.013 (0.19)	0.024 (0.30)
External	0.008 (0.32)	-0.062 (1.15)	0.098 (1.41)	-0.020 (0.31)	-0.011 (0.19)	0.038 (0.58)
Siaya	-0.024 (0.45)	-0.067 (0.69)	0.067 (0.59)	-0.045 (0.43)	-0.312*** (4.20)	0.203** (2.17)
Teso	0.008 (0.14)	0.005 (0.04)	0.119 (0.84)	0.118 (0.90)	-0.334*** (3.90)	0.130 (1.17)
Mbeere	0.020 (0.46)	-0.160* (1.66)	0.166* (1.76)	-0.051 (0.65)	-0.191** (2.54)	0.316*** (4.08)
Makueni	0.036 (0.58)	-0.144 (1.31)	0.135 (1.22)	0.049 (0.40)	0.045 (0.40)	0.110 (1.07)
Observations	90	90	90	90	90	90
Absolute value of t statistics in parentheses						
* significant at 10%; ** significant at 5%; *** significant at 1%						

With a large geographical area, effective coordination involves walking long distances to attend group activities. Therefore, it is likely that more members will have trouble fulfilling their

commitments, hence the negative relationship in with success score. The same negative relationship is shown on election, contribution, and bulking indexes. This is a reflection of coordination difficulties a group faces if it covers a large spatial area. This is likely to change with increased use of cellphones.

As the number of group activities increases, the group has a higher chance of success. The coefficient on model one is positive and significant at the 1% level. More activities add value to membership because members derive greater benefits from the collective action effort. With increased value, members will be more committed to the group affairs and work towards their success. More activities also improve social capital, which decreases need for stricter monitoring to avoid free riding by non-cooperators. The coefficient is also positive and significant on its effect to contribution index at the 5% level and asset index at the 1% level. As the group has more activities, it earns more incomes from deductions, improving the contribution index. It then utilizes the contributions to accumulate more assets.

There is a negative relationship between success index and group membership size. The coefficient on membership is negative and significant at the 5% level in the success model. Big groups might have individuals with diverse needs and interests. Hence, getting members to agree on common activities and operations requires skilled management that is usually lacking in the rural areas given that leadership is on a pro bono basis. More members also increase the opportunity for free riding and make it difficult to use social pressure to discourage such behavior. This result was as expected. The finding might be contrary to the theories that posit that collective action needs more members to increase economies of scale<sup>25</sup>. However, the

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<sup>25</sup> We tested for non-linearity of the variables number of villages, members, and activities and there was no evidence of nonlinearity.

results are consistent with Olson's (1965) an analysis of collective action and the group size paradox<sup>26</sup> (Esteban and Ray, 2001). The above two results are an indication of the high transaction costs in getting collective action to be effective with a large membership and spatial location in terms of service. Similar results are observed in management of natural resources through collective action (Antony and Steven, 2005, Shiferaw, et al., 2008). Large membership is also negatively associated with contribution. The coefficient is negative and significant at the 10% level. This could be an evidence of the free-rider problem. With a large membership individuals may feel that their contributions to the group have negligible effect. They will therefore be more likely to default on fees and charges, which leads to lower the contribution index.

Commercial group members, particularly the horticultural crop growers, will be more committed to their group and patronize them due to asset specificity. There is positive relationship between commercial groups and higher bulking and commitment indexes at the 5% and 10% levels respectively.

As posited earlier in the theoretical framework, the presence of an altruistic leader increases the success index by 0.07 and is significant at 5% level. An altruistic individual takes collective action seriously and is able to rally commitment of members and both internal and external resources to contribute to group success. An altruistic leader also attracts other like-minded people and rallies their efforts to the group enterprise. By demonstrating the sincerity of one's good intentions, an altruistic leader might encourage others to engage in reciprocal altruism

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<sup>26</sup> Olson (1965) and earlier work by Pareto (1927) argue that the free-rider problem makes small groups more effective. This is because with larger groups, the smaller is the perceived effect of an individual defection and the smaller is the size of individual private prize.

(Smith and Bliege Bird, 2000, Sosis, 2000). Hence, the altruistic leader is powerful or skilled enough to sanction free riding, solving a big concern in collective action effort. In return, the society accords such leaders some amount of respect as a social tax, increasing their utility (Hawkes, et al., 2001, Henrich and Gil-White, 2001, Michael, 2003). The presence of altruistic leader increases the contribution and asset index. The results suggest that these types of leaders are able to galvanize the support of other members of the society to patronize their groups and build an asset base. That could be the how they influence groups' success.

Groups that buy products from non-members increase their success rate. The coefficient is positive and significant at the 5% level. The variable captures the commercial orientation of a group. Such groups tend to have well thought-out marketing strategies, as trading involves incurring costs before selling the product for a profit. In these groups, one tends to find a good marketing representative with a good social network to gather price information from the market and contact potential buyers. As expected, a group that buys produce increases the bulking index as well as the asset index.

Groups that are found in remote areas, as captured by the distance-to-market variable, have fewer assets, decreasing the asset index score. The coefficient of distance to market is negative and significant at the 10% level in the assets model. The implication is that these groups are generally poor and have fewer resources. Good leadership also has a positive relationship with contribution, but the coefficient is not significant in the composite success score index.

Many of the variables expected to be significant on the composite success score were not. However, using the method of further disaggregating the score to individual indexes, we are able to get more insight into the interaction between the overall index and the individual items. From

the disaggregated models, we can see that the contribution, bulking, and asset indexes have a greater influence on the score direction compared to the commitment and election indexes.

### **2.5.3 Case study I (Commercial groups)**

This section gives a brief history and characteristics of some selected cases out of the 90 groups interviewed. We explore first the archetypes of commercial groups in the sample.

Group A in Siaya district has a success score of 0.74 and is in the top quartile of the success index. It was formed as a religious group with the main aim of improving the welfare of its members. With time, it has branched out into growing commercial groundnuts and amaranthus for seed and grain. This is as a response to the felt need to serve the women and orphans affected by HIV-AIDS. The group has acquired assets like party tents, seats and other equipment to hire out to the local community. A unique aspect of this group is that it also operates as a charity. Each year, it chooses a needy family in the area that is not a member of the group and builds a new house for them. This is sort of a local version of the American TV show “House Makeover”. The group has good leadership, composed of retired civil servants with wide outside exposure. It has even branched out into processing of Amaranthus (pigweed) grain into flour, marketed as a nutritious drink for HIV-AIDS victims as an immune system booster,<sup>27</sup> as well as making Uji (porridge) and several forms of local bread. The key to this group’s success is the realization that there is need to add value to ordinary food crops through processing. Their social bond is also very strong due to their religious affinity and the many activities they perform as a group. To increase their social capital, this group has a monthly lunch in a member’s home.

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<sup>27</sup> The flour is a very good source of vitamins, including vitamin A, vitamin B6, vitamin C, riboflavin, and folate, and minerals including calcium, iron, magnesium, phosphorus, potassium, zinc, copper, and manganese (<http://en.wikipedia.org/wiki/Amaranthus>).

Such a strong social network decreases the need for higher levels of monitoring to ensure cooperation from members, avoiding cases of free riding or shirking. The other key ingredients are self-initiation, visionary leadership by an altruistic leader, good management, proper record keeping, sense of social duty, and diversification.

Another group in Siaya in the Yala area that is worth mentioning started as a women's group. Let us call it group B; it has an index score of 0.92. Over time, the group accepted more membership to include men. The group started in response to a typhoid problem in the area. Women felt a collective need to clean up their water sources. They started a program of water catchment conservation. Once the benefit of working together was realized, the success attracted external help and encouraged the women to branch into other activities. With the help of their coordinator, they started multiplying an open pollinated variety of maize for the local market that has superior traits derived from varieties released from the Kenya Agricultural Research Institute (KARI) and CIMMYT.<sup>28</sup> Individual members also grow potatoes, for which the group coordinates in the sourcing of inputs and the marketing of the products. They also grow other horticultural produce for marketing in nearby Kisumu city. The ability of the group to coordinate small farmers has attracted attention from the private-sector firms that are forming joint ventures in seed production. A case in point is Leldet Ltd., a local seed company.<sup>29</sup> Leldet contracted with group B in 2007 during the long rains season to produce groundnut seed. The formal groundnut seed system in Kenya is in its infancy and for a private firm to have a contract with a group

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<sup>28</sup> Kakamega Synthetic-I was released by the KARI research station in Kakamega, Kenya. Its pedigree traces back to the work of CIMMYT and many partners in southern and eastern Africa—national maize research programs, private companies, and non-government organizations—to develop stress-tolerant maize for the region's small farmers.

<sup>29</sup> Leldet Ltd. is a small seed company that produces, promotes, and distributes improved seed of orphan crops for use by small-scale farmers in arid and semi-arid areas of Kenya.

composed mainly of smallholders is a significant step. The group started a food-catering branch that caters for local social events and provides all services, from food preparation and services to provision of tents and chairs. This is a group that is highly diversified in terms of its activities. Group B's sources of success include self-initiation due to a felt need, strong social capital, diversification into diverse commercial activities, visionary leadership with an altruistic leader, and the ability to network with various private, non-profit and government agencies. This high level of investment in the group increases the sense of ownership by its members. It is unlikely that individual members will chose to free-ride and risk being excluded from the benefits accruing from being a member. So the threat of being sanctioned by the group is credible and the loss incurred would be non-trivial. This takes care of the free-rider problem often witnessed in collective action efforts.

Moving from Western to Eastern Kenya, the study highlights a few groups in the same category. Commercial groups in Eastern Kenya are involved in mainly horticultural crop production, tree nursery establishments, and commercialization of the local cereals and pulses. The main horticultural crops grown were export-quality mangoes, citrus fruits, and vegetables (cabbage, tomato) and in cereals, the main crop is maize, with pigeon peas dominating the pulses.

Group C horticultural group is a case in point, with a success score of 0.65. A retired navy officer initiated it with the purpose of growing and marketing export mangoes and citrus fruits for the urban market. The group has a target every year of the number of citrus and mangoes trees each member should have on his or her farm. For continuation of membership, an annual audit is conducted to ensure that each member meets his or her targeted seedlings planted.

At the time of the survey, the group's main crop was mangoes geared for the export market. The group identifies a buyer and negotiates the terms of trade. The buyer picks the fruits from the members' farms using his own labor and prepares them for export. Group C is exploring avenues of providing the extra services of harvesting, packing, and transport to the airport/market. Such a strategy is likely to increase value to the commodity and encourage other competitors who do not have enough staff to pick the fruits to do business with them. More buyers competing for the same product might bid up the price, increasing producers' returns. The group is also investigating means of setting up a joint disease and pest management system to reduce costs and guarantee produce quality. In the export business, guaranteed quality is the key to success, and a group with a higher quality is more likely to get clients compared to other groups with average quality produce. The group displays a high level of professionalism in running of its affairs. It has a permanent staff employed to keep account books and maintain proper records. A hired consultant had finished conducting a strategic management analysis of the group. Following the analyst's recommendations, the group has started a savings and loan department. This is another way of increasing membership value. Savings and loan services are intended to tap into local saving capacity of the community as well as get financial grants from the government that are used to encourage rural development. If this scheme is successful, it will relax the credit constraint within the membership and improve members' welfare. The overall management of the group is very good. The sources of success are visionary leadership, professional management, enforcement of by-laws, diversification, and presence of a selfless leader.

Another group that has very similar characteristics is Group D (Wote location, Makueni district) with a success score of 0.79. It was initiated by a local school head. He had been involved with a similar self-development group in another region. Group D grows export-quality



mangoes, citrus fruits, and pigeon peas (seed and grain) for the local market and dairy farming. Its stated goal is to alleviate poverty in the area. Therefore, diversification of activities is a strategy to improve incomes for its membership. The group is very innovative. To guarantee quality mangoes to its export clients, it started a collectively managed disease and pest management system. This ensures a nearly homogeneous product to the customer. The group enforces strict collective marketing of all its produce. The group also had been contracted by ICRISAT as one of the seed propagators to be distributed to other groups in the region. It also has a dairy animal buying scheme that helps members' entry into the dairy sector for income diversification. It has a regular monthly contribution requirement for membership continuation. The group employs a closed membership policy and admits members from the siblings of the current members. This in effect preserves the already established culture, and family social pressure reduces incidences of non-cooperation. Sources of their success are self-initiation, closed membership policy, and well developed by-laws and culture that are strictly enforced, diversified enterprises, visionary leadership, value addition, and presence of a selfless leader.

Group E has a success score of 0.85. It was self-initiated long before the LLP project. In the initial stages, it bulked pigeon peas, maize, and beans. The group is located in Makueni, an area with unreliable rainfall, and wanted to have a bulking store as well as a seed bank. The current marketing representative attended a women's development conference and felt the need to practice what she learnt at home, and the group was born. Its main aim was to bulk the produce after the harvest, sell the product during the low supply season,<sup>30</sup> and sell seeds to the local farmers at planting time. The group also started selling locally made baskets from its

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<sup>30</sup> In many rural areas, food supply is usually low after the beginning of the rainy season before the next harvest. During this period, prices of most commodities are very high since few farmers are able to store enough to last them through this period.

members. They transport the baskets to the city (Nairobi) for final finishing before they are sold for export. The group, in partnership with the Kenya Red Cross, stocks and sells mosquito bed-nets to the local community to prevent the spread of malaria. It has employed a full-time clerk who runs a store and keeps proper records. With income from the commercial operations, the group acquired land and put up a building with the aid of a government grant. They intend to use the building as an agro-veterinary shop. The marketing representative is resourceful in fund-raising activities, and she is the driving force of the group. It has diversified into both food and commercial crops. Its strategy is to have branches of small groups involved with other activities. These “baby groups” deal with the local poultry business and export mangoes. All these groups operate from the same office. The strategy has been to have different names and management of the baby enterprises to avoid some individuals being overwhelmed by management activities. The sources of success are self-initiation, innovative management style, a diversified portfolio, and the presence of an altruistic leader.

In contrast to the success of these commercial groups, there were cases of failure. One such group is PMG F, with a success score of 0.48, initiated by the Catholic Diocese<sup>31</sup> in Ndhiwa division of Homabay district in Nyanza province. Members of the group are drawn from three administrative locations, namely Ndhiwa, Nyarongi, and Koriwa. It is organized as a Community Based Organization (CBO), and its objective is adding value to farmers’ produce. The group started by growing and processing sweet potatoes. The aim was to process potatoes into flour used to make various products such as bread, chips, porridge, and nutritious drinks. Unfortunately, group management did not do any initial feasibility study on the viability of the

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<sup>31</sup> The diocese runs a development arm of the Catholic Church in conjunction with Catholic Relief Services (CRS), an international non-governmental organization.

investments. They hoped that the diocese would buy all the products for the church-operated children's homes. Through grants, they invested in a mill, a drier, and a store. When the church did not buy the produce, they had nowhere to take their finished product. Unlike a group like Group E, where the marketing representative actively seeks markets for their products, PMG F still expected the external benefactor to play this role. The result is that farmers produced huge quantities of sweet potatoes with no established market. The glut bred animosity within the leadership and pitted members against the leaders. Even with substantial assets in terms of equipment and a subsidy from the diocese, the group had almost collapsed by the time of the survey. It had poor management, with internal leadership wrangles. The large membership of the group, dispersed over a large geographical area, could also have made communication and unity of purpose a challenge. Group F showed no innovation or flexibility to change according to shifting market conditions. This underscores the role of leadership and initial vision of the group in achieving any success. Sweet potatoes in the processed form are not very perishable, which overcomes the asset specificity constraint. The group has good objectives but no targets for implementation. It has no regular financial contributions from members to maintain its operations. The results are that the group was not sustainable. This group did not understand that to add value to a product required either processing a product to the point where it had an established market or to go out and create one. There was a clear lack of altruistic individuals with a vision to galvanize this group to a common purpose and exploit its potential. However, by the time of the survey, a small core group of members was planning to dissolve the main group. In its place, they intended to start another leaner group composed of cooperators.

Also in Ishiara town in Mbeere district, there is a cooperative society we will refer to as Group H, which has a success index score of 0.46. This is the oldest group that was interviewed

in the study and is unique because it was started as a cooperative society in 1980. The aim of the group was to bulk and market all types of farmers' products for its members. In the initial ten years, it was fairly successful because it was supported by the government. This was the period when cooperatives were deemed to be very important to the development of the farming sector and enjoyed government support in many ways. The cooperative had acquired some land and developed a commercial property in the town that was rented out at the time of the survey. However, in the 1990s there was a change of the Kenyan government policies due to structural adjustment programs. The support this cooperative enjoyed was withdrawn and the group was on its own. Despite having considerable assets, the cooperative declined in both membership and its activities. Out of the original 100 members, there were only 42 members in the register, and few were active. The only activity the group was involved with at the time of the survey was bulking honey, refining and selling it at the local market. The group had plans to expand its activities by setting up a modern commercial honey processing plant at its premises. Members had started growing pigeon peas and green grams and hoped to use the group for bulking and marketing.

Despite group H's long history and having considerable amount of assets in comparison to the new groups in the study, it was lowly rated by the success rate index. Having been started as a cooperative, it had a good constitution to guide its operations. However, the constitution was not followed or enforced effectively, which indicated it had poor leadership. In the group's twenty-year history, it had conducted only three elections despite the constitution's requirement of an annual election. Group H members are not required to have any contribution to the group finances. Lack of any form of subscription fees coupled with few activities made it difficult for the group to command loyalty and monitoring by the members. The percentage of its members that adhered to the bylaws was only 5%. There were no well-articulated goals and targets that

could inspire the members. In contrast to many groups in the survey, this was a group that had well educated leaders, with some having gone to college. However, there was little evidence of an altruistic leader who could inspire the group or give it the needed change of direction to improve its success rating.

The poor rating of Group H was mainly due to lack of visionary leadership despite the leaders being well educated compared to other groups. Group H's experience also demonstrates that access to assets does not guarantee a group success in the absence of good leadership and a vision. Group H has huge potential for growth, but the lack of a visionary altruistic leader made it not possible to exploit this potential. The group also demonstrates that a group effort supported by external agents without internal good leadership will not succeed if that support is withdrawn.

From the above sampled groups we can identify some common characteristics of commercial groups' success. These success factors are good leadership, presence of an altruistic leader, diversified activities, innovativeness in value addition, and self-initiation.

#### **2.5.4 Case study II (Food crop based groups)**

There were 40 groups in this category in our survey. Their main activities are bulking and marketing of cereals and pulses. Households grow cereals for home consumption and only market surplus when they need cash. A characteristic of these products is that they are not very perishable and can be stored in the farmers' stores for some time in the absence of a bad outbreak of a storage pest. This sector usually has many seasonal intermediaries operating at harvest time. Farmers store the produce and sell small quantities as cash is required in the household. Such a product does not encourage producers to undertake collective action for marketing. However, some groups were self-initiated and performed well. This category has less diversity in terms of

groups' activities. Hence, we will take two groups that are the archetypes of success and failure in this category and discuss them.

Group G (situated in Mbeere district) has a success index score of 0.67. It was formed after a period of soil conservation efforts in the area, which were organized as a food-for-work project following a major drought in 2001. CRS, together with the Catholic Diocese of Embu, had instituted a food-for-work project to help the area's residents affected by a major drought<sup>32</sup>. The food-for-work project consisted of formation of village-level groups, with members jointly working on each other's farms on soil conservation measures. These efforts had a net result of increasing crop harvests in the region when rainfall was good. To market the surplus grains, several village-level groups were encouraged to merge into marketing PMGs. Group G falls in the top quartile of the success index score. It is a typical representation of a successful food crop group resulting from these mergers. We therefore use it to illustrate the factors of success in this category. Like the other successful groups, the leadership has been crucial in directing the vision and growth of the group. Members were able to get some external funding that enabled the group to start a commercial grain store. Local farmers, both members and non-members, sell their produce to the group, which bulks and sells it to wholesalers from the city and other bigger towns in the area. The group has acquired metal silos, through a grant, to store the grain without damage by pests. The driving force of the group is the ingenuity of the marketing representative, just like Group E in Makueni. The group has also started working on value adding of its produce

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<sup>32</sup> It was part of a USAID-funded project named Technology Application for Rural Growth and Economic Transformation (TARGET), which ran between 2002 and 2004. This project sought to identify obstacles to legume crop development in semi-arid areas in Kenya. Low production, poor quality, and price fluctuation due to intermediaries controlling the market were some of the problems farmers faced. The LLP project was a follow-up project to address some of the problems identified by the TARGET project.

by packing it in shelf-ready quantities supplied to nearby supermarkets<sup>33</sup>. The ingredients for success in this group are well-articulated objectives, targets, enforceable by-laws, good management, value addition, considerable capital investment, and the presence of an altruistic marketing representative.

Common factors that underpin the success of other food groups are good and transparent leadership, well laid down objectives, well thought out by-laws that are enforced, regular meetings, diversified activities, and regular subscription fees to the group. Diverse activities in a group allow membership to derive greater in-kind and monetary benefits from the association. A common ingredient for success in many groups across the entire sample was regular financial contributions by the members to the group. Contributions ensure that active members have a financial stake in the group that encourages interest in the group affairs and helps ensure good management.

At this point, we describe Group I located in Mbeere district that has a success score of 0.37. It was formed under similar circumstances as Group G described earlier. Group I was formed after the soil conservation effort of 2001, and by 2007 had virtually collapsed. It is chosen as a contrast to group G because it is also found in the same geographical area and hence is affected by similar unobserved factors, yet it did not succeed like Group G. After group formation, members elected a local prominent resident as their leader. He was chosen because he was one of the few educated persons in the group. Unfortunately, his attention was divided between staying in the area and running a business in another town about 15 miles away. Hence, he was rarely in the area where the group had a bulking store. He did not also work in

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<sup>33</sup> Four other groups in Mbeere district have started packing self-ready products to market to supermarkets.

collaboration with the other committee members. He controlled every aspect of the group operations including assets, group books of accounts and records. Although this group had established by-laws, the leader broke them by not following established procedures of division of labor. For instance, the group was given a cell phone to access marketing information through the LLP project. And instead of having the marketing representative perform her function, the leader kept the phone and did not give any information to the group members, leading to animosity within the committee. When the group was given inputs by the partner organizations, the leader would divert them to a local trader who would in turn sell them for their own personal profit. Group I also served a very large geographical area, and members had no time to bond and act collectively. It took five years for a section of the membership to get together to enforce their by-laws and oust the wayward leader through an election. This group had a huge potential for success since it served a very productive area and could bulk huge amount of grains with proper leadership.

Group I was formed under the auspices of a local religious agricultural development organization. Some members on many occasions sought intervention from this organization to oust the leader, but without a meeting convened by the members at an annual general meeting, it was difficult to replace the leader. The group did not have any required subscription that would build solidarity within the membership. There were no other activities the group performed with exception of bulking grain for sale and receiving of inputs from donors. Eventually it remained as a group by name only, and all its operations ground to a halt.

However, by the time of the survey, a section of the membership had called an annual general meeting and had elected a new leader. The members insisted on getting a woman as their new chairperson. Their argument was that a woman leader was less likely to misappropriate



group assets and women compared to men were more negatively affected by group failure. Therefore, a female leader would be more committed to the group cause.

In retrospect, we find that several factors led to the poor performance of this group. First was the manner in which it was formed. This group was formed from loosely connected soil conservation small groups whose members had never worked together and could not easily identify free riders and troublemakers before they joined. Therefore, there was no cohesion among the potential members. Second, the group served a large spatial area that made it difficult for coordination of the group activities among its members. Third was lack of adherence to the group's by-laws. Despite obvious misuse of group assets, members could not come together to organize new elections. This was a classic case of 'The tragedy of the Commons' (Hardin, 1968). Fourth, if the group had had a by-law requirement for regular monetary subscription, it would have ensured self-selection of cooperators who were likely to take action against a wayward leader. Fifth, the partnering development agents also contributed to this group's troubles. Provision of inputs and other assets like cell phones should have been done under a strict condition that the group adhere to some basic laid down mode of operations like good governance. Six, there was an obvious lack of an altruistic leader in this group who could have provided the necessary leadership to solve their problems with their chairperson early enough. The lack of infrastructure and the remoteness of the group location made it difficult for development agencies to visit the group to provide necessary group dynamics education to the members. The combination of all these factors led to the poor performance of Group I, and it provides a good contrast to a group with the necessary success factors.

### **2.5.5 Case study III (Reconstituted groups)**

Five groups out of all the groups interviewed had sprung up from the ashes of the collapsed groups that were formed through encouragement of external agents. At the beginning of the Technology Application for Rural Growth and Economic Transformation (TARGET) and LLP projects, there was the sensitization process about the need to form groups. Through these projects, many groups were formed, most of which we interviewed. Producers from a wide geographic region formed these groups. Unfortunately, these producers were frequently strangers to one another and in some cases did not have a common goal. Hence, when elections were conducted, a group of individuals was elected from different village constituent groups as officials, but not for their leadership abilities. Some groups eventually failed but remained active only as a conduit for receiving project inputs in the form of seeds and chemicals.

Fortunately, some members of the failed groups were able to perceive the benefits of being in a collective effort and the reasons for the failure of their old groups. Restructured groups have eventually sprung up on their own. An example of this phenomenon is Group J, with a success index score of 0.75. The group is located at Kambi ya mawe in Makueni district. It is categorized as a commercial group because the members are focused on diversified products. They grow pulses, cereals and horticultural crops. Like some of the groups in the study, this group was formed after the 2001 TARGET project. Members came together after sensitization by development agents. However, individual members were drawn from a large geographical area. When elections were conducted, they allocated positions based on localities to ensure equity. Therefore, leaders were not chosen on the basis of their leadership capabilities. There was little to keep this group together other than the need to remain as a group and benefit from inputs provided. Initially, the group bulked grain and in particular pigeon peas seed under contract by

ICRISAT as part of a seed multiplication program. The group had little bonding among the members, so when the seed multiplication project ended, they could not agree to diversify its activities to remain relevant. Eventually, the group ground to a halt with no activities. This continued until a few members came together and decided to start a new group in place of the old one. The new members are drawn from a smaller geographical area than its predecessor. It has a core membership of individuals who seem to value the ideal of collective effort. Since they were members of a previous collective action effort that failed, the “core group” screens thoroughly any potential new members before accepting them. Due to membership being drawn from a small geographical area, they are able to identify easily cooperators and free riders and weed out potential future trouble makers.

As a prototype of these reconstituted groups, Group J gives us a sneak preview of others with similar characteristics. The groups are composed of farmers who know one another well, have identified common interests, and are well aware of the undoing of the previous efforts. These groups tend to have very good leadership, have a vision, well-designed and usually enforced by-laws, diversified activities, regular contributions and a core group of altruistic individuals. These reconstituted groups provide an insight into the dynamic process of group formation after sensitization and group education. They show that the initial group formation process could have been improperly executed but the education process of participating in collective action initially given was worthwhile. In these groups, we see that even the failure of a group after sensitization and the group education is not per se a bad thing. There was a dynamic process where groups that were formed for the wrong reason or had bad leadership failed. Nevertheless, since the members appreciated the benefits of collective effort, they reorganized their groups on their own to have stronger collective action.

In this process, we witness in the field a process of a repeated game alluded to earlier in the theoretical section. Members of a community come together to play a game of collective marketing. Unfortunately, they do not know each other's type. Some are cooperators and others are free-riders. As they work together, some reveal their type, although not completely. As predicted in theory, the game reaches a low-level Nash equilibrium with the failure of the group. If the group is dissolved, a subset of the former group play the second-period game. However, this time cooperators are able to identify each other and form the "core group" that drives the reconstitution of the next group. It is likely that in the second period, more cooperators will come together to form the new group and increase the probability of success. There are more likely to institute a more costly-to-fake signal for commitment to discourage potential free-riders and lead to self selection of cooperators.

The results in this case study section mirror the work of Ostrom (1990). In her work, Ostrom emphasized the connection between 'The Tragedy of the Commons' (Hardin, 1968) prediction and the Prisoner Dilemma (PD) game in the provision of a common pool resource. She shows that in the PD game, prisoners are trapped by individual incentives to defect, leading to failure of cooperation. However, although a PD game structure is useful for empirical analysis of CA cases and predicts results of many phenomenon in the real life, it is not a reality in all circumstances. And just as identified in this study, Ostrom showed that it is possible for individuals to develop effective structures that solve the 'common set of problems' that plague many cooperation situations. The problems are indentified as free-riding, commitment, supply of new institutions, individual monitoring and effective sanctions. The study finds some common conditions that overcome these problems, similar to those identified by Ostrom (1990):

1. Group boundaries should be clearly defined.

2. Members participate in creating and modifying the rules.
3. Rules governing the use of collective goods should be appropriate to local needs and conditions.
4. Members participate in devising their own governance structures, and this should be respected by external agents.
5. A system for monitoring member's behavior should be developed by the members themselves.
6. Presence of a system of effective sanctions that is enforced.

In this study, we also show that many CA situations appear to have the structure of a prisoners' dilemma at a given point in time, but often represent not a one-shot game but a repeated game structure where individuals have the opportunity of updating their beliefs and modifying their strategies. The players are able to learn from the decisions and consequences of their actions and those of their trading partners, update their beliefs, and evolve structures that foster subsequent cooperation. This leads to common poor resources being supplied.

## **2.6 Testing of the group analysis framework**

In the methods section, this study proposed a new group analysis framework. This section presents descriptive analysis of the Group Analysis Framework and results of the regression estimation of success rating of groups based on quartile categorization of the success index score as an empirical testing of the framework. The second part of this section employs a case study approach to test the analysis framework using two selected groups from the sample.

## 2.6.1 Descriptive Analysis of the Group Analysis Framework

We briefly go through the Group Analysis Framework by describing the questions included and by examining a cross-tabulation of the results from the Framework with the success score rating index.

**Table 2-4: Cross-tabulation of group performance and important factors**

Group issue		Quartile of group of success <sup>‡</sup>				Somers' D <sup>34</sup>
		1	2	3	4	
		(%)	(%)	(%)	(%)	
Categorization (by crops)	Food	40.0	22.5	22.5	15.0	0.340***
	Commercial	12.0	28.0	28.0	32.0	(3.050)
	Self	25.5	21.3	23.4	29.8	-0.079
Initiation	External	23.3	30.2	27.9	18.6	(-0.669)
	No	20.0	60.0	20.0	0	0.268
Bylaws	Yes	21.0	20.0	22.0	22.0	(1.392)
	No	29.4	29.4	19.6	21.6	0.195*
Measurable targets	Yes	17.9	20.5	33.3	28.2	(1.674)
	No	35.0	35.0	25.0	5.0	0.324**
Subscription	Yes	21.4	22.9	25.7	30.0	(2.533)
	No	70.0	10.0	20.0	0	0.566***
More than 3 activities	Yes	18.8	27.5	26.2	27.5	(2.814)
	No	24.4	34.1	24.4	17.1	0.147
Small geographical area	Yes	24.5	18.4	26.5	30.6	(1.263)
	No	42.1	21.1	28.9	7.9	0.412***
Altruistic leader	Yes	11.5	28.8	23.1	36.5	(3.878)
	No	30.3	30.3	27.3	12.1	0.229**
Good leadership	Yes	21.1	22.8	24.6	31.6	(1.973)

\*Significant at 10%; \*\* Significant at 5%; \*\*\*Significant at 1%

t statistics in the parentheses

‡ Quartile 1 is the lowest with Quartile 4 being the highest

<sup>34</sup> Somers' D is an asymmetric measure of association between two variables. Given predictor variable X and outcome variable Y, we may estimate D(YX) as a measure of the effect of X on Y, or we may estimate D(XY) as a performance indicator of X as a predictor of Y.

The first questions in figure 2-2 (shown earlier) seek to know the nature of the good the group deals with. A good characterized by high asset specificity is more amenable to establishment of a producer marketing group, as discussed earlier. From table 2-4, we find that the nature of the produce a group is involved in is important to its success. The quartiles numbers are arranged in ascending order, with four being the top group.

For the food crop groups, only 15% fall in the top quartile, whereas 32% of commercial groups fall into that group. Of all the food crop groups, 40% fall in the bottom group, compared to only 12% of commercial groups. Based on Somers' D measure of association and direction, these results are significant at the 1% level.

The second question seeks to find out how the groups were initiated. A value of one means a group is externally initiated, and that is the reason in table 2-3 the association direction to success is negative. Though the nature of group initiation is not significant in the crosstab, 30% and 19% of self- and externally initiated groups respectively fall into the top quartile.

The next four questions in figure 2-2 explore the competency of the group management in setting up institutions that can ensure its success. The questions probe the internal planning and overall operations of the collective effort. The third question asks if the group has well-articulated by-laws. A cross tabulation of group success against having well-articulated by-laws reviews show that among the groups with no bylaws, 20% and 60% of the groups are found in the lowest and second lowest quartiles, respectively, with no group in the top quartile. In contrast, groups with bylaws are evenly distributed across all the quartile groups. The fourth question deals with the ability of the group to enforce its bylaws. Unless there is a credible threat that contravening group bylaws will result in some form of censure, then bylaws will have few

desired effects. However, it was not possible to collect this information and hence this question is not tested in the cross tabulation. The fifth question also deals with the ability of a group to set well-articulated objectives and goals. Although we asked this question in the survey, we did not classify explicitly if the objectives and goals were well defined or not. Hence, this question is not formally tested.

The sixth question seeks to find out if the group has set up well-defined targets that are measurable. Groups that had measurable targets had a higher success rate, with 28% falling into the top quartile compared to 22% for the groups with no measurable targets. And 33% of groups with measurable targets fell in the third quartile, compared to 20% of group with no measurable targets. The measure of association is significant at the 10% level.

The seventh question in figure 2-2 explores the commitment of the members to group welfare by looking at the financial subscription and contributions. Subscription is the regular financial contribution each member is supposed to give to the group. A group with regular monetary subscription is able to weed out the non-committed members by eliminating the ones who do not contribute. Also, regular subscriptions will increase the level of investment in the group effort and the monitoring each member will put into the group's affairs to make sure that the group succeeds in safeguarding his or her investment. Contribution is usually a one-off monetary contribution to the group and is mainly charged as an entry fee. Groups use contributions as a barrier to entry and as a way to self-select members who are likely to be cooperators. A contribution also indicates that the members have invested their resources into the collective effort. The higher the risk of losing a big investment, the higher the commitment level each member employs. If the group requires frequent member financial contributions, has many



activities, and covers a relatively small geographical area, then the increased interactions will increase bonding within the group, and members will have more time to know each. Once members get to be comfortable with one another, they will be more likely to agree on issues pertaining the running of their group, contributing to success. Table 2-4 shows that about 30% of the groups with subscription and 5% of those with no subscription fall into the top quartile. This result is significant at the 5% level. Though it is retained in the crosstab, it can be argued to be endogenous because it is used in the construction of the success index. However, we retain here in the explanation because it is described by the groups has a very important tool for signaling commitment by members.

The eighth question looks at the diversity of the groups' activities. And 70% of the groups with no more than 3 activities fall in the lowest quartile, with no group in the top quartile. In contrast, groups with more than three activities are evenly distributed across all the quartile groups, with the smallest group being in the lowest quartile (19%). The results and direction of association are significant at the 1% level.

The most common and cheapest mode of communication in rural areas is verbal; therefore, spatial and geographical location of the collective effort becomes a crucial factor. It is difficult to pass information about meetings and other crucial marketing information to the group members when they are dispersed over a large geographical area. Transport means are also poor, and often members walk to the meeting location. Producers are very busy, having many commitments, and will be more averse to walking long distances to attend meetings. The ninth question captures this effect, with groups operating in small areas having 31% of the groups in the top quartile groups and in contrast to the other group operating a bigger area having 17% in

the same quartile groups.

The last question in the framework focuses on self-assessment of group leadership quality. At the outset, a group may not admit inadequacies. After going through the previous questions with members in a focus group setting, it was easy to finally reach the level where members would honestly gauge the leadership qualities of their leaders. Table 2-4 has two ways of capturing group leadership. The first is the presence of an altruistic leader and the second is the self-assessment of overall leadership. Groups with an altruistic leader had 37% of the groups in the top quartile, while the group lacking such a leader had only 12% in the same quartile. In contrast, 42% of the groups with no altruistic leader fell into the bottom quartile, whereas group with an altruistic leader have only 12% in this quartile. This association is significant at the 1% level. The last question asked the focus group members to assess the overall quality of their group leadership. Groups with a perceived good leader had 32% in the top quartile, while the ones with bad leadership had only 12% in the same quartile. The association is significant at the 5% level.

In summary, questions in the analysis framework can be used for a quick assessment of a group success rating. The framework can be utilized to pinpoint areas of intervention in an already operating farmer group. We find that the results from this initial analysis conform to the hypotheses derived from theory and the literature review. Based on the data, the factors the framework finds key to success are group categorization (based on the asset specificity of a good), presence of measurable targets, a group having regular monetary subscription, the group working in a small spatial area, presence of an altruistic leader and having good leadership. These initial group interview results thus validate the ability of the analysis framework to give

quick results for analyzing collective action groups. While the framework focuses only on some key aspects of a group, section 2.5 gave the results of both econometric and case study analysis approach of the factors of success. The results of an in-depth testing of the framework are presented in the next section (2.6.2), followed by two cases that illustrates how the framework can be implemented.

## 2.6.2 Regression results of the group analysis framework factors

The group analysis framework was developed to pick up the most important factors that are necessary for a group to succeed. It is necessary to test whether the identified factors have a strong relationship to the success of the groups interviewed. Therefore, to use the Framework we needed to be confident that it has a decent prediction of the ‘success score index’. To test the efficacy of the framework, we ran a number of regressions and one graphic representation of the predicted mean success. The first exercise was to go through the 90 groups in the sample and test the framework’s ability to predict success. Running each group on the framework, we counted the number of ‘Yes’ and ‘Red Flags’ each group had and put that into the data.

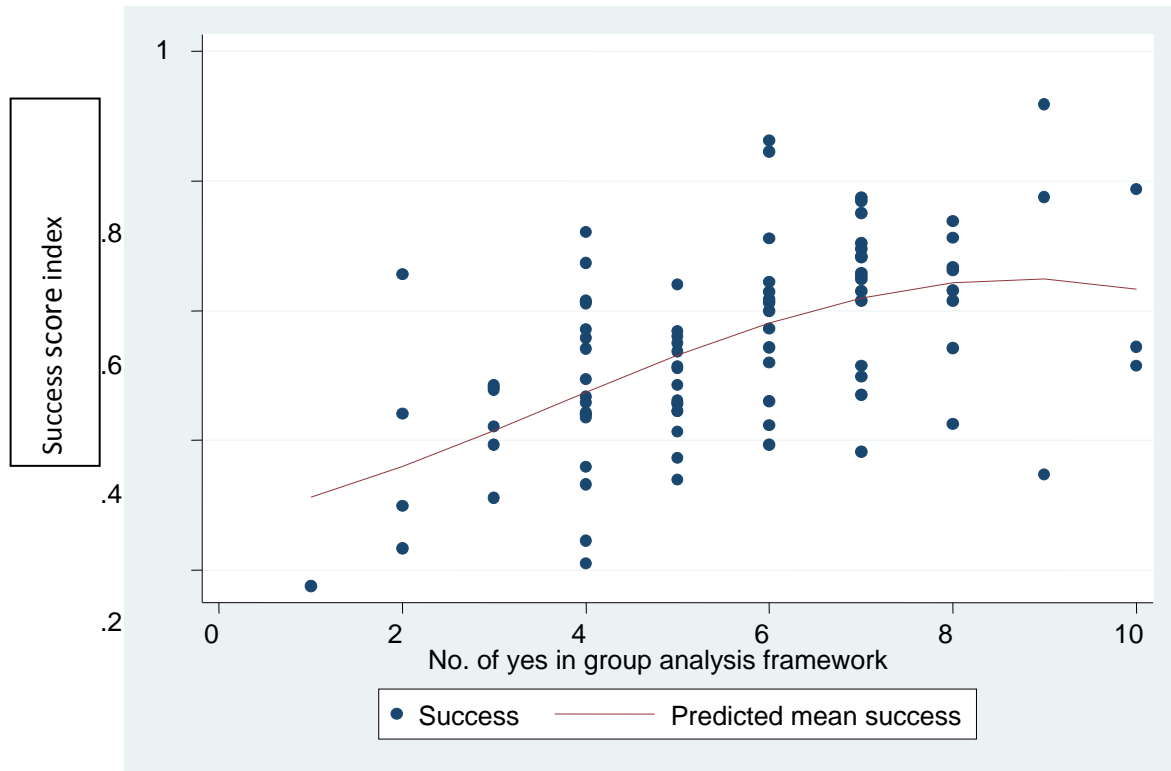
**Table 2-5 : Model to test the group analysis framework**

Success score index is the dependent variable			
	(1)	(2)	(3)
	‘Yes’	‘Yes’ <sup>2</sup>	‘Yes’ <sup>3</sup>
yes	0.042*** (4.84)	0.096** (2.46)	0.038 (0.33)
yes <sup>2</sup>		-0.005 (1.39)	0.007 (0.33)
yes <sup>3</sup>			-0.001 (0.58)
Observations	90	90	90

Absolute value of z statistics in parentheses  
 \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Then we run a fractional logit regression on the number of ‘Yes’ each group had and calculated the marginal effect. The results are in table 2-5 above model 1 column two.

Model one shows that as the number of ‘Yes’ increase, the success score index rises. Therefore, we estimated model (2) to test for a local maximum. The ‘Yes’ squared coefficient is not significant at the 10% level, and hence, we find no evidence of a local maximum. This is a logical conclusion since a ‘Yes’ shows that a group is healthy in that aspect. However, a function can have no maximum but still have an inflection point. It is at this point that there is critical number of ‘Yes’, to be sure that a group will be successful. We therefore estimated model (3) testing for local inflection point. Again we find no evidence of a local inflection point. A graphic representation of the polynomial model (3) is shown below in figure 2-3. The polynomial graph shows graphically that there is no inflection point. However, as the number of ‘Yes’ reaches 9 the graph tends to show some leveling off. However, in the statistical analysis of model 2 there was no evidence of a local maximum. We can conclude that though there is no maximum number of ‘Yes’, by the 9<sup>th</sup> ‘Yes’, the 10<sup>th</sup> ‘Yes’ will not improve the Framework’s ability to predict higher a ‘success score index’. We may then conclude that if a group has nine ‘Yes’ out of ‘10’ possible ‘Yes’, then it has a very high probability of succeeding. Figure 2-6 shows that below four ‘Yes’ the success score index will be below 0.5, which tending to the low success region.



**Figure 2-3 : Polynomial plot of group-analysis framework test**

**2.6.2.1 Quantile regressions of the ‘Group Analysis Framework’**

Two types of regression, a linear OLS and quantile regressions, are estimated. In the earlier regression analysis, we used fractional logit since the success score is an index bound between 0 and 1. Employing the same method or least squares regression, the resulting estimates of various factors on conditional mean success score may not be indicative of the size and nature of the effect on the lower or upper tail of the score distribution. In an effort to focus attention on distribution tails directly without censoring, the data we use quantile regression. Quantile regression gives a complete picture of the covariates’ effects at the tails by estimating a family of conditional quantile functions (Koenker and Hallock, 2001). In our case, we choose to estimate quartile regression so that we can gain insight into the effect of the Group Analysis Framework

factors on the least and most successful groups as well as the median group(s). To get the required quartile regression estimation, the following conditional quantile function is solved as shown in Koenker and Hallock (2001).

$$\underset{\beta \in \mathbb{R}^p}{\text{Min}} \sum \rho_{\tau}[y_i - \xi(x_i, \beta)]$$

We also estimate the mean effect of the covariates to the success score by OLS for comparison. Results in table 2-6 below show OLS, lower quartile, median and upper quartile regressions.

Group categorization is positive and significant at the 5% level in the lower quartile estimation. It is very important for poor performers to be more commercially oriented if they are to perform better. This factor is not that important as the group rises in the success index score. This result is as expected and hypothesized earlier in the analysis framework discussion.

The negative sign on the coefficient for external initiation of groups hints that external initiation decreases a group's probability of success; however, the coefficient is not statistically significant. From our sample, we can therefore conclude that there is no statistical evidence that once groups are involved with external agents, they are more likely to fail, as proposed by some sociology literature mentioned earlier. But we can equally conclude that there is no evidence from our data that external initiation increases the chances of success.

The next question in the framework is about bylaws. However, the survey did not rate groups' bylaws for their articulation and enforceability. Only 5% of the groups interviewed did not have bylaws at all. Therefore, this variable does not have much variation in this sample. To capture the groups' ability to make good rules, the analysis uses the "convention" variable that captures whether the groups had some accepted conventions apart from the written bylaws.

**Table 2-6: Testing of the factors that used in the group analysis framework**

	(1)	(2)	(3)	(4)
VARIABLES	OLS	.25 Quartile	LAD (Median)	.75 Quartile
Commercial	0.453** (0.225)	0.619** (0.287)	0.392 (0.307)	0.434 (0.268)
External	-0.0835 (0.221)	-0.0307 (0.256)	-0.0955 (0.298)	-0.242 (0.297)
Convention	0.0930 (0.223)	0.0842 (0.235)	-0.0365 (0.290)	0.0953 (0.298)
Target	0.388* (0.211)	0.161 (0.253)	0.736** (0.288)	0.276 (0.280)
Buy product	0.561** (0.258)	0.726** (0.300)	0.365 (0.375)	0.427 (0.382)
Subscription	8.70e-05 (0.000132)	0.000156* (8.70e-05)	4.87e-05 (0.000117)	-0.000187 (0.000116)
# of village	-0.0815** (0.0394)	-0.0275 (0.0361)	-0.0945* (0.0522)	-0.102** (0.0462)
# of activities	0.184*** (0.0557)	0.217*** (0.0697)	0.244*** (0.0877)	0.160** (0.0651)
Altruistic	0.360* (0.214)	0.139 (0.271)	0.412 (0.308)	0.708** (0.284)
Constant	1.129*** (0.386)	-0.0587 (0.496)	0.765 (0.569)	2.091*** (0.501)
Observations	90	90	90	90
Adjusted R2	0.343			
Pseudo R2		0.2799	0.2799	0.2540

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Having conventions shows that a group is flexible enough to notice the inadequacy of its bylaws to guide the operation and institute other laws that may not yet be filed with the registrar of groups. The coefficient on convention variable has the expected positive sign, although it is not significant.

The variable for the presence of well-articulated targets captures the management abilities of the group in general. Its coefficient is significant in the OLS and LAD regressions but

not in the lower and the upper quartiles. This can be interpreted as the overall need for targets in general. The expectation was that it would be significant for the lower quartile, but this was not the case.

Buying of non-members' product to trade shows the planning and marketing abilities of the group. The variable was used to capture the groups' ability to have well thought-out objectives, as this was not well captured in the survey. It is significant in the OLS and lowest quartile regressions. Good management abilities and the ability to plan effectively to have enough capital to buy non-members' produce and then market it at a profit is essential for a poor performing group to succeed. It shows that groups that trade with non-members' product increase their success index.

The subscription variable is a dummy showing if the individual ever paid any subscription to the group with 1 being Yes and 0 being No. The variable is significant for the lowest quartile. The presence of many non-cooperators could lead a group to be in the lower quartile. Introducing regular contribution to a group weeds out the free riders as well as increasing commitments of the members due to increased investment. However, this variable could be endogenous since it is correlated with the success index because we used the per-capita contribution index in creating the overall success index. This will be investigated in future studies.

Operating in large geographical areas is captured by the variable indicating the number of villages. The results show that there is negative relationship between success rating and the number of villages. This confirms the hypothesis that coordination is a challenge for groups operating in a large geographical area. The variable is significant for all the estimations with the



exception of lowest quartile.

Diversification of group operations is captured by the number of activities a group performs. The variable shows a positive relationship with success rating. It confirms our earlier argument that groups need to add membership value by adding more activities. The coefficient is significant for all estimations at the 1% level.

Having an altruistic leader in a group increases the success index score. The coefficient is significant only in the top quartile and OLS regression. This variable captures good leadership quality of a group rather than using the self-assessed leadership ranking which could have been biased since leaders were present when this question was posed. We expected that the variable would be significant for all estimations, but it is only the case for the upper quartile.

### **2.6.3 Implementation of the group analysis framework**

After showing that the framework has predictive power on the group success score, we use two cases to test the group analysis framework further in a case study approach. The two groups used have a similar background in terms of starting period, agro-ecological zones, external support services, and main activities. They are Group E and Group K. Group E started in 1999. The marketing representative attended a world summit in Italy on social work and felt the need to start a group in her home area after returning. She sensitized the community, and eight groups merged together to form the current Group E. The current membership is 200 and is composed of 50 male and 150 female members. It is located in Kathonzweni market some 10 kilometres from Wote, the main district town.

**Table 2-7 Summary of the group analysis framework**

<b>Questions</b>	<b>Group E</b>	<b>Comments</b>	<b>Group K</b>	<b>Comments</b>
Is this a commercial group?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Is the group self-initiated?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Does the group have well-articulated by-laws?	Yes	Continue (good sign)	Yes	Continue (good sign)
Are the by-laws enforceable (enforced)?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Does the group have well defined objectives?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Does the group have measurable targets?	No	Red Flag raised (potential problems)	No	Red Flag raised (potential problems)
Does the group have regular subscription fees?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Is the group involved in more than one activity?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
Does the group cover a small geographical area?	No	Red Flag raised (potential problems)	No	Red Flag raised (potential problems)
Does the group have good leadership?	Yes	Continue (good sign)	No	Red Flag raised (potential problems)
<b>Conclusion</b>	The group has 8 yes and 2 no, which implies that it is likely to succeed	Success	The group has 9 no and 1 yes, which predicts that the group is unlikely to succeed	Collapsed and had to be divided into several smaller units

Group H is located about 5 kilometres away from Emali town of Kibwezi district. It was started in 2003 through encouragement by ICRISAT/KARI (through the TARGET project) and

the local church development committee of Catholic Diocese of Machakos. It was composed of 336 members--120 males and 216 females, all farmers. Both groups were initially started to bulk and market members' surplus cereals and pulses.

We use the framework as shown earlier (figure 2-2) to analyze the two groups. The process is summarized in table 2-7 below. We also go through step-by-step implementation of the whole process tree, showing the decision taken at each step for each group. The analysis framework implementation clearly predicted that Group E, with a success score of 0.85, would be a successful group and that Group H, with a success score of 0.36, was unlikely to succeed.

Group E is described earlier in the commercial group section. Therefore we highlight a few contrasting characteristics to show the analysis by the framework. Group E was self-initiated as a food group and later evolved into a commercial group by diversifying its activities. It has well-framed by-laws that are read to the members regularly and strictly enforced. The group also had very well defined objectives, although they lacked measurable targets. Members contribute Kshs 40 per month (US \$ 0.52), which increases their commitment to the group.

The group not only bulks and sells seed and grain cereals and pulses but also has other activities like selling handmade baskets and other locally made items by the women. It also stocks and sells mosquito nets. However, the group serves a large geographical area that makes it difficult to communicate effectively. It regularly holds elections, and in the last 8 years have had 8 elections. It has well-informed and self-assessed good leadership. The group formation and marketing activities have benefited from an altruistic and visionary marketing representative. With only two out of ten areas checked raising red flags in the analysis framework, it is safe to predict a high probability of success (See table 2-7 above).

External agents initiated Group K as a food crop-marketing group. The group served a large geographical area, which made it very difficult for members to communicate. Members did not know each other well and did not have common interests. Through the effort of the Diocese and ICRISAT, the group was able to draw reasonably good by-laws. However, the management committee did not enforce them due to poor leadership. Like Group E, this group had a shop for bulking and marketing its produce. It is located five kilometers away from the main Mombasa-Nairobi highway. This enables individual traders in the area to buy products and transport them to the two big cities due to proximity to the main highway.<sup>35</sup> In comparison, Group E is about 60 Kilometers away from the same highway with very bad road conditions. Group K's by-laws called for a regular contribution, but this was not enforced. From 2002 until early 2007, Group K had conducted a single election, which was against the bylaws; the bylaws stipulated that elections were to be conducted every year. Lack of regular elections brought up many leadership problems such as the lack of committee cohesion. The group also did not develop workable objectives with measurable targets. It did not diversify its operations, and its sole activity was to bulk and sell pigeon peas collectively.

The framework correctly predicted that this group was unlikely to survive (see table 2-7 above). In 2007, members subdivided the group into three small groups, each serving a smaller spatial location. The new groups have learnt from previous failure and might have a higher probability of survival in their second phase of their lives.

From the empirical and group framework analysis, the factors selected in the series of questions give a good view of each group. Hence, the framework can be utilized to investigate

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<sup>35</sup> At the time of the study, one of the group leaders was buying large quantities of green pigeon peas (as a private individual) and taking them to Mombasa for sale.

the potential of a group and pinpoint critical areas of interventions.

## **2.7 Conclusions**

The study objectives were to identify conditions necessary for smallholder groups to emerge and succeed. From the analysis and literature reviewed, the conclusion is that the nature of a good (crop, activities) will decrease or increase transaction costs an individual farmer faces in marketing her products. The nature of transaction costs will either foster or discourage collective action. An individual with a perishable product with frequent transaction faces higher transaction costs than someone producing a less perishable product that can be easily stored. Therefore, areas dominated by a low transaction specific good will see few producer marketing groups formed. However, for a successful farmer organization to emerge, regardless of the nature of the good, it is easier if there is an altruistic leader or a small “core group” of individuals spearheading the effort than a mass mobilization. Such an individual or core group is likely to invest more effort and resources in putting into place structures that enhance the probability of success. They will have moral authority to sanction a free rider and discourage individual opportunistic behavior that, left unchecked, leads to a low Nash-equilibrium of group failure.

The results suggest that development organizations or government agencies working with groups should try to work with already existing groups. Such groups would have developed an internal mechanism that reinforces collective behavior for the good of its members. If an external agent were to initiate a new collective action effort, it should evaluate if a group is warranted given the prevailing conditions. And if a group is needed, then the external agent should be willing to invest more time and resources into education of all members in group dynamics, management trainings, and strict monitoring. The lesson learnt is that coming up with successful new groups is tricky. The process of electing good leadership is difficult without members’

initial bonding and unity of purpose. Therefore, it is very difficult for the individuals to work together. In addition, groups formed because of direct intervention by an external agent usually have very high initial expectations. They expect lots of monetary and in-kind support from the supporting agency. There is a general lack of ownership of the collective effort. Lack of fulfillment of expectations within a specified period leaves members disillusioned, making it harder for a group to succeed.

In the initial stages of group formation, membership should be drawn from a small geographical area. This will ensure that individuals have interacted with each other in past. Repeated games in previous interactions help potential members to identify cooperators easily. Smaller groups in terms of membership make it easier for individuals to build greater social capital that helps to reduce the resources used to monitor each other. A diversified portfolio of activities increases the gross benefit a member derives from collective effort and thereby increases commitment that leads to greater success probability for a group.

Groups' internal organization and governance contribute to their success. This is a function of the leadership qualities of the elected officials and the trust the members have in them. Stronger social networks reduce negative behavior in a group. From the analysis, we can conclude that requirements to adhere to by-laws improve members' commitment to a group. If such measures are enforced, only committed farmers will join, and the non-committed ones will withdraw from the groups before there are problems.

The study has also demonstrated that the proposed group-analysis framework does a decent job in identifying intervention areas in operating groups and issues needed to be addressed in new group's constitution. Using econometric analysis with all the 90 cases we have

also demonstrated that the Group Analysis Framework actually predict the success of a group. If a group has four or less 'Yes' it will be below 0.5 on the 'success score index' scale. However, more studies need to be conducted using this framework to make sure that it can be generalized to a variety of conditions.

## **Chapter 3 : Determinants of farmer’s participation in collective action, patronage, and intensity: the case of farmers in semi-arid areas in Kenya**

### **3.1 Background**

Before 1989, most of grains and other agricultural produce in Kenya and in many developing countries were marketed through government-controlled parastatals or marketing boards. Pre-liberalization, there was the hope that with liberalization, market forces would get into play and efficient marketing systems would take the place of the often inefficient and corrupt government agencies. However, since 1990, when most of agricultural marketing services were liberalized in Kenya, there have been mixed results in the development of agricultural input, output, and financial markets. The expectations were that new institutions would spring up and offer attractively priced, timely, and reliable services that are critical for more intensive cropping, and particularly for intensification of cereal and pulse production in poorer rural areas (Dorward, 2001, Fafchamps, 2004, Jayne, 1997). One form of a marketing channel expected to spring up was some form of collective action effort—in particular, Producer Marketing Groups (PMGs)—to compete side by side with private traders or as a form of bargaining agent. However, these new institutional arrangements in many cases did not spring up automatically to cover the gap left by exiting parastatals, and those that did form often did not deliver the desired results. Members of producer-marketing groups often do not patronize them effectively, thereby not reaping desired benefits. The 2005 ICRISAT (2006) survey in Kenya showed that despite the sensitization about the benefits of forming PMGs, not all villagers participated, and even those who participated sold only a small portion of their produce through the groups (Shiferaw, et al., 2005).



### **3.2 Research questions**

It is important to determine the impediments that cause farmers not to join PMGs and patronize them effectively. This chapter investigates:

- i) What are the determinants of participation in PMGs?
- ii) What are the factors influencing patronage of producer marketing groups?
- iii) What factors influence the intensity of collective action?

The chapter sheds light on the factors that affect collective action in a low-income-country setting and in particular, in low-potential, semi-arid areas such as the study areas in Kenya. This is very important and timely, as the development community is seeking the best methods of employing PMGs to improve small-scale farmers' access to markets. Although some work has been done in this area, most has been in developed countries. There is also a marked lack of literature that has applied econometric methods to estimate the magnitude of different factors affecting collective action. In part, this lack of quantitative analysis has been due to the difficulties of measurement of factors like transaction costs and social networks.

### **3.3 Literature review**

In much of rural Africa, in order to market farm product surplus, farmers have to grade the produce according to grades that are not well defined, understood, and accepted by all the players in the market; search for a buyer; gather market information; transport the produce to the market; and negotiate for the price. All these tasks have a high transportation, opportunity, and transaction costs (Barrett, 1997). Since marketing and transactions costs involved are high, farmers opt either not to participate in the market or, if they do, to sell at the farm-gate to an intermediary. Often, they have little or no choice of a buyer due to low competition in the market. Lack of competition gives private traders the ability to exert greater market power

(Bellemare and Barrett, 2006, De Janvry, 1991, Kindness and Gordon, 2001). Hence, poor smallholders capture only a small percentage of the value of the products they sell, while middlemen and retailers higher up the commodity chain get a much greater share. For example, an analysis of the charcoal commodity chain in Senegal found that the net profit per sack of charcoal of a typical woodcutter at the base of the chain is about 21% percent of the total profit compared to a merchant profit of 52% (Ribot, 1998). In the absence of a direct market for tomato producers in Turkey, middlemen offered low prices (Esengun, et al., 2005). Hence, there are incentives for farmers to obtain a higher return for their effort by controlling the initial stages of the supply chain through a PMG.

Formation of PMGs gives producers another choice of a marketing channel apart from middlemen and spot markets. Farmers can continue marketing their produce as individuals or through producer marketing groups. Often producers will employ multiple channels. From economic theory, we predict that each household will choose a combination of channels that deliver the highest utility. This chapter explores the individual household's incentives to join producer-marketing groups. Underlying these incentives is the perceived distribution of benefits and costs. These are influenced by factors related to the nature of transactions costs faced by the individual producers. They are a function of the nature of the products they produce, the characteristics of the community, the social networks within the community, the resource and external environment such as the role of external organizations (government and NGOs), and accessibility to markets by individuals.

Literature on collective action is vast, and we just cover it briefly here. More details are available in Olson (1965), Reisman (1990), and Sandler (1992). Collective action requires involvement of a group of people with shared interests in some common action directed towards

achieving some shared interests (Marshall, 1998, Meinzen-Dick, et al., 2001, Sandler, 1992). Usually, economic theories of collective action are concerned with the provision of a high exclusion cost good (HEC)<sup>36</sup> (Ostrom, 1990, Schmid, 1989, Schmid, 2004) and other collective consumption goods through the collaboration of two or more individuals.<sup>37</sup> The theory explores situations where there is presence of market failures, and individual consumer rationality coupled with firms' profit-seeking behavior do not lead to efficient provision of the good. Features such as the group's purpose and existence of a common problem within a society have been identified as fostering participation in collective action. Collective action theory, therefore, gives us the starting point in exploring factors that influence producers to join producer-marketing group. Economic theory posits that individuals are more likely to participate if they share similar economic goals and uncertainties as well as socially accepted norms.

Since individual behavior towards collective action is influenced by benefits and costs of participating, we can utilize the theory of utility or profit maximization to analyze participation (Meinzen-Dick, et al., 2002). There is a broad consensus in the new institutional economics literature that participation in collective action depends on four classes of determinants: the characteristics of the collective action problem, the attributes of the group (members and non-members), the attributes of the institutional arrangements, and external influences (Sekher, 2001). Differences in perceived benefits of collective action by the households depend on their

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<sup>36</sup> In most literature, we find the term “public good.” The term ‘public good’ can be misleading: First, it refers to a private good with unique characteristics. Second, as Schmid (1989) indicates, the term itself implies that such good should be provided in the public sector. In this essay, we use high exclusion cost good (HEC). Schmid (1989; 2004) defines HEC as a certain type of good that the owner of rights cannot exclude non-paying consumers easily from access to the good and any benefits accruing from it.

<sup>37</sup> Mancur Olson's book *“The Logic of Collective Action: Public Goods and the Theory of Groups”* lays out the economic foundation for collective action.

characteristics such as age, education, gender, occupation, values, beliefs, ideas, and economic status (Hertberg, 2001).

Most studies in developing countries have concentrated on the question of market participation for the smallholder producers under various conditions. They explore the factors that influence smallholder farmer's participation in agricultural product markets. Goetz (1992) studied the participation of Senegalese agricultural households in grain markets, using a probit model of households' discrete decision to participate in the market, followed by a second-stage switching regression model of the supply decision. He finds that better information and access to new technology play important roles in the participation and supply decision. Holloway et al. (2005) used a Bayesian double-hurdle model to study the participation of Ethiopian dairy farmers in the milk market when non-negligible fixed costs lead to nonzero censoring. That work is similar to studies by Key, Sadoulet, and de Janvry (2000), but Holloway et al. distinguish between the discrete participation decision and the continuous volume marketed decision, as in Goetz. They find that intellectual capital stock is a good complement to physical assets in the decision to participate in the market. Key et al. (2000) developed a structural model to estimate structural supply functions and production thresholds for Mexican farmers' participation in the maize market, based on a censoring model with an unobserved censoring threshold. Their model differentiates between the effects of fixed and proportional (i.e., variable) transactions costs. The results show that lowering of transaction costs and promotion of producer marketing organizations increases both farmers' output and market participation. Bellemare and Barrett (2006) model market participation of livestock producers in Kenya and Ethiopia using a Tobit model to explore whether the producers make simultaneous or sequential market participation decisions. They find that fixed costs deter market participation of the livestock herders in Eastern

Africa. Vakis et al. (2003) explores the Peruvian potato farmers' choice of the marketing channel and propose a method to incorporate transaction costs explicitly. The results again underscore the importance of market information in reducing transaction costs and increasing market participation. Hernandez et al. (2007) study how tomato farmers in Guatemala make a choice between traditional markets and the supermarket channel using a sequential model. Their findings show that wealthier producers are able to market through the supermarkets due to lower transaction costs even though their profit rates are similar to traditional channels. Okello and Swinton (2006) use case study approach to analyze the strategies smallholder traders use in complying with strict enforcement of pesticide use on vegetables grown for export in Kenya. They find that some individual farmers form producer groups to coordinate the enforcement of the rules to individual farmers to remain compliant. All these studies have looked at determinants of producer choice of whether to participate in the market or the choice of different channels in the market. None looks at the choice between the traditional spot marketing channel and a producer-marketing group. Only the study by Okello and Swinton (2006) looks at the choice between individual farmers' direct contracting with an exporter or use of a farmer group to sign a marketing contract. However, the study uses a case study approach whereas our study uses a quantitative approach. It is this gap we wish to fill in this chapter. This is very important since collective action in many forms has been promoted as an alternative or complement to traditional marketing model.

Many of the studies reviewed underscore the role played by access to marketing information. A recent development in many developing countries is the widespread use of new information communication technology. Mobile phone use is found even in the remote parts of Kenya now, and this redefines the traditional means of access to market information and

transaction arrangements, with a likely impact on individual marketing channel choices. Mobile phones make it easier for a rural farmer to have a social network wider than her locality. An important source of transaction costs is information asymmetry between actors. Increased use of mobile phones in the rural areas is affecting the way actors transact business and the distribution of transaction costs. In 1998, Kenya had 15,000 cell phones; in five years, the number had grown by 139 times to 2.1 million by 2003. Then in three years, the number of subscribers increased again by 3 times to 6.5 million users by 2006 (CCK-Kenya, 2006). By 2008, mobile subscribers had increased to more than 12 million, and since one line is shared by at least two individuals, the national coverage is over 25 million people in the country (CCK-Kenya, 2008). With new technologies that enable producers to gather marketing information easily, we expect that the marketing structure will change and the role the PMG plays in gathering information will also change. Prior to introduction of mobile phones in the rural areas, traders from the major cities had to drive to rural areas to search for the produce. This increased the search cost, and traders had to factor the additional cost in the price offered to farmers. Currently, one finds these phones in almost every village and indeed in many homes in Kenya. The fact that a non-cell-phone owner will also access messages from the neighbor who owns one increases the penetration rate of this form of communication. Therefore, a trader can call in advance to negotiate for a product, decreasing the search costs. On the other hand, a producer will also call other traders or friends to find the prevailing market prices. There are other service providers that provide market information through short message services (SMS). A farmer or trader can find up-to-date prices of a commodity in most major cities by accessing a server using a SMS for a fee of about US \$ 0.23 per access. The improved information access will affect the balance of bargaining power between individual farmers and groups, on the one hand, and traders on the other hand.

Communication among group members is also enhanced or altered. Chowdhury (2006) finds that reduction in information costs through access to a fixed telephone changes the functioning of markets and households' participation in factor markets.

A recent study in Niger assesses the impact of cell phones on grain market performance (Aker, 2008). Aker finds that introduction of cell phones is associated with a reduction of 20 percent in grain price differences across markets, with a larger impact on markets that are farther apart and those that have poor road network. Akers study looks at the effect of ICT on marketing structure at the trader and consumer level, whereas the Chowdhury study investigates the effect of fixed phones on factor markets. We extend Chowdhury's and Akers' work by investigating the effect of cell phones at households' decisions to participate in CA, and their choice of the level of patronage. Therefore, our study will continue to shed more light on the way ICT is affecting various sections of the agricultural sector that has not been studied. No other study reviewed looks at use of new communication technology in the rural areas and its impact on the rural marketing channel choices. The paper therefore adds to the literature by looking at marketing choices producers make between collective action and traditional spot market and the impact of structural change in information access.

### **3.4 Theoretical Framework**

#### **3.4.1 Collective action participation and patronage model**

We hypothesize that households will make decisions on the channel(s) through which to market their produce in order to maximize their expected utility. We then assume that the utility a household derives from the choice of channels depends on the set of available channels  $C$ . In the case of many rural areas in Kenya and more so in the areas we conducted the survey, there were mainly two choices from which to choose. A household had to sell through a combination

of the spot market and a producer marketing group or the spot market alone. The spot market here includes going to the open market to sell the produce or selling at the farm gate to a broker or a trader. For ease of modeling we include both these channels in our definition of the spot market.

Let us assume that the household has a utility function of the form:

$$\mu_{ij} = V(Z_{ij}, X_i, E_i) + \varepsilon_i \quad (3.1)$$

For any given household  $i$  a given level of utility will be associated with any choice of the alternative marketing channel  $j$ . The utility derived from the channel choices depends on the attributes ( $Z$ ) of the channels, the socio-economic characteristics of the household ( $X$ ), and the social capital, location and the environmental factors ( $E$ ) (Akin, et al., 1995, Alaba and Alaba, 2002, Whittington, et al., 1990). The utility of choice comprises the systematic component (the first term) on the right hand side of the equation (3.1) and the error component  $\varepsilon_i$ . The error component is independent of the systematic component and follows a predetermined distribution (Ben-Akiva and Lerman, 1995, Manski, 1973).

A household choice between the alternative channels is a function of the probability that the utility associated with a particular option ( $j$ ) is higher than all other alternatives. Assuming that the relationship between utility and characteristics is linear in parameters and the variables in the function, and that the error term is identically and independently distributed, then we can have a reduced-form equation.



### 3.4.2 Reduced-form market choice

The household maximizes its expected utility by choosing the marketing channel that can be modeled as:

From equation (3.1), we can specify a reduced form model as follows:

$$E(\mu) = X_{ij}\beta + W_i\beta_i + Z\psi + \delta_i\alpha + \varepsilon_i \quad (3.2)$$

Where  $\mu$  is the utility that is associated channel  $j$ , where  $j = [1, 2]$ , which for our purpose signifies some a combination of the PMG and the spot market or the spot market only.  $X_{ij}$  is a vector of household characteristics that vary across the two alternative marketing channels considered,  $W_i$  are attributes invariant across the market alternatives such as location characteristics,  $Z$  are market characteristics,  $\delta$  are a vector of social networks,  $\beta, \beta_i, \alpha$  and  $\psi$ <sup>38</sup> are a vector of parameters to be estimated, and  $\varepsilon_i$  is idiosyncratic error term.

Let  $C_{ij}$  denote the market choice channel combination that maximizes utility for household  $i$ .

If we assume that  $\varepsilon_{ij}$  are normally distributed, and since our interest is to determine if the household will choose to market through the PMG, we can model this decision using a binary model:

$$P(C_{ij} = 1 | X, W) = G((X, W)\beta) = P(X, W) \quad (3.3)$$

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<sup>38</sup>  $\beta$  captures the effect of marketing-channel-specific parameters such as distance to the market, while  $\beta_i$  are parameters that show the impact of individual household characteristics on the market choice.

Let  $(X,W)=\lambda$  , where  $\lambda$  is  $1 \times K$  and  $\beta$  is  $K \times 1$ . Since we assumed the error terms are normally distributed, we can estimate the choice as a probit model:

$$G(\lambda) \equiv \Phi\lambda \equiv \int_{-\infty}^{\lambda} \phi(v)dv \quad (3.4)$$

Where  $\phi(\lambda)$  is the standard normal density,

$$\phi(\lambda) = (2\pi)^{-\frac{1}{2}} \exp\left(\frac{-\lambda^2}{2}\right) \quad (3.5)$$

### 3.4.3 Hypotheses

In the empirical analysis, we seek to test the following hypotheses:

*Hypothesis 1: Previous assistance from an external agent will increase the probability of a household being involved in producer marketing groups.*

External organizations may facilitate collective action efforts by providing technical support (in terms of training) and other inputs, provided that these interventions are complementary to local collective action. External agents may also improve participation because they usually tie access to their services to being a member of these organizations. However, external organizations may hinder collective action participation if their role substitutes for local efforts (such as replacing local effort or interfering in management decisions) or outright undermining collective effort (Berhanu, et al., 2001, Pender and Scherr, 1999). We control for the effect of external organizations by including a dummy variable that captures whether a household received services from a development agency. Prior experience with local organizations could favor collective action due to possible learning effects and the effect of social capital on the costs or ability to enforce collective action (Baland and Platteau,

1999, Pender and Scherr, 1999, Rasmussen and Meinzen-Dick, 1995) . However, a bad earlier experience may hinder subsequent participation in collective action efforts.

*Hypothesis 2: The more isolated a household is from the market (distance and conditions of the roads), the more likely it is to join a PMG.*

Better market access may lead to an increased level of competition by traders, arising from reduced marketing and search costs. Consequently, better market access may decrease participation in collective action by reducing the incentive of members to abide by collective action rules by providing more ‘exit’ options and making enforcement of rules more difficult (Baland and Platteau, 1999, Berhanu, et al., 2001, Pender and Scherr, 1999, Rasmussen and Meinzen-Dick, 1995). On the other hand, development agencies may target more remote areas because they work mostly in less developed area. If this is true, then the association between remoteness may depend more on the decisions of the external agencies pushing the creation of PMGs than on individual choice by the household about whether to join a PMG because of the transaction costs it faces in using the spot market. Though we may not be sure which reason is true in all situations, we will test the association between remoteness of a location and the local farmers joining of a PMG to access the markets and other services. In this study, market access is measured by the walking time taken to reach the nearest market town from the village or their point of produce sales.

*Hypothesis 3: Individuals with a higher social network index will participate more in the PMGs.*

Individuals share information with the other members of their group in the social network and reach a common understanding and perception when faced with a new technology (Valente, 1995). A person’s connectedness in a social system will affect his/her adoption of new

technology (Rice, 1993). Therefore, a head of household with a big social network will tend also to participate in collective action. Social network in this chapter is estimated through several indexes that are discussed later. Having many friends in collective action will over time overcome the free-riding mentality where individuals wait and see if there is a benefit from the group before joining. Hence, due to network effects, these producers will eventually join more groups. This is referred to as “behavioral confirmation” that stems from actors' desire to follow prevalent behavioral patterns of relevant others (Lindenberg, 1986) . Individuals have additional motivations to join the PMG if their friends do so. On the other hand, they will not participate in the PMG if their friends do not participate (Oberschall, 1994). Intensive interpersonal ties (friendship) are an important avenue of the spread of social influence that facilitates mobilization in collective action (Janky and Takács, 2009).

*Hypothesis 4: Access to mobile phones will decrease individual producers' participation in the PMGs.*

Access to good communication services in rural areas by households will affect choice of the marketing channel. We consider access to telecommunication as access to information and potential reduction in transaction costs through reduction of search costs and solving of the coordination failure between traders, producers, groups, and within a group. Previous studies have found that better marketing information plays an important role in market participation, and we expect also that the new information technology will affect the choice of marketing channels. Normally, producer marketing groups give an individual producer low-cost access to marketing information through the collective effort. Access to a mobile phone may provide a farmer an alternative faster source of information. This decreases the perceived benefit of a PMG, which in

turn decreases participation and might necessitate added benefits to induce farmers to join the collective effort.

### **3.5 Methods**

#### **3.5.1 Decision to participate in the PMGs and patronage**

This section addresses the two questions of participation in collective PMGs as well as the level of patronage (i.e., the amount of produce sold through the group)<sup>39</sup>. These are important questions because if there are producer-marketing groups, then we expect that members will market a proportion of their marketable produce through them. Answering these questions will provide development agencies and government policy makers with the crucial areas of interventions to have maximum impact with such collective action programs.

Previous research among the same respondents in the study area has shown that even the participating members were not selling all their marketable produce through the producer groups. If quantities sold through the groups are large enough to have a sizeable share of the market, then members can benefit from the potential benefits of economies of scale, scope, and greater bargaining power. Otherwise, being a member of a group will not be important, and the groups may eventually fail out of irrelevance. So we examine the factors that determine the household's decision to use more of the producer groups' marketing services compared to the spot market. Producers will use more of PMG's marketing services than the spot market if equation (2.1) holds true or there is a strict inequality.

However, we can estimate a supply function for sales through collective action, as follows:

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<sup>39</sup> The level of patronage is chosen by the household's choice of the level of consumption, and the rest is then marketed through the two channels.

$$q(t)C_j = f(X, A, E, SN, MC, I, t, L) \quad (3.6)$$

The factors used to explain differences in participating in PMG marketing include individual household characteristics ( $X$ ). These are in line with incentive and constraints that a household may face that affect its adoption decision. Household wealth ( $A$ ) variables are also used since wealthier individuals may have more choices in marketing channels. We include involvement of external development agencies ( $E$ ); experience with other organizations and social networks ( $SN$ ); distance to market measured in time spent walking and transport costs ( $MC$ ); and sources of information ( $I$ ); a time trend, which is captured by year variable ( $t$ ), and a spatial location variable ( $L$ ).

Past studies on market supply decisions have treated these as a sequence of two steps, a market participation decision followed by a supply volume decision (Goetz, 1992, Key, et al., 2000). However, most did not include information sources explicitly. We use information sources as dummy variables to estimate the effects of access to marketing and collective action information. We assume a two-step decision-making process. Let  $i = [1, 2, \dots, N]$  denote the households in question. Each household compares the level of expected utility derived from participating in  $C_j^*$  against its reservation utility attainable without participation,  $C_{Nj}^*$ . Here, we use the superscript “\*” to denote the fact that both levels of utility are latent (unobservable) random variables. Following the literature, we hypothesize that the difference between the utility levels is determined by a vector of covariates as shown below.

$$CA_j = f(X_i, A_i, L, PE_j, N, D_j, SN_i, I_j) \quad (3.7)$$

where  $CA_i$ <sup>40</sup> is a discrete variable equal to 1 if a household participates and 0 otherwise,

$(CA_i \in [0,1])$ ,  $X_i$  are observable household-head-specific and household characteristics (age, gender, years of education, and number of members of the household),  $A_i$  is a vector of asset endowment of the household (this includes the number of acres of land owned and value of productive assets),  $L$  is a spatial location dummy,  $PE_j$  is membership in an earlier collective action effort (this is a dummy variable with a value of 1 for prior experience),  $N$  is a dummy variable where 1 indicates that the household received extension services from one or more development agencies working in these areas,  $D_j$  is the distance to the market (this is measured in time taken to reach the market),  $SN_i$  are the social network variables, and  $I_j$  represents a vector of sources of marketing and collective action information.

We model the decisions as two step processes. The two methods used in the literature to model the two step process are the double-hurdle model (Dow and Norton, 2003, Duan, et al., 1984, Goetz, 1992, Jones, 1989, Leung and Yu, 1996, Madden, 2006) and the Heckman sample selection model (Amemiya, 1985, Heckman, 1976, Wooldridge, 2002). The estimation procedure used here is the Heckman self-selection model. In chapter 2 we have argued and shown that the more successful groups have members who have self-selected into the groups. Therefore, the error term of the selection model is correlated to the patronage model, and the Heckman procedure takes into account of this correlation to avoid biased results. The observed sales through a group are conditional on the decision to participate in the group marketing effort. We

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<sup>40</sup> Notice we have changed the notation from the general choice of channel in the earlier equations of  $C_j$  to  $CA_j$  since we have two choices that we are evaluating in this chapter.

assume that a vector of variables  $X$  affects participating in collective action effort, and  $Z$  variables determine the intensity of sales. This implies that  $X$  could be the same as  $Z$ .

First, a probit model for participating in collective action is estimated as follows.

Suppose that the latent variable  $CA_j^*$  follows:

$$CA_j^* = X_j\beta + \varepsilon_j \quad (3.8)$$

where  $\varepsilon_j$  is independent of  $X_j$ , which is a 1 by  $K$  vector of factors affecting the decision to participate for all households ( $i$ ),  $\beta$  is a  $K$  by 1 vector of parameters, and  $\varepsilon_j \sim \text{Normal}(0,1)$ .

Instead of observing  $CA_j^*$ , we observe only a binary variable indicating the sign of  $CA_j^*$

$$CA_j = \begin{cases} 1 & \text{if } CA_j^* > 0 \\ 0 & \text{if } CA_j^* \leq 0 \end{cases} \quad (3.9)$$

The second decision on how much to sell through a PMG is modeled by a truncated model to take account of those who have zero sales through the group.

$$Z_i^* = X_i\beta + \mu_i \quad , \quad \mu_i \sim N(0, \sigma^2) \quad (3.10)$$

$$Z_i = \begin{cases} Z_i & \text{if } Z_i^* > 0 \text{ and } y_i = 1 \\ 0 & \text{Otherwise.} \end{cases} \quad (3.11)$$

where  $Z_i$  is the level of sales through the organizations, which depends on latent variable  $Z_i^*$  being greater than zero and conditional to the decision to participate,  $CA_j$ .



The first stage estimation examines the determinants of participation, while the second stage provides the determinants of intensification or degree of patronage in collective action.

### 3.5.2 Indexes

The indexes used for various measures of social capital in this study were calculated from various questions posed in the questionnaires. Each of the indexes was a result of various measures used that were normalized to a percentage for ease of interpretation. Thus:

$$Socialnetwork\ index_i = \left[ \frac{\sum_{j=1}^N (snv_j * gwt_j)}{\sum_{k=1}^K gwt * k} \right] * 100 \quad (3.12)$$

Where  $snv_i$  refers to the various dimensions of the particular social network index  $i$  measured.

Since each index is calculated from the responses of several questions, it is weighted by the

maximum possible total  $\left( \sum_{k=1}^K gwt * k \right)$ . And  $gwt$  is the weight for each question or part of the

question that constitutes the index and  $K$  denotes the number of questions or parts of a question.

Each of the indexes used will be described later in the results section.

### 3.5.3 Collective action intensity model

In collective action literature many studies have looked at the factors that influence individuals to get together to produce a common good. Others like Olson (1965) and many other subsequent studies have looked at critical mass theory investigating the ideal group size (Esteban and Ray, 2001, Oliver and Maxwell, 1988). However, when studies are conducted in the field, one finds that any households join more than one group that give different services and sometimes join multiple groups that deliver similar services. We therefore felt that there was

need for further investigations on the factors that drive households to invest their scarce capital resources in several collective action efforts. To the best of our knowledge, this is the first study that formally investigates this phenomenon through quantitative analysis. Resources have opportunity costs, and joining a group takes away some resources from other household productive services. Our investigation therefore, is a step forward towards the understanding this phenomenon.

To investigate the reasons households choose to belong to more than one social network (social group), we apply a basic utility model developed by Estaban and Ray (2001) who initially used it to investigate the collective action and group size paradox first stated by Olson. Others have used variation of the model to look at coalition formation and lobby group membership (Anesi, 2007) and even in the case of an environmental treaty (Murdoch, et al., 2003). In our case we use similar notation but instead of looking at a single group and the number of agents joining the effort, we investigate an agent making decision as to the number of groups she decides to join.

Let  $a$  denote the level of effort the agent contributes to the collective efforts. This effort can be in form of money or time contributed to the various groups.

We assume that individual preferences are represented by the (additive separable) utility function

$$\mu(w, a) = w - v(a) \tag{3.13}$$

Where  $v$  is an increasing, smooth, convex function with  $v'(0)=0$ , and  $w$  is the per capita benefits from various collective efforts,  $a$  is the level of effort the agent contributes to the collective

action and hence  $v$  is the disutility of expending resources  $a$  (effort, money) to participate in the collective action. As in Estaban and Ray (2001), the method is equivalent to measuring expected utility in units of the collective good. From the sum of the benefits we subtract the cost of the efforts contributed, translated into the equivalent units of the collective good.

If function  $v$  is linear in  $a$  then efforts the agent exerts in participating in PMG activities can directly be subtracted from the benefit, as in (Olson, 1965), and is equivalent to thinking the agent will borrow extra capital from a frictionless credit market such that the rate of interest  $I$  is insensitive to the amount borrowed. In such a case then  $v(a)$  is just  $(I+r)a$ . The implication is that as long as there is a capital market and there is some benefit from an extra group and the benefits exceed the cost, the agent will increase the number of groups joined indefinitely.

Although such a scenario theoretically can occur, it is unrealistic because from the survey we find that there is a limit to the number of groups a household joins. In this study we assume it is more appropriate to assume that additional units of efforts are increasingly costly. Therefore, the marginal rate of substitution between reward and effort, that is the amount of extra benefit that will just compensate an individual for contributing an extra unit to another effort, increases as total effort increases. This rate of increase, which is the elasticity of the marginal rate of substitution with respect to effort, is what determines the number of groups (total efforts) an agent will join.

This is a more realistic case that guarantees that one cannot join an infinite number of groups even if they offer extra benefits since the cost of capital increases at an increasing rate (Demir, 2007). We then model the number of groups an individual joins as:

$$SN_i = f\left(X_i, A_i, L_i, T_i, SI_i, GD_j, PE_i, N, TC_j, D_j, I_i, t\right) \quad (3.14)$$

Where  $SN_i$  is the dependent variable and is a count variable of the number of social groups a household is involved in as a member,  $X_i$  are observable household-head-specific and household characteristics (age, gender, years of education, and number of members of the household),  $A_i$  is the asset endowment of the household (a vector that includes the number of acres of land owned and value of household assets),  $L$  is a spatial location dummy,  $T_i$  is the trust index that measures how much the household trusts the other members of the village (defined below),  $SI_i$  is an index measuring how much social insurance a household has within the community (defined below),  $GD_j$  is the group democratic decision making process index (defined below),  $PE_j$  is membership in an earlier collective action effort (the variable will be a dummy variable with a value of 1 for prior experience),  $N$  is a dummy variable, where 1 indicates that households received extension services from one or more development agencies working in these areas,  $TC_j$  are marketing and transaction costs variables,  $D_j$  is the distance to the market (this is measured in terms of time taken to reach the market),  $I_j$  represents the sources of marketing and collective action information, and  $t$  is a dummy variable of year that captures time trend.

We apply the Poisson regression to estimate the model for the following reason. We have the distribution  $D(SN | X)$  when  $SN$  is an unbounded count variable. Let  $\mu(X) = E(SN | X)$  where  $SN \in \{0, 1, 2, \dots\}$  and  $\mu(\cdot) > 0$ . Then the distribution is a Poisson if the density is  $f(SN | X) = \exp[-\mu(X)] [\mu(X)]^{SN} / SN!$ , where  $SN! = 1.2 \dots (SN-1).Y$  and  $0! = 1$ . We have a count-dependent variable that ranges from 0 to 9. And the most popular method for estimating count data is quasi-maximum likelihood estimation using the poisson quasiliikelihood function.

Poisson is used because it is computationally simple, it also gives satisfactory results, has compelling robustness and is relatively efficient (Wooldridge, 2002).

#### **3.5.4 Data**

Data used in all the models in this essay come from the household survey data previously described in chapter one. We use pooled regression of the three surveys from 2003 to 2007.

### **3.6 Results**

In this section, we present brief descriptive statistics of the main variables in the models considered in this study. Then we move on to results of the PMG participation and patronage models, and finally to the intensity model, which investigates the factors that affect households' choices on the number of PMG efforts to join.

#### **3.6.1 Project placement impact on results**

As we discuss the results in this section, it is important to point out that participation in the PMGs and group formation can be affected directly by program placement decisions made by external agents working in the area. Apart from the LLP program mentioned in chapter one, there were other development partners working in the study areas. And many of the development groups encourage farmers in the rural areas to form groups to access their services. Since each development group would like to open its operations in new areas, there will be situations where they will operate in areas where farmers have had no previous experiences with external agents. Such a situation will affect the impact and direction of some of the social-network and access-to-information factors tested in this study.

#### **3.6.2 Descriptive statistics**

To explore the relationship between social networks and collective action, we calculated several indexes as measures of the strength of farmers' social networks and cross-tabulated them with membership in PMGs. Table 3-1 (below) shows that households that have a higher solidarity index are more likely to be members of a group.

**Table 3-1: Social network impact on PMG membership**

		<b>PMG member</b>		<b>Chi2</b>	<b>Asymp sign</b>
		No	Yes		<b>2 sided</b>
<b>Solidarity index</b>		21.24	50.14	510.6	0.000
<b>Trust index of the community and group members</b>	Mean values	60.63	58.88	28.6	0.158
<b>Diversity index</b>		28.77	73.81	642.3	0.000
<b>Number of friends in PMG</b>		7	9	510.6	0.000
<b>Got NGO help*</b>	Yes	56.9%	43.1%	23.3	0.000
	No	42.5%	57.5%		
<b>Previous PMG experience*</b>	Yes	57.5%	42.5%	506.7	0.000
	No	45.5%	54.5%		

Note (\*): NGO help and Previous PMG experience are row percentages

Solidarity in this study refers to extent to which members of the same village or social network are willing to help one another in times of needs. In other words, we can refer it as the degree of collective insurance in the society. In the survey instrument, we gave the respondent a list with groups of items (seed, grain, other food items, cloths, and cash) a respondent would give (receive) to (from) a fellow group member in times of a famine. The number of items mentioned are summed up and then divided by the maximum possible sum and turned into a percentage to create the index. The results indicate that societies with better collective insurance will have more members in collective action. To create the trust index, the household was asked if a majority of the village members could be trusted. Then the respondents were given choices of various groups of people<sup>41</sup> and asked if they trusted them. These are the variables that were

<sup>41</sup> The groups given were family members, church leaders, group members, fellow farmers, political leaders, and friends. Trusting all the groups would yield a value of 100%, whereas trusting no one gets a value of 0%.

summed up to create the index. The trust index was 59 for PMG members and 61 for non-members.

From the cross tabulations, it appears that within the sample in this study, more diverse groups are more likely to be members of the PMG. Diversity in this study stands for diverse religious affiliation, ethnicity, age group, and wealth endowment. We had seven categories of diversity. To have the least diversity, a group's members would have to be drawn from the narrowest category. Hence, such a group would have a value of 1/7, whereas groups with greatest diversity have an index value of 1. This value was then converted to a percentage.

The expectation was that the more friends a household had in PMGs before joining a PMG, the higher the likelihood that the household would join a PMG. On average, members had nine friends involved in PMGs while nonmembers had seven. From the table, we find that having previous PMG experience does have a negative impact in being a member of a group. However, this could be affected by the decisions on program placement made by external agents promoting group formation. If the external agent decided to promote group formation in a new area where it had no previous operations, then this decision would lead to a negative correlation between previous NGO experience and joining a group. Since we do not have enough information on exact decisions by NGOs working in the study areas on program placements, we cannot discount this scenario.

The average land ownership for the members and non-members is very similar, with a difference of about 0.16 acres more for non-members (see table 3-2). However, the total cropped area is higher for the members; with 65% more cropped land than for non-members. The differences can be explained by the group members being more dedicated to farming activities



and hence putting more land into cropping either through hiring or utilizing more of their land into production. However, since the PMGs were organized around crops, it is conceivable that farmers who had a higher percentage of land under pasture would be less likely to participate.

**Table 3-2: Asset ownership effect on PMG membership**

	PMG member		Anova (F test)	
	No (Mean)	Yes (Mean)		% Δ
<b>Total owned in acres</b>	7.37	7.21	0.144	-2
<b>Total acres cropped</b>	7.38	12.17	74.903***	65
<b>Total asset value (Kshs)</b>	206,755.29	98,879.77	25.775***	-109
<b>Total household farm income (Kshs)</b>	86,404.48	109,575.39	4.887**	27
<b>Transfer payments (Kshs)</b>	69,270.40	229,170.61	5.024**	231

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The mean level of assets is higher for non-members than for members, with a decrease of about 109% in the value of assets owned by members compared to non-members. Development agencies in the rural areas work with the poor members of the society. So once these groups are formed, the poor are encouraged to join as way of accessing services. Group members have a higher mean value of transfer payments from other sources than do the non-members, with a difference of about 231%.

We also tested the differences between the two groups in terms of the reported transaction and marketing cost variables as well as some other variables that would indicate the ease of access to markets (Table 3-3).

**Table 3-3: Relation of transaction and other costs in relation to PMG membership**

	PMG member		Chi2
	No (Mean)	Yes (Mean)	
<b>Distance to point of sale (time)</b>	10.50	13.01	179.978***
<b>Transport cost to the market</b>	18.52	21.38	251.042***
<b>Sales tax</b>	1.45	1.56	265.291***
<b>Distance to the point of sale (km)</b>	20.00	17.73	743.746***

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

From table 3-3 above, it can be seen that households that had a higher measure of transaction cost or higher cost of marketing were more likely to be involved in PMGs for all measures, with the exception of the distance to the market in kilometers. As expected from transaction cost theory, the households with higher transaction costs were more likely to choose an organization form that minimized those costs. The reversal in the result concerning distance to market as measured in minutes and kilometers could be due to the fact that it is very difficult for individuals in the rural areas to accurately estimate distances in length measures, whereas they can measure in terms of time spent traveling more accurately. An alternative explanation could be that members live in areas with worse roads than nonmembers do, hence the time to travel a given distance is greater than in areas with good roads.

Farmers' sources of information for collective action and price information are expected to have a significant impact on households' decisions about whether to join groups. If a household gets its collective action information from the media (newspaper, TV and radio) or from local traders, then it is less likely to participate in a PMG (see table 3-4). Households who get their price and CA information from all other sources of information seem to be more likely to be found involved in some form of collective action. We discuss this further in relation to mobile phones as a source of information in the participation model.

**Table 3-4: Sources of information and its influence on collective action**

	PMG member		Chi2
	No (%)	Yes (%)	
<b>Media is source of CA information</b>	51.5	48.5	0.232
<b>Traders are the source of CA information</b>	99.5	0.5	214.176***
<b>Groups are the sources of CA information</b>	36.1	63.9	42.864***
<b>NGOs are the sources of CA information</b>	32.2	67.8	53.305***
<b>Extension service is the source of CA information</b>	49.8	50.2	6.056**
<b>Media is the source of price information</b>	44.9	55.1	10.164**
<b>Mobile phone is the source of price information</b>	12.5	87.5	5.532**
<b>NGOs are the source of price information</b>	35.2	64.8	12.976***
<b>Groups are the source of price information</b>	27.2	72.8	51.478***

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

### 3.6.1 Participation model

The first model estimated was a PMG participation model, where membership in a producer-marketing group was the dependent variable. The aim of this model was to answer the first research question regarding the factors that influence a household's decision to join a PMG. The probit model results show most of the variables have the expected signs (see table 3-5).

Among households' characteristics, age has a positive sign but age squared has negative sign and a very small magnitude. Both coefficients are significant at the 1% level. Therefore, there is evidence for an inverted-U relationship between age and participation in the PMGs; the turning point is at 67 years.

**Table 3-5: Factors that affect the decision to join a PMG**

<b>Membership in a PMG is the dependent variable</b>			
<b>VARIABLES</b>	<b>Probit (marginal effect)</b>	<b>VARIABLES</b>	<b>Probit (marginal effect)</b>
<b>Individual characteristics</b>			
Age	0.04*** (4.14)	<b>Marketing and transaction cost</b>	
Age2	-0.0003*** (-3.95)	Transport cost per 90 kg bag	0.0003 (0.40)
Male	-0.003 (-0.07)	Distant to market (minutes)	0.001 (1.43)
Education	0.01 (1.08)	<b>ICT access</b>	
No. HH members	0.004 (0.51)	Access to mobile phone	-0.12*** (-2.62)
Formal job	-0.08 (-1.63)	<b>Sources of price information</b>	
		Farmers	-0.03 (-0.45)
<b>Location characteristics</b>		Government agents	0.05 (0.43)
Village population	-0.002*** (-3.82)	Traders	-0.01 (-0.15)
Log rainfall	0.33*** (7.24)	Mass media	-0.08 (-1.34)
<b>Household wealth</b>		NGOs	0.02 (0.21)
Livestock value	1.66e-06** (2.26)	<b>Access to CA information</b>	
Asset value	0.00 (0.83)	Traders	-0.26** (-2.03)
Land cultivated	-0.00 (-1.05)	Government agents	0.06 (1.23)
Other income	-0.00 (-0.27)	NGOs	0.15** (2.21)
<b>Social networks</b>		<b>Time trend</b>	
Previous CA experience	0.03 (0.58)	year	1.20*** (10.24)
NGO help before CA	0.10* (1.68)	<b>Spatial Location</b>	
No. of friend CA	-0.00 (-1.46)	Siaya	0.30*** (4.15)
Diversity index	0.01*** (15.24)	Teso	0.13* (1.90)
		Mbeere	0.81***

<b>Table 3-5 cont'd</b>			
Solidarity index	0.01***		(6.61)
	(7.19)	Makueni	0.79***
Trust index	0.00		(8.47)
	(0.27)		
Observations	1658		
Pseudo R2	0.7495		
Wald chi2(34)	511.56		
Prob > chi2	0.0000		
(Std. Err. adjusted for 1013 clusters)			
Robust t statistics in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

The implication is that up until the age of 67, as the individuals get older, they are more attracted to the PMGs. Older people have more free time to get involved in the group activities. With time, older members of the society are able to appreciate the wisdom of working together and have less energy to ferry products to the market and wait for buyers. However, after 67 years, they may have less energy to travel to groups meetings and other activities and will reduce their participation. This is similar to finding of farmer's participation in dairy cooperatives in Ethiopia (Francesconi and Ruben, 2007).

On location characteristics, an increase in the population of the village decreases the probability of a household joining a PMG. The coefficient on village population is negative and significant at the 1% level. A village with a higher population decreases the transaction cost for both the trader and farmer in accessing a trading partner. Therefore, there will be greater competition in such a village, decreasing the need for an organization for marketing their goods. Hence, the coefficient for village population has the expected negative sign.

The estimated model also controlled for the rainfall amounts and time trend. The two variables are positive and significant at the 1% level. These variables capture other factors we

could not be controlled for in this model that affect the individual farmer's decision to be a part of a group. It could also be interpreted that PMG membership has been growing over time for reasons not captured entirely by the other variables in the model. Farmers are also more likely to join PMG in areas with more rainfall because they have more produce to sell and require group services.

The livestock value coefficient has a positive sign and is significant at the 5% level, although the actual magnitude is small. To increase crop production, a farmer requires capital resources to access inputs and usually needs animal power for land preparations and weeding. Therefore, this result is as expected. Increased livestock value might imply that a farmer will produce more crops and therefore joins a PMG to help in marketing the products.

Previous help by a development agency increases the probability of a household joining a group. The coefficient is positive but barely significant at the 10% level. Many of the development organizations encourage individual producers to join some form of collective action. Being involved in collective action makes it easier for these agencies to improve their own effectiveness. It is more cost-effective visiting a group than individual clients. Also, some of these groups were formed as a result of encouragements by agencies working in the regions. The linkages between farmers and external groups may be essential in the initial stages on group formation and the group's survival (Gregorio, et al., 2008, Scherr, et al., 2001).

Farmers in areas with a higher diversity in terms of ethnicity, religious, and other aspects had a higher probability to be in a PMG. The coefficient of the diversity index is positive and significant at the 1% level. As discussed earlier, in the literature, diversity's impact is ambiguous, but in this case, a more diverse farming community in the PMG operating areas

increased participation. Usually, social heterogeneity is hypothesized to have a negative effect on cooperation because different social norms may make creating and enforcing decisions more costly. However, the data from this sample supports those studies that have found that diversity fosters collective action (Bandura and Wood, 1989, Goldenberg and Mazursky, 2002, Lowndes and Skelcher, 1998).

The solidarity index was created to assess a household's stance on social responsibility towards its immediate neighbors in the village. The index was created from two questions. One sought to know if households would provide assistance to their fellow villagers in the event of a drought or scarcity with basic needs like seeds or food. The second question reversed the previous question by asking if they would receive the same basic needs under similar circumstances. The coefficient of the solidarity index was positive and significant at the 1% level. Hence, the greater the solidarity a household feels towards its neighbors, the higher the probability of joining a PMG. In the rural areas, a farmer faces a variety of risks that are not formally mitigated through the market. The alternative is to have reciprocity that hinges on moral obligations to meet the basic needs of the groups. Households that are already familiar with communal reciprocity therefore have a higher probability of joining collective action efforts.

Information communication technology aids the flow of information, especially in remote rural areas in developing countries through cell phones. In the last few years, Kenya has witnessed an explosion of access to mobile phone use even among the rural farmers in spite of lack of electricity. This variable captures access to a cell phone by ownership or access through friends or relatives. Farmers are able to communicate with relatives, and buyers are able to get valuable market information and negotiate produce sales through cell phones. Hence, it is not surprising that access to a mobile phone had a negative effect on membership in a PMG. The

coefficient for this variable had a negative sign and was significant at the 1% level. Individual members of a PMG are able to access market information, other agricultural information, and negotiation with traders. The mobile phone gives the individual farmer a wider network of information sources, thereby limiting the range of benefits they enjoy from group membership. PMGs provide an avenue for individual farmers to interact, socialize, and exchange ideas. A cell phone provides a similar service without joining any group.

Sources of information about prices were expected to affect farmers' decisions on joining a PMG. However, none was significant in the estimated model. However, access to CA information from NGOs is positive and significant at the 5% level. As expected, CA information from traders has a negative impact. The coefficient has a negative sign and significant at the 5% level. CA information from NGOs would encourage individual farmers to join groups because they normally promote the idea of working in groups. Traders, on the other hand, give negative information about the groups and discourage their customers from joining them.

We also included location dummies that control for unobserved spatial heterogeneity in location factors. Homabay district was excluded. It was excluded because there were fewer promotion activities in this district compared to all others and we expected that to be reflected in the analysis. All the dummies are positive and significant compared to Homabay. With the exception of Teso, all other coefficient of the dummies are significant at 1% level. They could also be capturing the amount of promotion activities the various development partners had in the different districts. We know from the field survey that there were fewer promotion activities to encourage group participation in Teso, and this is captured by the coefficient Teso being positive but is significant at only the 10% level. The differences in magnitude of the dummies across the



different zones suggest that that even among these zones there were differences in factors influencing the choice of participation that the model may not have captured.

### 3.6.2 Group patronage

From the field interviews, it was apparent that not all group members sold their produce through the organizations. And even those who sold through the group often made only a small fraction of their total sales through them.

Hence, it was important to isolate those factors that have the biggest effects on patronage. The dependent variable in this model was the percentage of sales through the group out of the total crop sales.

**Table 3-6: Factors that influence members' level of group patronage**

	(1)	(2)
Dependent variable	PMG member	% to group sales†
VARIABLES	(Selection equation)	Heckman
<b>Individual characteristics</b>		
Age	0.101*** (3.572)	-1.254* (-1.956)
age2	-0.001*** (-3.459)	0.012* (1.928)
gender	0.084 (0.438)	3.879 (1.186)
educate	0.021 (1.177)	0.581 (1.366)
No. of HH members	0.016 (0.733)	0.022 (0.046)
Formal job	-0.228 (-1.516)	-1.635 (-0.516)
Married	0.038 (0.701)	
<b>Location characteristics</b>		
Village population	-0.006*** (-3.981)	
Log rainfall	0.976*** (7.359)	

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**Table 3-6 cont'd**

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**Household wealth**

Asset value	0.000 (0.759)	-0.000 (-0.585)
Land cultivated	-0.004 (-0.562)	0.295* (1.800)
Other income	-0.000 (-0.083)	

**Social networks**

Previous CA experience	0.082 (0.559)	0.833 (0.273)
Had NGO before PMG	0.241 (1.452)	10.759*** (3.285)
No. of friends in PMG	-0.005 (-1.078)	-0.091 (-1.118)
Diversity index	0.034*** (15.612)	-0.314*** (-3.878)
Solidarity index	0.019*** (7.079)	-0.076 (-1.266)
Trust index	0.001 (0.209)	-0.006 (-0.115)

**Marketing and transaction cost**

Transport cost per 90 kg bag	0.001 (0.540)	0.052* (1.809)
Market distance (minutes)	0.003 (0.879)	-0.044 (-0.614)

**ICT Access**

Access to a mobile phone	-0.313** (-2.346)	3.184 (1.051)
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**Access to price information**

Farmers	-0.090 (-0.456)	0.976 (0.230)
Government agents	0.133 (0.484)	-16.924*** (-2.853)
Traders	-0.033 (-0.175)	-5.041 (-1.307)
Mass media	-0.261 (-1.294)	-2.617 (-0.631)
NGOs	0.075 (0.278)	-7.862 (-1.402)

**Access to CA information**

Traders	-0.975* (-1.845)	
Government agents	0.190 (1.383)	

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<b>Table 3-6 cont'd</b>		
NGOs	0.428** (2.377)	
<b>Time trend</b>		
year	3.422*** (11.252)	12.909*** (3.670)
<b>Location</b>		
Siaya	0.784*** (2.936)	-41.529*** (-6.545)
Teso	0.370 (1.237)	-43.938*** (-6.730)
Mbeere	2.723*** (6.697)	-41.093*** (-6.091)
Makueni	2.543*** (6.893)	-43.793*** (-6.444)
<b>IMR (lambda)</b>		-12.792** (-2.409)
Constant	-17.144*** (-10.185)	93.258*** (3.919)
Observations	1660	1660
Censored observations		894
Uncensored observations		766
Wald chi2(27)		218.17
Prob > chi2		0.0000
t statistics in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

†Percentage sales through the PMG are the dependent variable in model 2.

We estimated a Heckman sample selection model that takes into account the fact that individuals self-select to join PMGs. The results of the estimation are shown in table 3-6. The first model is the selection model and the second model is the intensity or patronage model. All discussions in this section refer to model 2, which is the second stage of the Heckman two-part self-selection model accounting for self-selection in the PMGs.

The lambda coefficient in the model is negative and significant at the 10% level. Therefore, we reject the null hypothesis that there no evidence for self-selection. Hence, the Heckman self-selection model was the right estimating procedure for group patronage.

The results show that most of the individual characteristics are not important in determining patronage intensity. Age in the selection model shows that as household heads increase in age they are likely to join PMG at a decreasing rate as expected. The age and age squared coefficient in the intensity model are significant. The age coefficient is negative and significant at the 10% level. And the age-squared coefficient is positive and significant at 10% level. Hence, there is a U relationship between age and level of sales through the group. Households with older household heads have fewer sales through the group. This can be explained by the past failures of marketing collective efforts. The middle aged household's may be joining the PMG for social reasons. Age in the intensity model has a turning point at age 53 years. This could be the point where the individuals discount the risk associated with group marketing for the convenience it provides of shorter distances to the market and less waiting time to sell the product.

As expected from the participation model, the location characteristics are significant and have same sign as we get in the selection model 1 in the estimation. The reasons are the same as mentioned above in table 3.5.

Moving to household wealth indicators, the coefficient on land cultivated is not significant in the selection model while positive and significant at the 10% level in the group patronage model. Group patronage increases by 0.3% per every increase of one acre of land owned by a household. This reflects the fact that more cultivation is likely to increase crop production. The reason more production might increase percentage sales through the PMG is not clear. But this phenomenon might be driven by the fact that as produce volume to sell increases, it becomes worthwhile to sustain the transaction costs of being in the PMG in order to get slightly more per kg sold. If one only had a few kilograms to sell, the transaction costs might

outweigh the potential gain. The magnitude of increase of 0.3% is very small. In this model, we omitted the livestock variable because of high collinearity of that variable with the other variables in the model.

Receiving NGO help by development agents to individual households did not encourage self-selection to join but once they joined the households sold a higher percentage of their produce through the group. The coefficient on NGO help is positive and significant at the 1% level. If a household had any help from a development agent, it increased its sales through the group by 11%, which is a very sizable amount. The implication is that development agents build trust with farmers. Many development agencies tend to work better in a group setting, as discussed earlier. Hence, it is plausible that households that work with them trust and value group efforts due to the services they receive. However, the individual households could have already been members of the PMG and that is what motivated the NGO assistance in the first place. This finding goes contrary to sociology literature that finds that once a development agent is involved in a group, the group tends to disintegrate. It also shows that the development work by the organizations in study areas is viewed positively by the farmers.

Whereas diversity of individuals in an area increases the probability of a household joining a PMG, it decreases the amount of produce sold through the group. The diversity coefficient is negative and significant at the 1% level in the patronage model. Diversity therefore seems to hinder the actual operation of the already existing group. Maybe it makes it difficult for group members to impose sanctions on free riding, decreasing trust in the ability of a group to market its produce (Miguel and Gugerty, 2004). Therefore, as in other studies discussed earlier, this study concludes that group heterogeneity has ambiguous effects on the PMGs. In a

somewhat similar manner, an increase in the solidarity index increases the self-selection into groups, but it has no effect on the patronage intensity in the group.

Higher transport cost of produce would be expected to encourage households to join groups so that they can have a bargaining power or undertake joint marketing. The coefficient on transport cost is not significant in the selection model but positive and significant at the 10% level in the intensity model. An increase in one shilling of the transport cost of a 90 kg bag of produce to the market increases the amount of sales through the PMG by 0.05%. Though this amount is small in magnitude, the results are as expected, since we posited that high marketing cost would increase PMG patronage. The variable also captures the difficulties of access to the market for individual farmers located in remote areas. The implications are that farmers far removed from the market physically will use the PMGs more.

Access to price information through all the channels explored does not have an impact on self-selection, but access through government agents has a negative association with the percentage of products sold through the group. We would expect that if government extension agents promote group participation and patronage, the coefficient would have a positive correlation with patronage. The results show that access to more land for cultivation increases patronage intensity. There is a likelihood that the poorer members of the groups have smaller percentage to market anyway and since government agents work with poorer members of the society, this is being captured in the variable “access to information through government agents.” However, this needs to be investigated further.

The time trend coefficient is positive and significant at the 1% level. It shows that with passage of time, group members increase their patronage. This result is important, since at the

beginning of the life of a PMG, there might be fewer sales through the group, but as the group builds trust, the patronage increases. Therefore, it is important to support these groups in their formative years.

### **3.6.3 Collective action intensity**

The sampled rural households belonged to an average of 2 social groups, and the household belonging to the most groups was a member of 9 groups. Different groups serving the same area usually provide different services. Therefore, for a household to access these services, it is forced to join a variety of CA organizations. During the survey, we found that groups were performing specialized narrow functions. Different development agencies encourage formation of groups that are in line with the agencies' interests, leading farmers to belong to multiple groups. Table 3-7 shows the results of the estimated Poisson model that examined the factors influencing multiple memberships. The second column shows the coefficients or probability of joining multiple PMGs and the third column shows the marginal effects or the magnitude of the probability of joining more PMGs.

Therefore for the second column we are interested in the signs or the direction of the coefficient whereas the magnitude of each of the coefficient is shown in the third column.

The results in table 3-7 show that households with a male head of the family join more groups than do female-headed households. The coefficient on the gender variable is positive and significant at the 1% level. Our conjecture here is that men in rural areas have more time compared to women to dedicate to activities outside of household labor requirements. Women usually bear a disproportionately bigger household labor burden. They are involved in farming activities as well as house chores, while men are involved in farming activities only.

**Table 3-7: Factors that affect the number of collective action groups joined**  
**Dependent variable is the number of groups to which the household head belongs**

Variables	(1)	(2)
	Poisson	Poisson marginal effects
<b>Individual Characteristics</b>		
Age	0.011 (1.20)	0.015 (1.19)
Age2	-0.000 (1.11)	-0.000 (1.10)
HH head is male	0.259*** (4.98)	0.333*** (4.65)
Education	0.021** (1.97)	0.028** (1.96)
# of HH members	-0.001 (0.09)	-0.001 (0.09)
Formal job	-0.053 (1.10)	-0.071 (1.08)
<b>Household wealth</b>		
Total asset value	-0.000 (1.53)	-0.000 (1.49)
Land farmed	-0.004*** (2.64)	-0.006*** (2.61)
<b>Social networks</b>		
Had prior CA experience	0.037 (0.69)	0.049 (0.69)
NGO help before CA	0.031 (0.49)	0.042 (0.49)
No. of friends in CA	0.001 (1.08)	0.002 (1.08)
Diversity index	0.002*** (2.79)	0.003*** (2.73)
HH community trust index	0.002** (2.30)	0.003** (2.28)
Solidarity index	-0.001 (1.39)	-0.002 (1.38)
<b>Price volatility</b>		
Price St.Dev	0.007** (2.20)	0.009** (2.25)
<b>Marketing and Transaction cost</b>		
Selling time (min)	-0.002*** (2.94)	-0.003*** (2.82)
Transport cost	0.001* (1.78)	0.001* (1.76)
Market distant (Min)	0.000 (0.03)	0.000 (0.03)



<b>Table 3-7 cont'd</b>		
<b>Access to credit</b>		
Has credit access	0.030 (0.74)	0.041 (0.74)
<b>Access to ICT</b>		
Mobile phone	-0.087* (1.70)	-0.119* (1.65)
<b>Sources of CA information</b>		
Traders	-2.563*** (4.40)	-1.742*** (16.45)
Government agents	0.110*** (2.81)	0.150*** (2.66)
NGOs	0.272*** (5.19)	0.404*** (4.40)
<b>Time trend</b>		
year of the interview	0.603*** (19.83)	0.810*** (9.32)
<b>Spatial location</b>		
Siaya	0.364*** (5.51)	0.570*** (4.48)
Teso	0.276*** (3.98)	0.416*** (3.48)
Mbeere	0.952*** (10.48)	1.463*** (6.70)
Makueni	1.460*** (17.74)	2.842*** (8.76)
Constant	-1.916*** (6.83)	
Observations	1660	1660
Wald chi2(29) Log Prob >	2698.80	
chi2	0.0000	
pseudolikelihood	-2584.0778	
(Std. Err. adjusted for 863 clusters)		
Robust z statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

Also, households with a male head are likely to have both spouses in the home, whereas households with a female head are likely to have only the woman as the sole family head, with no male spouse for various reasons. This gives women less time to divide among many groups and core farm-labor requirements.

More education in the household gives the members of the household an ability to recognize the benefits of group membership and join many efforts. Educated members of the

society in developing countries tend to migrate to the urban areas in search of better job opportunities. Hence, there are few well-educated people in the rural areas. Therefore, educated members of the community are usually in leadership positions of multiple collective action efforts. The education coefficient is positive and significant at the 5% level.

A household with more land under cultivation requires more labor devoted to farm and will devote less time resources in CA efforts. The coefficient on land farmed is negative and significant at the 5% level. Members of the society, who have more land cultivated, are usually the well-to-do and participate in fewer groups. These household heads are usually time-constrained and their opportunity cost of time is higher than that of less well-to-do households. They will therefore participate in groups that give them higher marginal utility. Another possible explanation is that larger farms may be able to get many of the scale economies individually that smaller farms can only capture acting collectively.

As in the model of group participation, diverse societies encourage more cooperation and households join more groups. The coefficient on diversity index is positive and significant at the 1% level. Similarly, a household that exhibits higher trust of the community surrounding it will increase the number of groups it joins. The coefficient is positive and significant at the 5% level. Therefore, we find evidence that strong social networks improve group participation intensity. Few other studies have included such variables in their analysis, although social networks are considered important in general in the CA literature.

An increase in price volatility increases the number of groups a household joins. This variable could be capturing the uncertainty in the benefit flow of the existing marketing channels, increasing the need to diversify a household portfolio of groups. Ideally, we should

have added the risks associated with the new CA portfolio to the model. However, we did not have that information. The results shows that an increased annual price risk increases the number of CA a household invest into to help manage the risk. The coefficient is positive and significant at the 5% level.

We also tested in the impact of marketing costs and transaction costs to group participation intensity. The model shows that the transaction cost captured by the selling time coefficient has a negative correlation with the number of group a household joins. The coefficient is negative and significant at the 1% level. A household that takes longer selling its product in the market may not trust the group's marketing abilities and is ready to invest more time selling its product. On the other hand, it could also be capturing the presence of higher transaction costs in the marketing process.

A higher transport cost for the product increases the household participation in more groups. The coefficient on transport cost is positive and significant at the 10% level. Households in more remote areas may have fewer services than the ones in more accessible areas. Therefore, a household in these areas will find the various services provided by groups attractive and join more groups.

Access to a mobile phone reduces the number of groups a household joins. The coefficient is negative and significant at the 10% level. Just like the case of joining a group, it seems that better communication with other individuals outside the community reduces the benefit an individual gets from cooperating with the community in a village.

The coefficients of variables capturing sources of CA information are all significant. Households that get information from traders join fewer groups. Farmers' reliance on traders

could indicate their mistrust of CA efforts and hence, they join fewer groups. An alternative explanation could be that traders are in direct competition with CA efforts and thus do not pass favorable information to farmers, thereby discouraging potential members. The coefficients on government and NGOs are both positive and significant at the 1% levels. This indicates that government and other development agents have cooperated in encouraging farmers to join CA efforts. This underscores the role that information plays in the decision on collective action intensity.

The time trend coefficient captures the changes in the perception of participation in a group benefits over time. The variable is positive and significant at the 1% level. It shows that with time groups in these rural areas may be providing important service that households value. Therefore, households increase their intensity of participating.

### ***3.7 Conclusions***

Social networks have a big impact on the decision by producers to join a producer marketing group, patronize it, and on the number of collective action groups a farmer joins. The implication is that before collective effort is advocated in any area, it is important to make sure that the social dynamic component is well addressed through community mobilization and education. For an effort to succeed, greater effort should be put into training the community as a whole on group dynamics and social responsibility of the members. Therefore, it is necessary to build trust to avoid future opportunistic behavior of others, which often leads to failure.

Previous assistance by a development agent before joining a PMG improves the probability of a household joining a group and also increases the level of patronage. Earlier research had shown that once an external agent is involved in collective action, groups are likely to fail. Our findings are not consistent with these previous results. However, we did not ask the

households if they were involved with self-started groups or those that were encouraged by external agents. The question asked sought to know if the household had ever received assistance from a development organization before deciding to join a PMG. All we can say is that previous help from an external agent encourages an individual to join a group.

As expected, an area with high population is likely to have many traders and the market to be more competitive than a sparsely populated region. Hence, when encouraging the formation of groups for the purpose of produce marketing, it is important to take into consideration market conditions. And if a market is deemed to be competitive, a PMG can only play the role of a competitive yardstick.

From transaction cost theory, it was expected that TC and marketing costs would play an important role in the decision to join a PMG and any other CA efforts. We find that that transport costs have no impact on the participation decision, but they play a part in patronage. Once farmers join a PMG, they are at a better position to choose between the two channels available. One explanation is that PMG generates slightly higher prices per kg that make it worthwhile to patronize the PMG if one has sufficient volume. For those with small volumes, the transaction costs of using or joining the PMG may exceed the gain.

Information sources play a vital role in a producer's decision process. Therefore, a strengthened information delivery system through existing groups, external agents and government agencies could lead to more households to join and patronize PMGs in rural areas.

Access to a cell phone gives a farmer access to communication with the outside world beyond the normal village interaction. This increased coordination with others outside the village may be the reason why access to a mobile phone decreases the probability of joining a group.

The study by Aker (2008), discussed earlier, found evidence that mobile phones improve traders' market coordination, decreasing their search costs. The fact that farmers can coordinate with traders directly might reduce the need for a PMG as a coordinating body between the farmers and traders. Though we may not deduce too much from this study since the phenomenon is new, more research needs to be done on this topic to understand this phenomenon. As new complementary services are added to ICT technology that specifically target local communities, it might improve local interactions.

## **Chapter 4 : Can membership and participation in Producer Marketing Groups contribute to improved smallholder producers' welfare? Evidence from semi-arid areas in Kenya**

### **4.0 Background**

The vast majority of rural inhabitants in developing countries still depend, directly or indirectly, on smallholder agricultural production for sustenance and income generation (World-Bank, 2008). Many rural smallholder farmers lack effective organizations, which deprives them of the power to influence local decisions affecting their lives, to negotiate better terms of trade, to interact on equal terms with powerful market intermediaries, and to make governmental and nongovernmental organizations (NGOs) accountable to them (Gulati, et al., 2007, Miehlabradt and McVay, 2005). In policy research and development-driven agendas, there has been a renewed interest in agriculture and its ability to stimulate pro-poor growth but under a new institutional framework (Hellin, et al., 2009, World-Bank, 2008). An institutional approach to improve farmers' welfare needs to have as key objectives increasing access to assets and modern technology in terms of inputs, information, financial services, and markets (Gonzalez, 2008). To achieve these goals, collective action has been promoted in semi-arid areas in Kenya with the purpose of improving producers' countervailing power, reducing transaction costs, and reaping the benefit of economies of scale and scope. Small farmers' organizations are some of the institutional platforms for collective action that can mitigate these inherent problems (Shiferaw, et al., 2008). When successful, producer groups are expected to increase their members' farm productivity and income through access to better inputs and higher prices or low marketing costs, thereby improving their overall returns to production (Kydd and Dorward, 2003, Kydd, et al., 2004).

However, organizing smallholder producers into a viable and beneficial business organization is not a small task. There are high transaction costs involved that sometimes outweigh the potential benefits (Stockbridge, et al., 2003, Stringfellow, et al., 1997). Often due to lack of essential preconditions for successful collective action, such as altruistic leadership, basic education, capable management, entrepreneurial skills, social cohesion, and financial capacity, many organizations fail before they are able to achieve their goals (Berdegue, 2002, Hulme and Shepherd, 2003, Key and Runsten, 1999, Masakure and Henson, 2005, Pingali, et al., 2005, Stringfellow, et al., 1997). Even with the potential pitfall of failure, others have argued that farmers' organizations should be promoted because it is the best avenue for assisting smallholder farmers in accessing necessary services (Collion and Rondot, 2001, Ephraim Chirwa, et al., 2005, Hellin, et al., 2009, Omamo, 2005, Peacock, et al., 2004, World-Bank, 2008). Therefore, there is still an ongoing debate on whether farmers' organizations provide enough tangible benefits to the producers to warrant their support and promotion by government and development agencies.

#### **4.1 Research questions**

This chapter seeks to investigate if the farmers in semi-arid regions of Kenya who participate in producer marketing groups (PMGs) derive enhanced benefits compared to non-participants in the same area. The research questions we hope to answer are:

- i) Do members of a PMG face a lower price risk?
- ii) Does being a member of a PMG improve a producer's crop income?

The core economic incentive for joining a producer marketing group is enhanced income, crop production and/ or reduced variability in output prices.



The stated objectives of most of the groups in the study area are to enhance members' welfare, obtain better prices for their produce, improve access to inputs, develop business skills, share knowledge, and transform PMGs into business entities with members able to eventually own shares (Shiferaw, et al., 2005). Farmers will join collective action if they believe that their incomes will be enhanced or their prices will become more stable through collective bargaining (Ruben, 1997). Collective action in the form of an active PMG can protect farmers from temporary price fluctuations by storing the produce during the period of low prices and selling when prices are higher and/or negotiating a less variable price with traders.

However, a farmer initially might derive little additional benefit from selling her produce through the PMG, but she may value the access to the other, non-core assets or services provided by the organization, which improve her overall welfare through other investments (Berdegue, 2001). Successful groups do provide an opportunity for a farmer to access improved seeds and other inputs (Shiferaw, et al., 2008).

#### **4.2 Literature review**

Looking at the literature on farmers' membership in producer organizations and their welfare impact, we find the effect on various measures of farmers' welfare to be ambiguous. The results depend on the product of interest and sometimes-overarching market conditions.

Some studies show that the net effect of farmer membership in a farmer cooperative on total household income tends to be neutral (Berdegue, et al., 2001). In his thesis, Berdegue (2001), using a Heckman self-selection model, found that farmers' participation in a cooperative only has a significantly positive impact on members' farm profit margins when the cooperative operates in markets with high transaction costs, such as the dairy sector. This is consistent with what Staal (1997) and Nyoro et al. (2005) found in Kenya. Berdegue (2001) argues that a

producer organization may not benefit its members with increased returns if it operates in markets with low transaction costs for undifferentiated commodities like wheat or potatoes, which could indicate a more competitive market. Knack and Keefer (1997) find no significant relationship between group membership and economic performance in their cross-country study. In their study of collective action and social networks in the Philippines, Godquin and Quisumbing (2006), using a 2SLS method, find no evidence of positive returns to group membership in terms of increased per capita expenditures. They explain that the lack of impact could have been due to the choice of instruments used.

Another strand of literature has found positive association between measures of group membership and household welfare (typically measured by household expenditures) (Grootaert, 1999, Grootaert, et al., 1999, Haddad and Maluccio, 2002, Maluccio, et al., 2000, Narayan and Pritchett, 1999). In their case studies of dairy cooperatives<sup>42</sup> in Ethiopia and Kenya, Holloway and Stall found that cooperatives enhance rural-urban linkages and increase market participation by the rural producers (Holloway, 2000, Staal, 1997), which could lead to improved welfare. Chowdhury et al. (2005) found that new market governance like cooperatives reduce transfer costs and consequently enhance rural-urban linkages, enhancing farmers' income. A case study of pig producers in Vietnam illustrates that collective action approaches such as cooperatives or farmer groups can facilitate the reduction of transaction costs in production and marketing to improve both productivity and improved incomes (Lapar, et al., 2006). A study in Nicaragua that investigated why farmers continued to stay in cooperatives after the change of government system from socialism to a more market-oriented economy found that farmers who were

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<sup>42</sup> The dairy industry is more likely to be characterized by specific assets than the grain sector we are analyzing. So some differences in the results are likely.

members of cooperatives benefited from access to services and utilized their social capital to access credit that in return improved their welfare (Ruben and Lerman, 2005). A study of collective action efforts in the Kenyan central highlands found that the majority of the households in the survey were involved in some form of collective action and believed that group effort improved their welfare (Kariuki and Place, 2005). However, this study used descriptive statistics without any statistical tests to measure welfare gain and individual perceptions. The study gives a good starting point, but one cannot assess how statistically significant its findings were. Recent work from the World Bank group on tobacco clubs in Malawi (Negri and Porto, 2008) show that membership in these clubs increase farm production by 40-74% per acre. There is also some recent work done in Kenya using a nationwide panel data collected in 2000 and 2004 by Tegemeo Institute of Egerton University. This study did not target a particular crop but measured the total rural households' welfare. Correlating the means of members and non-members on several performance dimensions, the study finds that households that had joined farmers' organizations performed better in terms of agricultural production, accumulation of assets and poverty alleviation (Ngugi and Kariuki, 2009). This study used Least Significance Difference (LSD) to test the mean differences across the groups. However, this method has the drawback of not taking care of potential self-selection problems, which could bias the results. Another study uses the price received by the pigeon-pea farmers in the Eastern Kenya, based on the second round of data used in this study. This study found that PMG members received higher prices and had better access to improved seeds (Shiferaw, et al., 2008). Another recent study in South East Nigeria also finds that membership in a cooperative increased a household's expenditure (Babatunde, et al., 2008). However, this study also used

cross-section data and hence could not deal with potential problems due to self-selection and other confounding factors.

Other studies disaggregate groups by their function when examining the relationship of group membership with economic outcomes (Grootaert, 1999, Grootaert, et al., 1999, Knack and Keefer, 1997, Maluccio, et al., 2000). Christian Grootaert finds that membership in producer and other social groups has a positive association with household incomes, while membership in religious groups and government/national groups has none (Grootaert, 1999). Maluccio, Haddad, and May (2000) find that membership in financially oriented groups like Rotating Savings and Credit Associations (ROSCAs) has a positive association with household per capita expenditure.

From the literature, we can conclude that the impact of participating in collective action among rural poor has mixed results in terms of welfare improvement. This chapter uses panel data that was collected in three rounds. The first round was the survey conducted before PMGs were formed; then there are two rounds of surveys conducted after the PMGs' formation. Therefore, unlike most of the studies reviewed that use cross-section data, we can explicitly compare the effect of treatment with a counterfactual. We therefore hope to add to the understanding of the impact of collective action on households' welfare at a time when different forms of non-market based initiatives are being promoted in developing countries to alleviate poverty. Also unlike previous studies that were focused on the impact on farmers' welfare of membership in cooperatives, this paper focuses on PMGs, which are different from cooperatives. As argued in the chapters 1 and 2, PMGs are a smaller form of collective action from cooperatives (see chapter 1). This study is focused on semi-arid areas of Kenya that are usually food-deficit regions due to cyclical drought. Therefore, this study will be among few studies that have done empirical work on farmers who usually grow crops for their own consumption, only

market small surplus quantities, and are mainly members of PMGs rather than cooperatives. Previous studies that have looked at the same question have focused on areas with cooperatives and used methods that do not address issues of self-selection and other confounding factors.

#### **4.3 Theoretical framework**

This section briefly discusses transaction cost economics (TCE), which is used as the basis of developing the behavioral model we use as the conceptual framework. Transaction costs economics builds on Coase's article (1937) , "The Nature of the Firm", which postulates that economic activity does not occur in a frictionless environment. The main source of friction in the economy, according to Coase, is the costs of carrying out the exchange (Benham and Benham, 1998). Coase recognized the role of transaction costs in the organization of firms and other contracts. Transaction costs include the costs of information, negotiation, monitoring, coordination, and enforcement of contracts. He explains that firms emerge to economize on the transaction costs of market exchange and that the boundary of a firm or the extent of vertical integration will depend on the magnitude of the transaction costs. Williamson's articles on the economics of organization and contracts are an extension of Coase's line of thinking (Williamson, 1996, 1979). He combines the concepts of bounded rationality and opportunistic behavior to explain contractual choice and the ownership structure of firms. Opportunistic behavior manifests itself as adverse selection, moral hazard, and other forms of strategic behavior. In Williamson's framework, a trade-off has to be made between the costs of coordination and hierarchy within an organization and the costs of transacting and forming contracts in the market (Drugger, 1983). This trade-off will depend on the magnitude of the transaction costs. Eggertson (1990) defines transaction costs as "the costs that arise when individuals exchange ownership rights for economic assets and enforce their exclusive rights. "

In terms of the context of this study, only the transaction costs arising for individual agents or for basic economic units such as households are considered. This type of transaction cost includes expenses and opportunity costs, both fixed and variable, arising from the exchange of property rights. Transaction costs originate typically from the following activities (see Eggertson, 1990, Jaffee and Morton, 1995): the search for information about potential contracting parties and establishing the quality of the produce (this includes personal time, travel expenses and communication costs); screening costs that arise from the uncertainty about the reliability of potential suppliers or buyers and the uncertainty about the actual quality of the goods; the uncertainty of the future state of the world (Schmid, 2004); the bargaining that is needed to find the true position of contracting parties, in particular when prices are *not* determined *exogenously*; making of (formal or informal) contracts—i.e., defining the obligations of each party; monitoring of contracts; and the enforcement of the contract and collection of damages when partners fail to observe their contractual obligations.

Transaction cost theory posits that organizational forms or governance structures that minimize the production and transaction costs for a given activity will have a competitive advantage. Therefore, even if we assume that producers have bounded rationality, they will choose the governance structures that they believe give them highest utility (Williamson, 1986). If TCE theory is correct, we expect that producers will only chose to participate in PMGs if these organizations have a comparative advantage over dealing directly with traders and provide higher welfare benefits to participants compared to non-participants. These benefits can arise through access to affordable production technology, lower marketing and transaction costs, reduced marketing risks and uncertainty, and selling at higher prices than the alternative market.

We next present an investment model that illustrates mechanisms that affect producer income when a farmer joins a producer marketing group. Our argument is that joining a PMG involves some up-front costs that the farmer is unlikely to recoup initially, but that the investment of time and money she or he makes in the PMG is done in hopes that there will be returns over time. For simplicity, we portray this process through use of a two-period investment model. We use the household as the unit of analysis, ignoring intra-household allocation. A household with specific characteristics  $X$ , labor  $L$  and a capital endowment  $K$  produces one good (this good is a vector of all the on-farm and off-farm production),<sup>43</sup> with its capital and labor using the production technology  $f(K, L; X)$  in two time periods. The household gains utility from consumption in each period according to its utility function  $U(C_1, C_2)$ , where  $C_i$  is consumption in period  $i=1,2$ . The household is assumed to consume the same amount as it produces in value terms, so consumption is equivalent to income. For simplicity, we assume that marketing of its produce is the only way the household can increase its consumption in period two. The household can continue marketing its produce through the spot market or through producer groups by joining one of the PMGs. Assume that everyone can get an average net return  $P_{sm}$  for that portion of production sold on the spot market and that marketed through PMG will yield an average net return  $P_{ca}$ . Revenue in period 1, therefore, is  $P_{sm} * q_{sp} + P_{ca} * q_{ca} = R$ <sup>44</sup>. This equation states that the net revenue  $R$  is as a result of the quantity sold in the spot market  $q_{sp}$ , multiplied by the spot market average net return  $P_{sm}$ , plus the net return received at the PMG  $P_{ca}$

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<sup>43</sup> The majority of the farmers' off-farm income among the sample is in form of transfer payments from relatives in the urban areas.

<sup>44</sup> Note that the total returns ( $R$ ) are net returns.

multiplied by the quantity sold through PMG  $q_{ca}$ . If the household chooses not to participate in the PMG, then  $q_{ca}=0$ , and the revenue will be  $P_{sm} * Q = R$ . Revenue  $R$  is a function of  $P_{sm}$ , and all farmers receive this type of return from the spot market.  $P_{ca}(CA)$  gives the net return  $R$  that is conditional on the farmer joining the group. The differential income<sup>45</sup> a household gets for participating in collective action can be represented as  $R=g(CA)$ , where  $R$  is a function( $g$ ) of  $CA$ , which is a vector of all the effort and contribution involved in PMG activities and  $CA=F(Z, D)$ , where  $D$  is the differential income earned through using the PMG,  $Z$  represents other household characteristics that affect market choice behavior. (This assumes that inputs into  $P$  will be a function of expected monetary and non-monetary returns).

Previous studies have indicated that marketing of produce through collective action produces positive returns to the household through higher prices (Shiferaw, et al., 2005, Shiferaw, et al., 2008) and/or access to new technology and lower input prices. A household has always the opportunity to sell in the spot market. Therefore, our analysis is concerned with this potential differential income and other service benefits the household gets if it is a member of a PMG and sells some produce through the group. And it is this potential differential income and services the household invests in the farm to get differential income in period 2<sup>46</sup>.

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<sup>45</sup> The differential income here includes extra value of production from access to improved technology.

<sup>46</sup> In our analysis, we assume that producers will only join collective action if there are a potential positive benefit through higher prices, lower costs, or access to other services that increase production within the farm.



In period one, the household can choose either to immediately consume any differential income from participating in the PMG or to invest a portion of it,  $\phi: 0 \leq \phi \leq 1$  in capital goods<sup>47</sup> that can be used in period 2. In the second period, therefore, has a capital stock of  $K + \phi R$  if the household did market some of its extra production, and  $K$  if it did not. The relative output price in period 2 is expected to be  $E(P_2)$ <sup>48</sup>. We assume that both functions  $f(\bullet)$  and  $g(\bullet)$  are concave, continuous, and twice differentiable. Therefore, the household attempts to:

$$\begin{aligned} & \text{Max } U(C_1, C_2) \\ & C_1, C_2 \end{aligned} \quad (4.1)$$

Subject to:

- (1) Consumption<sup>49</sup> in period 1 is equal to the amount produced in that period less the amount saved to invest in production in period 2:

$$C_1 = f(K, L - CA; X) + (1 - \phi)g(CA; Z) \quad (4.2)$$

- (2) Consumption in period 2 is the amount produced in that period:

$$C_2 = P_2 f(K + \phi g(CA; Z), L; X) \quad (4.3)$$

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<sup>47</sup> We assume that the producer will invest in capital goods in the farm in period 1 that will be used for production activity in period 2. Since we have set up a two-period model, we do not take account of interest that differential income can earn if invested in period two.

<sup>48</sup> The price  $E(P_2)$  in period 2 can be any price. Therefore, at this point, in order to keep the model general, we do not want to assign the price to be the PMG price or the spot-market price.

<sup>49</sup> In our model construction, we assume that the only way to change consumption from what it would if they relied only in the spot market is by joining a PMG since all other avenues are open to all including consuming less in period one.

Participating in a producer group is costly due to membership fees and opportunity cost of time due to meetings members are required to attend. The loss in monetary terms and labor in a household may lead to some income drop<sup>50</sup>.

Households that invest a portion of their differential returns in period 1 in productive investments will experience an increase in income in period 2 due to the increase in capital. Therefore, the household's problem is to maximize its utility by choosing the extent of its participation in the PMG, and the portion of returns,  $\phi$  that it will invest.

$$\begin{aligned} & \text{Max}_{CA, \phi} U \left\{ f(K, L - CA; X) + (1 - \phi)g(CA; Z), P_2 f \left[ K + \phi g(CA; Z), L; X \right] \right\} \\ & \text{s.t.} \\ & 0 \leq \phi \leq 1 \end{aligned} \tag{4.4}$$

To ensure optimality, first-order conditions with respect to collective action (CA) and proportion of extra income invested in additional capital ( $\phi$ ) must be met as shown below:

Taking the first order conditions with respect to CA, we get equation (4.5), which shows that the household chooses the collective action until

$$U_{C_1} \left( -f_L + (1 - \phi^*)g_{CA} \right) + U_{C_2} P_2 \phi^* f_K g_{CA} = 0 \tag{4.5}$$

where subscripts denote partial derivatives and arguments of the function have been suppressed.

This shows that joining collective action might decrease factor productivity in period 1 and increase consumption in period 1 through differential income from higher prices and investment in period 2 through investment of a portion of the extra returns.

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<sup>50</sup> However, this loss can be compensated for possibly entirely and over and above the earlier income through differential income in depending on their choice of patronage. This is what the chapter will test.

Taking the first-order condition with respect to  $\phi$ , we get equation (4.6), which shows that the household equates, in marginal utility terms, the cost of participating in collective action in period 1 and 2 with the overall gain from CA in periods 1 and 2. The solution implies that the household maximizes utility with respect to the fraction of differential returns invested in period 2.

$$-U_{C_1} g(CA^*; Z) + U_{C_2} P_2 f_K g(CA^*; Z) = 0 \quad (4.6)$$

Equation (4.6) equates a loss of consumption in period 1 with the gain in period 2. Given expected prices in period 2, the household equates the marginal utility of consuming the differential returns from CA in period 1 with the marginal utility of those differential returns in period 2, in terms of income or consumption from its investment in period 2. If a household does not invest any of its returns (i.e.,  $\phi=0$ ), then the household is constrained to have a higher relative marginal utility of consumption in period 1 than in period 2.

Rearranging equation (4.5) as a function of the marginal product of labor, we get:

$$f_L = \left\{ \left(1 - \phi^*\right) + \frac{U_{C_2}}{U_{C_1}} P_2 \phi^* f_K \right\} g_{CA} \quad (4.7)$$

Equation (4.7) suggests that the household equates the marginal product of labor within the household with some function of marginal loss labor as result of attending group meetings and other labor inputs it has to make in the PMG.

Rearranging equation (4.6) we get:

$$f_K = \frac{U_{C_1}}{U_{C_2}} * \frac{1}{P} \quad (4.8)$$

Equation (4.8) states that the household attempts to set the marginal product of capital  $f_K$  in period 2 equal to the product of the inter-temporal marginal rate of substitution  $\frac{U_{C_1}}{U_{C_2}}$  and relative prices in period 1,  $I/P$ .

From equation 4.5 we find that joining collective action can have two effects. There could be an initial decrease in production due to the commitments and resources put into collective effort. But it also shows that there is differential consumption in period two. Our theoretical model therefore leads to the hypothesis we intend to test in this essay of a long-term improvement of production that may increase welfare. Households that participate in PMGs may get some differential returns and invest in the household's stock of assets, and if the optimal portion of differential returns  $\phi^*$  is positive, participation in PMGs should have a positive effect on the overall welfare.

#### ***4.4 Estimation strategy***

This chapter uses several methods for investigating the welfare issues. Here we describe the DiD estimation strategy that looking at the differences in crop income and then use other method to investigate the intra-annual price volatility. We use responses to survey questions conducted in three rounds to evaluate quantitatively the impact of PMG membership. A potential pitfall is that units of observation are not randomly assigned to participate; rather, they might have self-selected to participate in producer groups. This becomes a problem in estimation and inference. The decision to constitute some of the producer groups was promoted by various development agencies, and the areas they are formed in are not necessary random; hence, the program placement could be correlated with the outcome measure. In the econometrics literature, statistical techniques used to analyze such data are often referred to as

"treatment effects" models (Goldberg, 1972, Maddala, 1983, Wooldridge, 2002), where the program of interest is the "treatment," which is joining a PMG in this analysis.<sup>51</sup>

In the treatment effects literature, several approaches to modeling have been suggested. First are the "Heckman-type" selection models (Goldberg, 1972, Heckman, 1976), in which a selection equation and an outcome equation are jointly estimated, assuming a bivariate normal error term in the two equations. Second are the instrumental variable estimators (Brundy and Jorgenson, 1971). In this method, there is need for a variable to be measured that is related to selection into treatment but not to the outcome measure, and this "instrument" is used to make unbiased inference. Third are nonparametric matching methods, most prominently propensity score matching (Rosenbaum and Rubin, 1983), in which the probability of each unit being selected for treatment is first estimated and matched with control observations based on the propensity score to the treatment (Buckley and Shang, 2003). Matching involves pairing treatment and comparison units that are similar in terms of their observable characteristics. If the relevant differences between two units are captured in the observable (pretreatment) covariates, which occurs when outcomes are independent of assignment to treatment conditional on pretreatment covariates, matching methods yield an unbiased estimate of the treatment effect (Dehejia and Wahba, 2002).

In this study, we do not use the Heckman selection model because the Heckman method does not compare two groups explicitly. Rather, the outcome equation only estimates the treated group alone. We could have applied the instrumental variable approach, but the method has the drawback that it is very difficult to get a good instrument that is related to the selection and not

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<sup>51</sup> Any future reference to "treatment" in this chapter will refer to joining a PMG, and the "treatment effects" are the consequences for the household of joining the group.

the outcome. An attempt was made to instrument for participating in a PMG, but unfortunately no appropriate instrument was identified. We use one of the simplest techniques for estimating treatment effects with observational data, the "difference-in-differences" (DiD) estimator. The DiD method is appropriate since we have panel data with baseline survey data and a subsequent survey data after treatment. Using this method, we avoid the need for a quasi-experimental survey method, which requires having an explicit counterfactual to the treated population, since in the DiD method, the baseline becomes the control data. We now briefly describe the DiD model.

#### **4.4.1 The Difference-in-Differences Estimator**

The DiD estimator model estimates the difference between outcomes measured at two time points for both the treated observations and the controls (those not participating in the program) and then compares the difference between the groups—hence the difference-in-differences (Ashenfelter, 1978, Ashenfelter and Card, 1985). This strategy ensures that any variables that remain constant over time (but are unobserved) that are correlated with the selection decision and the outcome variable will not bias the estimated effect.

This method thus requires repeated observations of the units. Either the technique can be applied to a true panel, where data is gathered on the same units at both times, or repeated cross-sections, such as two national random survey samples. The DiD model is effective in detecting small treatment effects. We chose this estimation strategy since we have a very short panel and producers are still slowly adopting the new marketing channel. However, when we use the fixed effects estimation, we lose all the cases where we have only a single observation. In our study, Western region had data collected only in 2007. This region will not be used for analysis in this DiD method, since it requires a baseline survey or repeated surveys. Therefore, we use 400 cases

instead of the total 850 cases interviewed in the 2007 survey. The key assumption of the DiD model is that the average change in the outcome is presumed to be the same for both the non-participants and, counterfactually, for participants if they had not participated. We assume that changes in economic conditions or other policy initiatives affect both the participants and the non-participants in similar ways. Dee and Fu (2004) provide an excellent discussion of this assumption in an education research context and how to minimize the possibility of its violation through the careful selection of independent variables (Ravallion, 2006). If this condition of the average change in the outcome being the same for both the non-participants and, counterfactually, the participants had they not participated is violated, then the estimates may be biased, and one solution is to use a propensity score to get a comparable group as a control (Abadie and Imbens, 2006).

We evaluate the impact of collective action or treatment on an outcome (household crop income)  $Y$  on the population in the study area  $i$ . Suppose that there are two groups indexed by treatment status  $T = 0, 1$  where 0 indicates households that do not receive treatment, i.e., the control group, and 1 indicates households that do receive treatment, i.e., the treatment group. We observe households in two time periods,  $t = 0, 1$ , where 0 indicates a time period before the treatment (before joining marketing groups) and 1 indicates a time period after the group receives treatment, i.e., post-treatment. Every observation is indexed by the letter  $i = 1, \dots, N$ ; households will typically have two observations each, one pre-treatment and one post-treatment. For the sake of notation, let  $\bar{Y}_0^T$  and  $\bar{Y}_1^T$  be the sample averages of the outcome for the treatment group before and after treatment, respectively, and let  $\bar{Y}_0^C$  and  $\bar{Y}_1^C$  be the corresponding sample

averages of the outcome for the control group. Subscripts correspond to time period and superscripts to the treatment status.

The outcome,  $Y_i$ , is modeled by the following equation:

$$Y_i = \alpha + \beta T_i + \gamma t_i + \delta (T_i \cdot t_i) + \varepsilon_i \quad (4.9)$$

where the parameters  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ , are all unknown and  $\varepsilon_i$  is a random, unobserved error term that contains all determinants of  $Y_i$  that our model omits for simplicity. The coefficients have the following interpretation:

$\alpha$  = constant term

$\beta$  = treatment-group-specific effect (to account for average permanent differences between treatment and control)

$\gamma$  = time trend common to control and treatment groups that picks up any differences in the mean of the latent individual effects between the treatment and comparison units, such as would arise from initial purposive selection bias into the program<sup>52</sup>

$\delta$  = gives the mean impact estimator<sup>53</sup>

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<sup>52</sup> This is equivalent to a fixed-effects estimator in which the error term includes a latent individual effect that is potentially correlated with treatment status.

<sup>53</sup> As shown in the next section, the impact of interaction between time and treatment is referred to as the impact estimator in the DiD literature.



#### 4.4.2 Assumptions for an unbiased estimator

A reasonable criterion for a good estimator is that it be unbiased, that is, the expected value of the estimator,  $E[\hat{\delta}] = \delta$ . The assumptions we need for the difference-in-difference estimator to be unbiased are given by the following:

1. The model in equation (Outcome) is correctly specified.
2.  $E[\epsilon_i] = 0$ .
3. The error term is uncorrelated with the other variables in the equation:

$$\text{cov}(\epsilon_i, T_i) = 0, \text{cov}(\epsilon_i, t_i) = 0, \text{cov}(\epsilon_i, T_i \cdot t_i) = 0$$

where the last of these assumptions, also known as the parallel-trend assumption, is the most critical. Under these assumptions, we can use equation (4.9) to determine that expected values of the average outcomes are given by

$$\begin{aligned} E[Y_0^T] &= \alpha + \beta \\ E[Y_1^T] &= \alpha + \beta + \gamma + \delta \\ E[Y_0^C] &= \alpha \\ E[Y_1^C] &= \alpha + \gamma \end{aligned} \tag{4.10}$$

The difference-in-difference estimator is defined as the difference in average outcome in the treatment group before and after treatment minus the difference in average outcome in the control group before and after treatment.

$$\hat{\delta}_{DiD} = \left( \bar{Y}_1^T - \bar{Y}_0^T \right) - \left( \bar{Y}_1^C - \bar{Y}_0^C \right) \tag{4.11}$$

The *DiD* estimator assumes that the selection bias (the unobserved difference in mean counterfactual outcomes between treated and untreated units) is time invariant, in which case the outcome changes for non-participants reveal the counterfactual outcome changes,

$$E(Y_1^C - Y_0^C | T_1 = 1) = E(Y_1^C - Y_0^C | T = 0) \quad (4.12)$$

Equation (4.12) is called the weak exogeneity condition, which holds only in difference-in-difference estimation (Ravallion, 2006).

Taking the expectation of equation (4.11) we get

$$\begin{aligned} \hat{\delta}_{DiD} &= E[\hat{Y}_1^T] - E[\hat{Y}_0^T] - \left\{ E[\bar{Y}_1^C] - E[\bar{Y}_0^C] \right\} \\ &= \alpha + \beta + \gamma + \delta - (\alpha + \beta) - (\alpha + \gamma - \alpha) \\ &= (\gamma + \delta) - \gamma \\ &= \delta \end{aligned} \quad (4.13)$$

Hence, the estimation in equation (4.9) is shown to be unbiased.

The DiD estimator can be readily generalized to multiple time periods. Therefore, we estimate the treatment effect by running a regression of  $Y_{it}$  on the (individual and date-specific) participation dummy variable  $T$  and other independent variables of interest with individual time fixed effects (Ravallion, 2006).

For this study we use ICRISAT data of 400 households collected in 2003 (baseline) and in a subsequent follow-up interview of the same households 2005 and a third round of survey in

2007 to have a total of three rounds of surveys. We will pool the data over the three time periods and across treatment status and run one OLS Fixed Effect regression on <sup>54</sup>:

$$Y_{ijt} = \alpha + A_j + \phi X_{ijt} + \gamma t + \beta T_{i1} + \delta(T_{i1} \cdot t) + \varepsilon_{it} \quad (4.14)$$

$Y_{ijt}$  = Welfare measure for household  $i$  in village  $j$  by time  $t$ . For our estimation, we use total value of crop income <sup>55</sup> for a household in every year.

$\alpha$  = the intercept term

$A_j$  = district fixed effect

$X_{ijt}$  = A vector of household and individual characteristics

$t$  = the time dummy

$T_{i1}$  = the dummy that indicates whether the household joined a producer marketing group. It is included as a separate regressor to pick up any differences in the mean of the latent individual effects between those who joined PMGs and comparison units, such as would arise from initial purposive selection bias into the program.

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<sup>54</sup> We ran a pooled OLS with random effect accounting for the clusters. This takes care of any serial correlation of the error term within the individual households and any heteroscedasticity.

<sup>55</sup> A discussion is provided in the results section for the rationale of using the value of crop income as the measure of treatment effect in our model.

For  $T_{i,t}$ , coefficient  $\delta$  captures the interaction of the treatment dummy and the time dummy variable, giving the mean impact, and is the main (treatment effect) variable of interest in the model.

$\mathcal{E}_{ijt}$  = the error term.

For the individual household characteristics used in this model, we include age, gender, education of the head of the family, and a dummy variable indicating whether the household has someone in formal employment. The expectations are that the age of the household head is correlated with farming experience the household has acquired over time and the amount of resources it has. Younger households will have less experience and fewer productive resources to employ in their farms. Therefore, it is expected that the older the household head, the more the household is able to produce. However, since the productivity of the household head declines over time, it is expected that the effect of age on productivity will level off and decline by a certain age. Hence, we include the squared age of the household head as well in order to capture the non-linearity. Also, women in rural areas have less control over productive resources than do men due to culture and customs. They tend to do lots of house chores that keep them longer around the homestead instead of being involved in farming activities that increase farm production. The areas of study also happen to suffer from water scarcity during the dry periods. Women have to travel long distances to get clean water, and that takes time away from their farming activities. Therefore, we expect that having a female head of household will reduce the value of crop production. Having more education is expected to improve the ability to acquire better farming technologies and improve crop production. Having a household member in a formal job should have an ambiguous relationship with crop production. It is possible that

individuals with a formal job have more resources to acquire better farm inputs and also hire labor for crop production, thereby increasing production. On the other hand, having a member of the household in formal job reduces the amount of family labor employed in farming. However, farming in conditions with unreliable rainfall is unattractive for an individual with alternative sources of income. Such a household could then cut back on its farming activities and rely more on non-farm income.

We also included the independent variable “total land owned” in the estimated model. This is a proxy for the amount of land available for farming and assets the household has to put into farming. We expect that with more land, the higher the production. To account for transaction costs, we had a variable for the length of time it took to sell the produce in the market. This variable, together with the cost of transport to the market, attempts to capture how far away the household is from the market. Remote areas have fewer alternatives in terms of income-generation activities; hence, we expect households in these areas to concentrate more on farming activities, increasing the value of production. We controlled for credit by including a dummy variable indicating whether the household had received any form of credit. This variable captures whether credit constraints are an impediment to crop production. Since most of the households in these areas use their own seed and little in the form of purchased inputs, we expect that credit access will have little impact on production.

Sources of price information were also taken into account. The expectation is that the households that receive most of the information from the PMG would have a higher value of production. The assumption is that these households will be active group members that get not only price information but also other technology and improved inputs that enhance crop production from the trainings through the groups. The amount of rain in the production year was

added to account for the variation in weather conditions, which have a profound impact on crop production. A district dummy was added to account for location heterogeneity that is difficult to observe and account for in the model.

#### **4.5 Data**

The data used is from the household surveys described in chapter one.

#### **4.6 Results**

##### **4.6.1 Descriptive statistics and initial discussion**

This chapter seeks to estimate the welfare impact of the introduction of the producer marketing groups on the semi-arid farming communities in Kenya. The study uses two indicators to assess impact. The first is the value of crop production value (taken as a measure of income), using the panel data from Eastern Kenya only, and the second is the within-year price standard deviation (taken as a measure of household price risk) of the main crop sold in the area, using all the data from Eastern and Western Kenya.

Ideally, we would have desired to use a survey-based measure that approaches as closely as possible one of the household welfare measure of economic theory. A common measure used is the real income or real expenditure, although consumption is favored in developing countries. Unfortunately, in our surveys, expenditure data was not collected. The next best measure is household income. However, as Deaton (1997) argues, agricultural incomes can be extremely variable month to month and year to year based on the cropping patterns and climate conditions. Hence, household or individual incomes in semi-arid areas can be a poor indicator of living standards when assessing impacts of PMG membership. Examining table 4.1 below shows that other income, which consists of off-farm formal jobs salaries, sale of assets, charcoal, trees, and

other income that is not directly from farming activities, is a significant part of the farmers' income.

**Table 4-1: Variations in various measures of household welfare measure from 2003 to 2007**

	PMG membership					
	No			Yes		
	Year of the interview			Year of the interview		
	2003	2005	2007	2003	2005	2007
	Mean (Kshs)			Mean (Kshs)		
Total asset value	360,232	111,499	69,830	177,169	60,949	
Total other income <sup>56</sup>	49,901	99,889	46,791	97,836	63,726	
Total crop net-income	16,453	6,530	18,224	1,417	30,565	

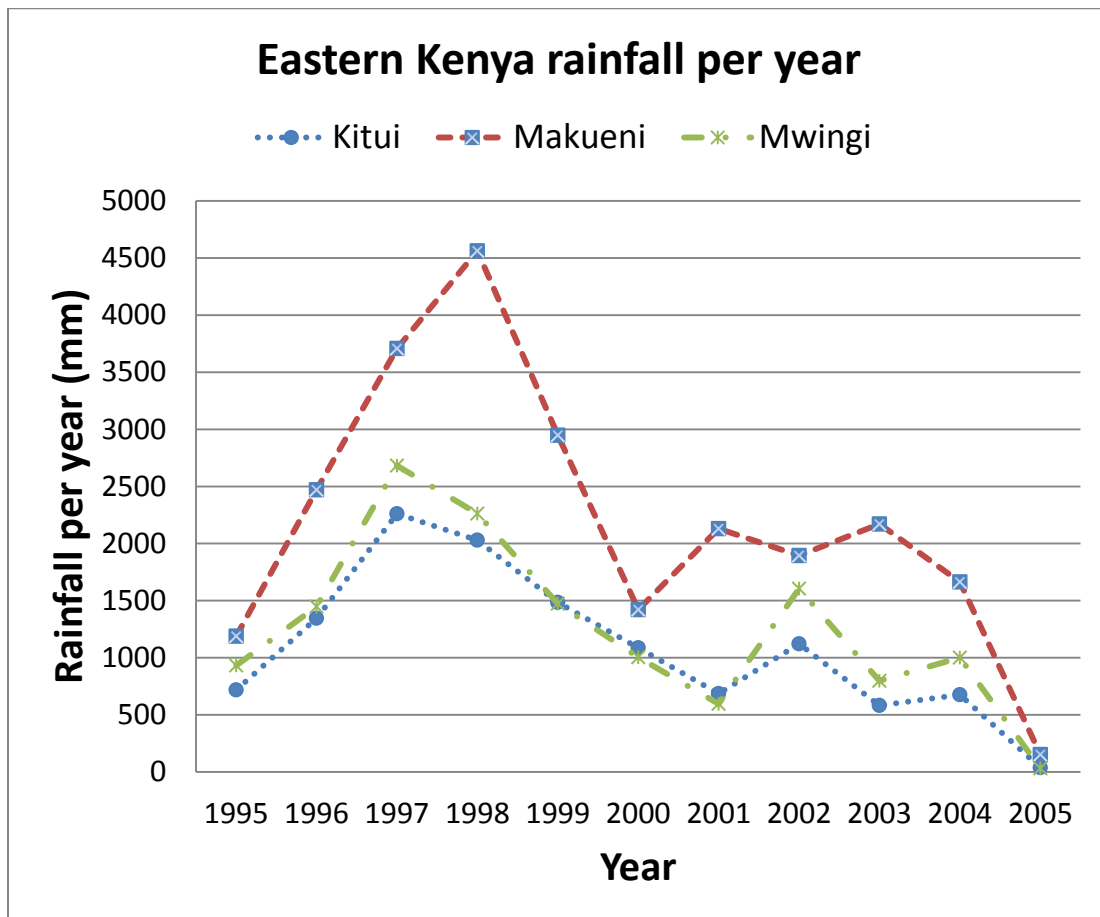
Source: ICRISAT household survey data 2003-2007

Therefore, using total farmers' income would be capturing this portion of income, which may not be related to PMGs' activities and hence overestimate their impact. In our study, we argue that household income is not an appropriate measure because of coping strategies households tend to employ. In times of drought, households rely heavily on off-farm income, mainly from transfer payments from relatives and members of the households working in the urban areas and from sale of assets. From 2003, when the baseline survey was conducted, the rainfall pattern shows a steep decline in annual rainfall (See fig 4-1). The year 2005 recorded a

<sup>56</sup> Total other income includes sale of assets, remittances, and total of salaries of members of the families with formal employment.

major drought, which had significant impact on crop production and the household's assets. The households disposed some of their assets for consumption smoothing in such weather conditions.

Therefore, in this study it was difficult to use either the household income or assets as a measure of welfare changes that can be attributed to the presence of PMGs. The time period is also short for the organizations to have developed enough produce marketing share in the study area to attract higher prices from the traders. It takes time for a PMG to develop to a level where it can have enough quantities and financial clout to take the produce to the bigger markets or to demand a significant price differential from the spot market. Table 4.1 above shows that mainly between 2005 and 2007 there was a general decline in assets held. In the same period, mean total crop net income increased for all groups.





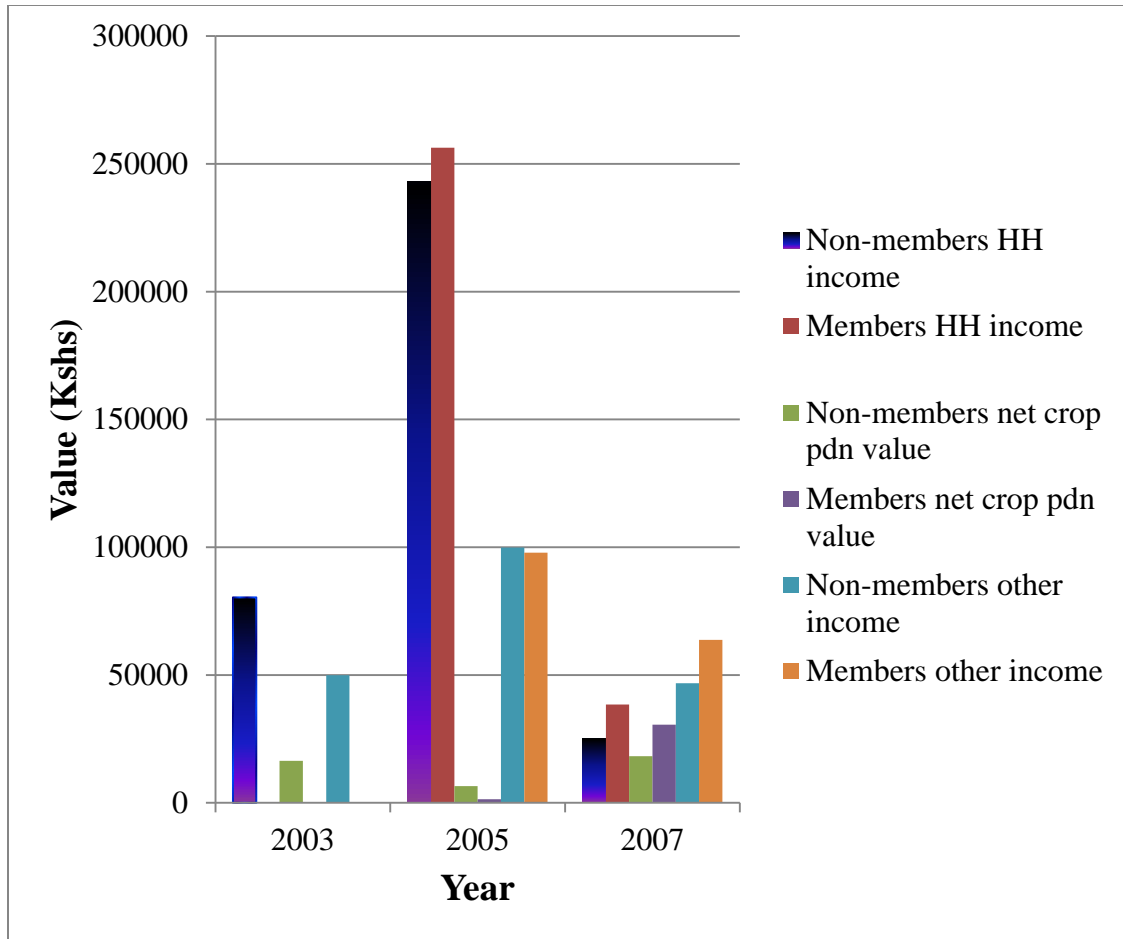
**Figure 4-1: Rainfall patterns in the study areas<sup>57</sup> from 1995 to 2005<sup>58</sup>**

Producer marketing groups were used by the development agents to introduce better seeds of selected crops in the study areas. In the Eastern region, short-, medium-, and long-duration maturing pigeon peas were introduced. Also, more drought-resistant chickpeas and green grams were also introduced. In Western Kenya, several varieties of disease-resistant groundnuts were introduced. The net effect was that members were able to harvest from these new varieties even in times of insufficient rainfall or with a severe disease outbreak, although production was usually less than the full potential. Figure 4-2 below shows that the net mean crop production value for members increased significantly from a negligible amount in 2005 to a value even more than that of non-members in 2007.

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<sup>57</sup> Note that the rainfall graph has Kitui and Mwingi districts, which are not in the study areas, and Mbeere, which is in the study area, is missing. There is no meteorological station in Mbeere, but it shares very similar climate conditions with Kitui and Mwingi. Therefore, the rainfall amounts for the two districts are used as proxies for Mbeere rainfall.

<sup>58</sup> The graph also shows that the rainfall in 2005 tending to zero. There was a major drought in 2005 in Kenya with very little precipitation in the study areas with Kitui, Mwingi, and Makueni having only 37, 32, and 153 mm of rainfall respectively.



**Figure 4-2: Movement of incomes and net crop production value over the study period**

Since PMGs members would be the first to get the new varieties seeds, the hypothesis is that before the technology is dispersed to the non-members we should be able to measure short-term shifts in net crop production value, particularly in times of drought conditions, among PMG members. Therefore, the use of net crop production value would be a better and appropriate measure of the short-term impact of the presence of a PMG in a location. However, we point out that crop production from where we derive the net crop value can be very variable due to unreliable rainfall, particularly in Eastern Kenya. This is controlled for by having rainfall variable in the econometric model. Figure 4-2 shows that household incomes display a more

volatile pattern than other incomes and crop production value. This finding gives more weight to use net crop production value to measure the impact on PMGs on the study area.

#### 4.6.2 Livestock value

**Table 4-2: Value of livestock ownership across PMG members and non-members**

	PMG membership		Anova		
	No	Yes	Mean square	F	Sig
	Mean				
Livestock Value (Kshs)	15,923	21,080	0.261	1.161	0.022

From table 4.2 above, there is a significant difference in livestock ownership between the two groups. Livestock value is higher for PMG group members than non-members. This is significant because livestock assets can quickly be liquidated to provide income to buy inputs for crop production. Also, livestock, and especially oxen, are used as animal traction for land tillage and weeding. In that case, this might bias the result of net crop production value towards the PMG members. However, this is controlled for in the model by introducing a livestock value variable.

#### 4.6.3 Welfare measures trend

In general, households with higher mean total assets had less tendency to join a PMG across the genders (see table 4-3 below). This is not surprising because some groups were

formed from the soil conservation village groups established as a food-for-work drought-mitigating effort by external development agents after a major famine in the 2001/2002 farming season. Therefore, there is some expectation that poorer households could be overly represented in the PMGs. From the table, non-members have higher mean asset values. However, female members and non-members had lower mean total incomes. The scenario is reversed for the net-crop production value, where female-headed households had a higher value in comparison to the traditional male-headed households. This could be an artifact of data driven by the fact that only 32% of the households in the whole survey were female-headed.

**Table 4-3: Welfare measures by Gender**

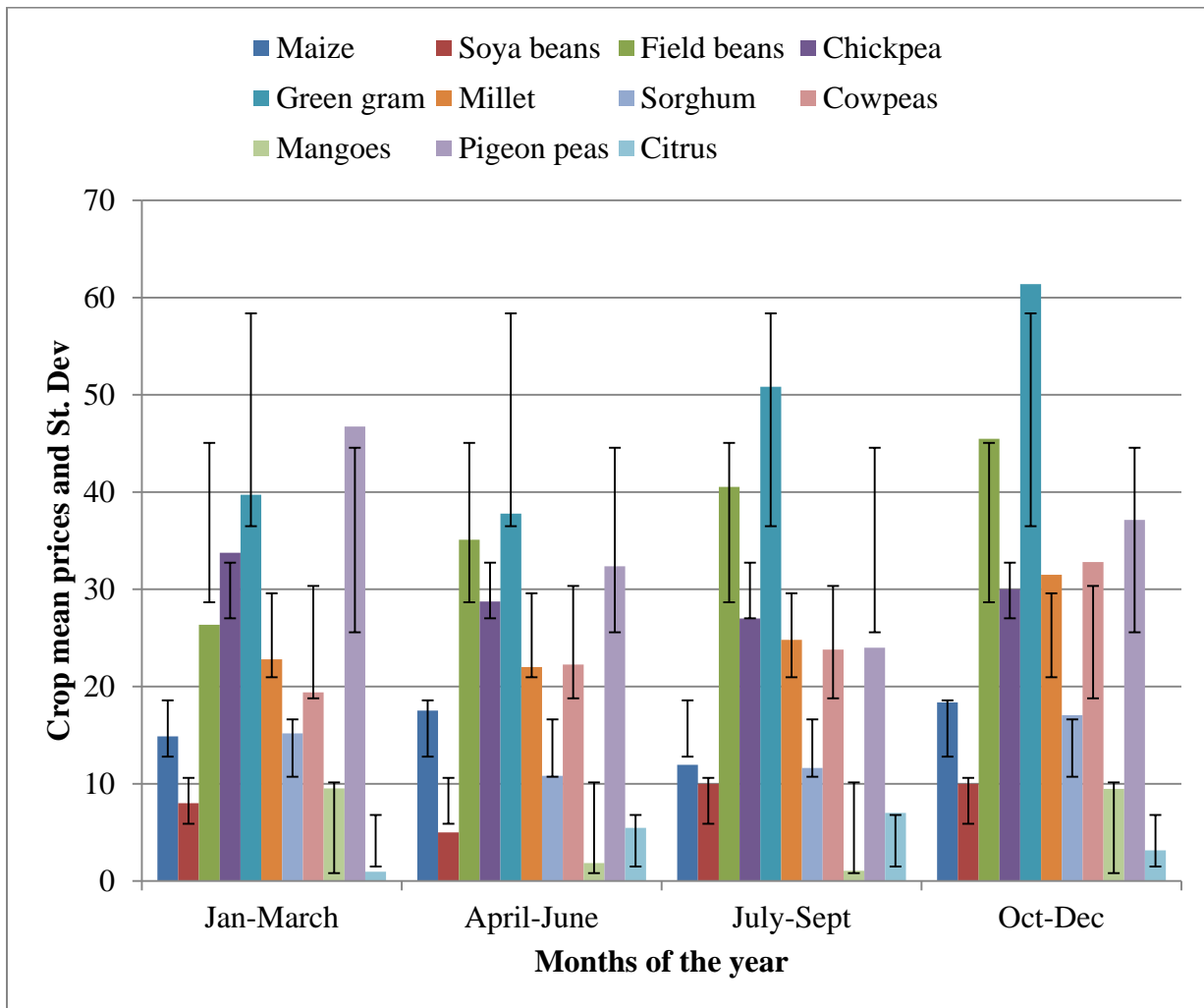
Welfare measure	Gender	PMG Membership	
		No (Mean in Kshs)	Yes (Mean in Kshs)
Total assets	Female	247,539	47,360
	Male	182,777	116,716
Total Income	Female	77,601	75,842
	Male	91,580	121,254
Net crop production value	Female	16,581	22,570
	Male	14,833	20,560

#### 4.6.4 Price volatility<sup>59</sup>

The study was conducted in marginal lands in Kenya at risk of droughts, floods, and pests. Smallholder production in these areas is vulnerable to poor access to markets and frequent weather shocks. Therefore, farmers' income based on on-farm agricultural production is vulnerable to volatile product prices (see figure 4-3 below). Figure 4-3 shows high volatility in different crop prices for the 2006 production year. Intra-annual price volatility is an important

<sup>59</sup> The section on price volatility uses all the data collected in the study (Eastern and Western Kenya).

component of household net returns variability and general farmer welfare, and therefore it is very important to quantify price volatility of agricultural products. The hardest-hit farmers are net food buyers who are usually in the market later in the production season to buy stable food for home consumption. The differences between the volatility in the prices among commodities is also important for farmers' private investment decisions in farm enterprise mix and product marketing (Heifner and Kinoshita, 1994).



**Figure 4-3: Different crop price means and standard deviations for 2006**  
(Source: 2007 PMG level data set)

*Note: The line bars in the graph are standard deviation from the mean*

Farmers' organizations are supposed to play a role in dampening the price volatility by both bulking and storing the product to sell at better prices or negotiating stable prices in with traders.

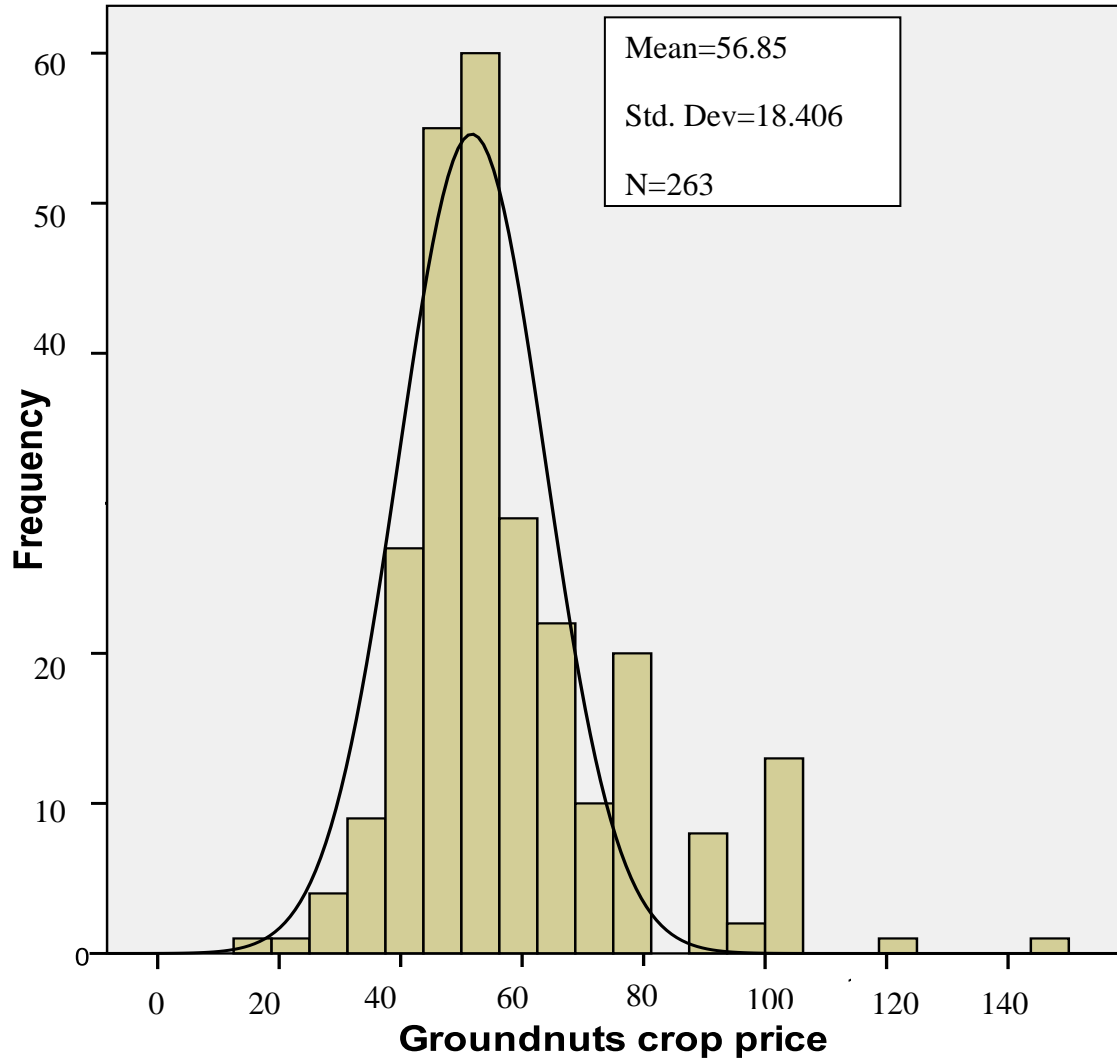
Different methods have been used to measure this price volatility, including the standard deviation of prices, the coefficient of variation, and the Black-Scholes-Merton model (Jordaan, et al., 2007). Other methods evaluated by Offutt and Blandford (1986) include the percentage range, the average percentage change, the moving average, and the Coppock index.

In this chapter, we use the standard deviation of prices from the mean group price as our measure of volatility. Since each farmer was associated with a group (either PMG members or non-members), a mean price for every year was calculated for both members and non-members separately. Using members' annual mean price received for the main crop<sup>60</sup> sold in the region, a standard deviation was calculated at the group level, and the same was done for the non-members associated with each group but using the non-members' mean price. The annual standard deviation calculated is then used as the dependent variable in the econometric model later on for each year. The drawback of using this measure is that the standard deviation and the coefficient of variation assume that past realizations of price and volatility have no influence on current or future realizations. Hence, a better method would have been to use Autoregressive Conditional Heteroscedasticity (ARCH) or Generalised Autoregressive Conditional Heteroscedasticity (GARCH) approach (Just and Pope, 2002, Moledina, et al., 2003). However, this requires time series data over a long period of time, which we do not have. Therefore, this study uses standard deviation as a measure of price volatility.

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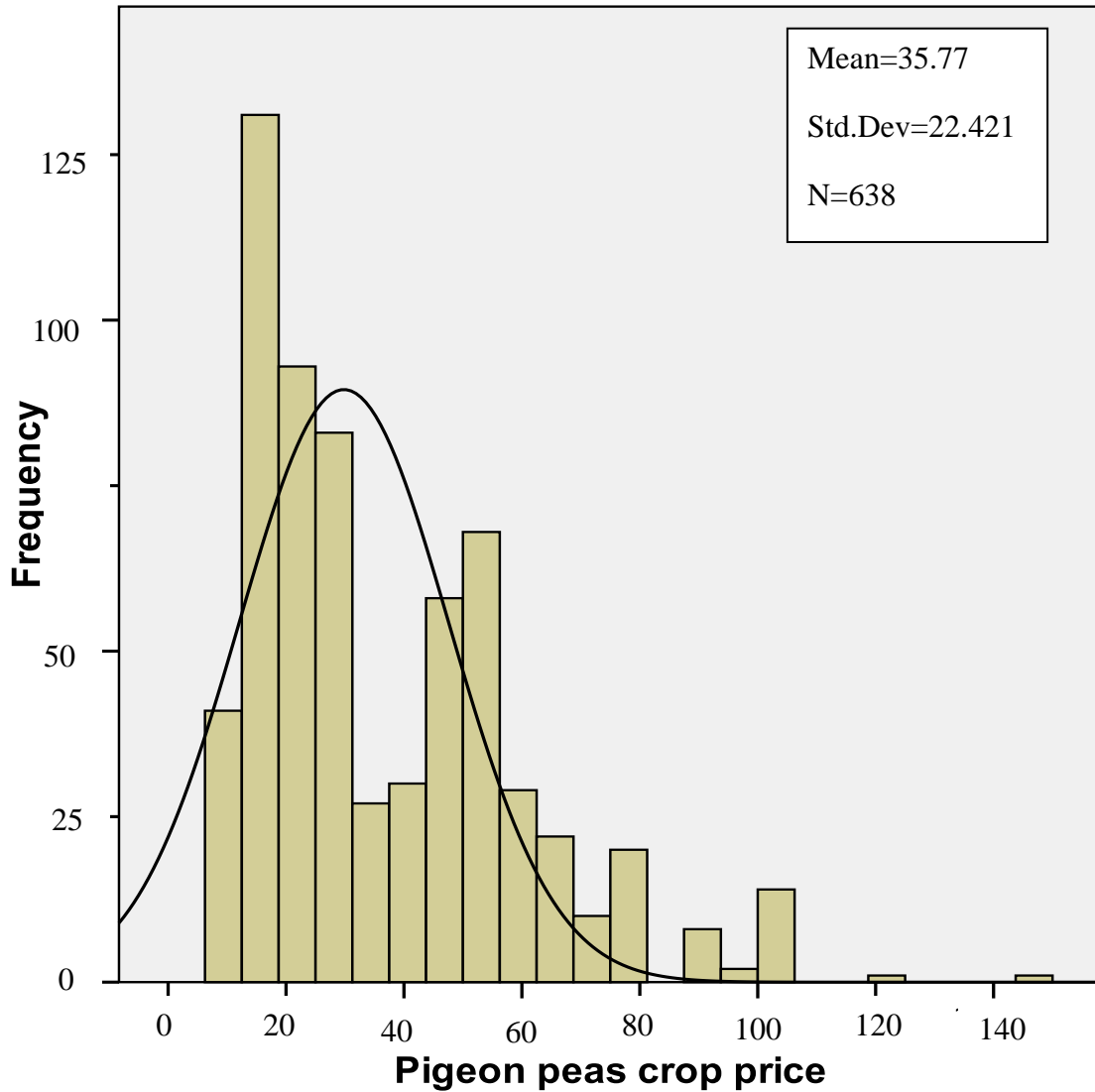
<sup>60</sup> For Eastern Kenya, the crop used was pigeon peas and in Western Kenya, prices for groundnuts were used.

Figure 4-4 shows the price distribution of pigeon peas in Eastern Kenya and groundnuts in Western Kenya. Both crop prices show evidence of fat tails, although most fall inside the normal curve. Note that the graph for the pigeon peas has more data points because households growing this crop in Eastern Kenya were interviewed in the three survey periods, whereas the graphs for groundnuts have fewer data points because the first interviews in Western Kenya took place in 2007. The price distribution for the Western region follows the normal curve. This could be the impact the trading company had on stabilizing prices. The Eastern price distribution is more skewed. These heavy tails indicate that higher price variability could be mitigated if farmers had sale price contracts that would stabilize farmers' prices.



**Figure 4-5: Graphs of Groundnuts crop price for the three-survey period**



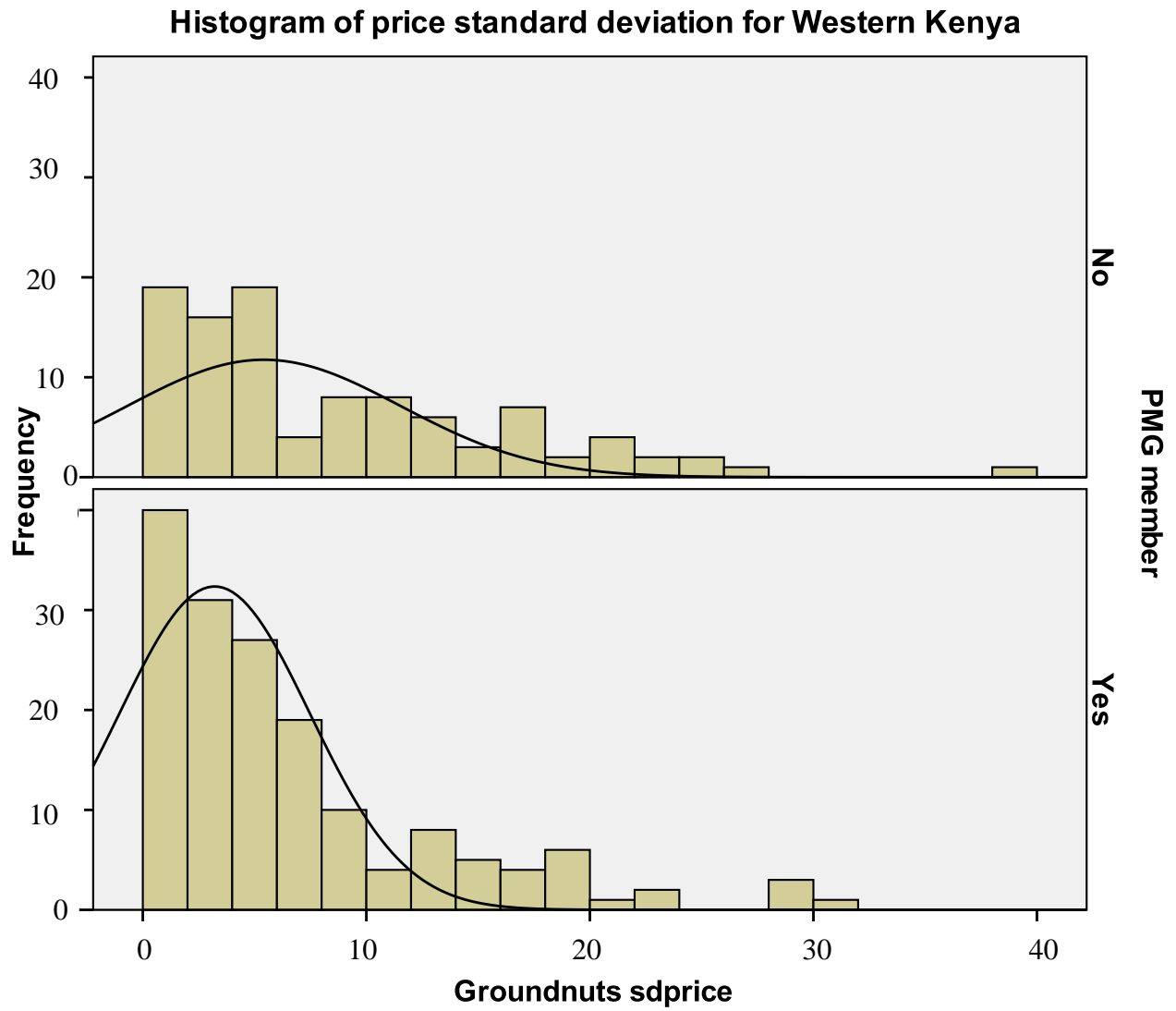


**Figure 4-6: Graphs of Pigeon peas and Groundnuts crop price for the three-survey period<sup>61</sup>**

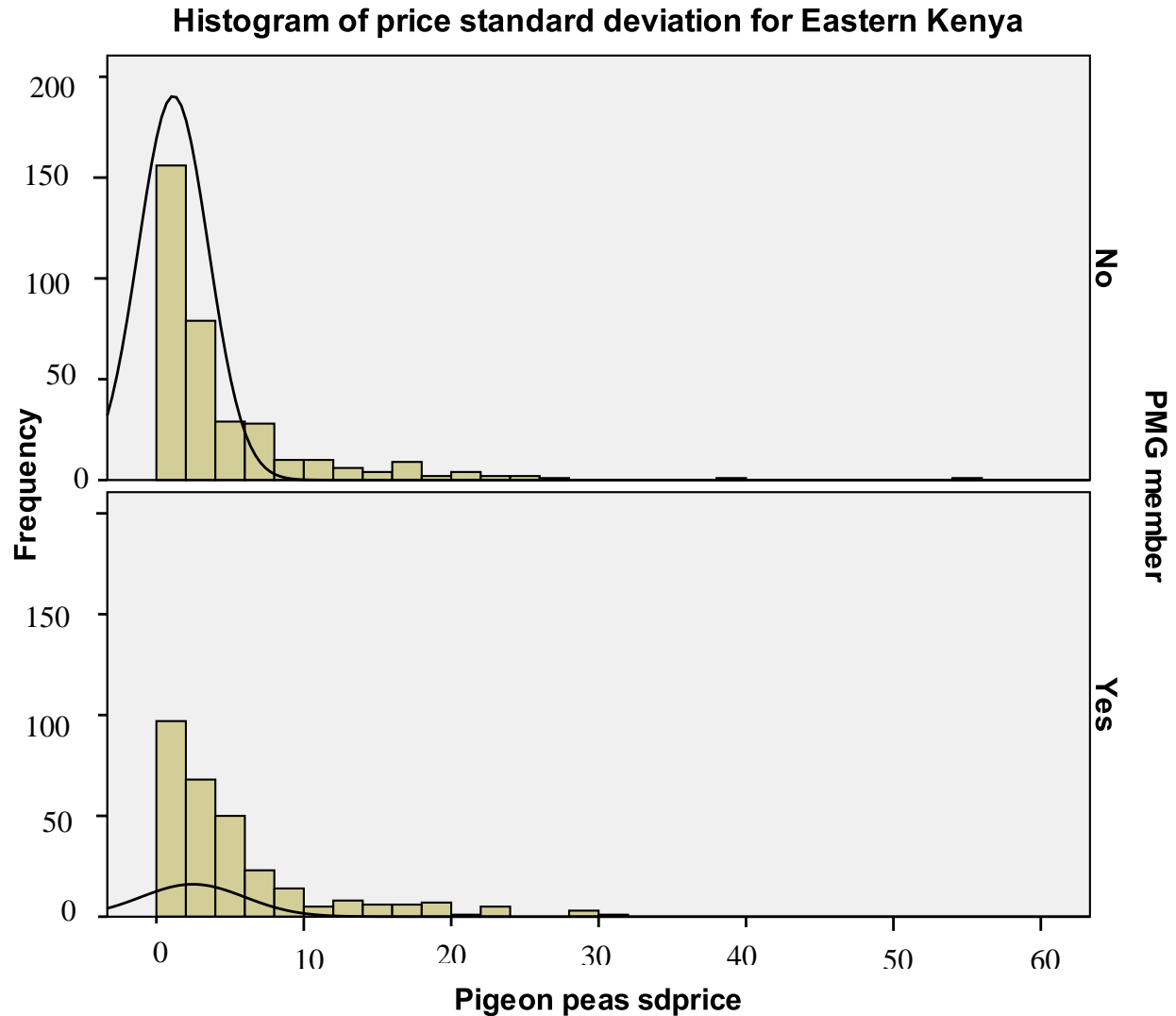
One of our expectations in this study was that the price variations would be lower for the PMG members compared to the non-members. This is true for members’ standard deviations groundnuts prices in Western Kenya, whose distribution is tightly packed closer to zero than that of non-members (see figure 4-5 below). However, members’ pigeon peas price standard

<sup>61</sup> The frequency is the number of members who sold at a particular price and the price is in Kshs/kg

deviation is more dispersed from zero than that of non-members in Eastern Kenya (see figure 4-6).



**Figure 4-7: Distribution of price standard deviation of groundnut for Western Kenya (2007)**



**Figure 4-8: Distribution of price standard deviation of pigeon peas for Eastern Kenya (2003-2007)**

However, this could be caused by the inclusion of 2003 data where there were no groups and hence everyone was a non-member. In the subsequent econometric analysis, this effect would be picked up by the year dummy.

Figure 4-5 shows that being a member of a PMG is correlated with lower price volatility. The members’ price standard deviation is tightly close to zero and bound within a narrow band of zero to ten, whereas for non-members’ standard deviation of prices ranges from zero to twenty. This is reversed for pigeon peas in Eastern Kenya, with non-members’ price standard deviation

being tightly bound from zero to 10, whereas members' standard deviation is widely dispersed. Again this could be affected by the inclusion of 2003 data before the groups were formed.

#### **4.6.5 Random Effects or Fixed Effects model**

##### **4.6.5.1 Crop production value**

In the analysis, we estimated both fixed effects and random effects models, which show some differences in terms of values, significance levels, and signs in some coefficients. Therefore, the logical question is which one do we use? If we assume that the unobserved heterogeneity is uncorrelated with the other independent variables, then a random effects model is most appropriate. In the model estimated, the results of the fixed effects model has a  $\text{Corr}(u_i, x_i) = -0.2838$ . This is a low level of correction, and we assume that the random effects model is more appropriate. However, to confirm this observation, a Hausman test was implemented, where the result  $\chi^2(16)$  was 10.98 with  $\text{Prob} > \chi^2 = 0.8105$ . We therefore fail to reject the null hypothesis that the two methods yield identical coefficients.

#### **4.6.6 Correlates of crop production value<sup>62</sup>**

In this section, we present both random and fixed effect models (table 4-4) to estimate the impact of PMG membership on the level of net crop income. We estimate treatment effects accounting for serial correlation and potential heteroscedasticity of the error term within a cluster.

The variable of interest is the interaction of PMG membership and year 2007 ( $\text{pmmem2007}$ ), which gives the average treatment effect.<sup>63</sup> Though we have a three-period data

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<sup>62</sup> Crop price was deflated to remove the effect of inflation in the models.

<sup>63</sup> This is because, as discussed in the DiD model earlier in the methods section, the variable membership picks up any differences in the mean of the latent individual effects between those

set, we can only estimate 2007-treatment-effect because introduction of the 2005 effect will drop one period due to the identification problem. Choosing the 2007 treatment effect captures the long term effect. Results from the model show that the treatment effect is positive and equal to Kshs 12,972 (US \$ 172)<sup>64</sup>. The inference is that compared to the producers who did not join a PMG group, members had an increase of about US \$ 171 in net crop production value in 2006/2007 production year. An increase of almost \$ 171 worth of produce in the rural semi-arid areas in Kenya is not a trivial figure in a country where 56% of the population lives on less than a dollar a day (UNDP, 2006).

The dummy variables yr2005 and yr2007 capture the two subsequent rounds of the survey after the baseline survey in 2003. These time dummies capture the effects on crop production values that are due to other factors that are common to both treated and untreated groups. The coefficient of the 2007 variable is positive and significant at the 1% level. This finding suggests that there could have been a general improvement in drought- and disease-resistant technology adoption in the study areas that accounts for this general improvement in production. In other words, it is possible that the seeds made available to the PMG members had already multiplied and the non-members were able to acquire them in enough quantities to show this widespread crop production impact in a span of five years.

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who joined PMGs and comparison units, such as would arise from initial purposive selection bias into the program.

<sup>64</sup> All conversions of the Kshs to a dollar are at a rate of US \$ 1=75.10 Kshs

**Table 4-4 Determinants of net crop income**

Impact models (difference-in-difference) net crop income in the dependent variable		
<b>Variables</b>	(1)	(2)
	RE model	FE model
PMG member	-7,473 (1.46)	-12,129 (1.58)
yr2005	-1,789 (0.29)	13,753 (1.43)
yr2007	50,936*** (6.10)	70,353*** (5.07)
pmgmemyr2007	12,972** (2.08)	17,551** (2.04)
<b>HH characteristics</b>		
Age	409 (0.77)	1,459 (1.04)
Age2	-4 (0.84)	-14 (1.13)
Male	-2,126 (0.77)	-7,588 (1.55)
Education	1,143*** (3.23)	1,543 (1.52)
Formal job	1,413 (0.47)	-3,955 (0.82)
<b>Assets</b>		
Land owned	732*** (4.66)	2,196*** (5.66)
Livestock value	0.193*** (4.24)	0.219*** (2.74)
<b>Marketing and Transaction cost</b>		
Sell time (min)	-123* (1.71)	3,348* (1.73)
Transport cost	-94*** (2.62)	-246 (0.84)
<b>Credit</b>		
Credit	1,864 (0.73)	1,536 (0.36)
<b>Source of price information</b>		
Traders	7,368 (1.44)	21,778*** (2.64)
Government agents	-3,107 (1.04)	-6,343 (1.21)
NGOs	-155 (0.04)	3,282 (0.51)
<b>Rainfall</b>		

<b>Table 4-4 cont'd</b>		
	RE model	FE model
Log rainfall	11,956*** (5.51)	15,329*** (5.73)
<b>Location dummies</b>		
	(2.81)	
Makueni	16,339** (2.41)	
Constant	-111,470*** (4.47)	-218,054*** (4.16)
Observations	1656	1656
R-squared		0.23
Number of clusters	1013	1013
Robust t statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

The increase in net crop production value due to passage of time by an average of US \$678 for 2007 exceeds the marginal effects of any of the other variables in the model. All the PMG groups distribute improved seeds to their members at a lower price than the non-members can access them. However, informal seed distribution is very important for the open-pollinated crops, and this could drive the increase in crop production over time. This finding is consistent with earlier findings that there was widespread adoption of improved seeds in the study areas (Shiferaw, et al., 2008). However, the time variable could also be picking up weather effects that were not fully captured by the rainfall variable, which just measured total rainfall but not its timing in critical periods of the crop cycle. Thus, all these effects of time may not just be due to better technology. Also, global food prices went up in 2007 in real terms; to the extent that such global price increases were transmitted to Kenya, the value of production could have increased even if the physical volume of production did not.

Education in our model specification could be a proxy for the ability to acquire new farming knowledge and utilize it appropriately that cannot be observed and measured. Education

is positive and significant at the 1% level. There is an increase in crop production value of Kshs 1,143 (US \$16) for every extra year of schooling for the head of the household. This result is consistent with our expectations and consistent with what many studies in farm technology adoption have found— that more education increases technology adoption and hence more production (Alene and Manyong, 2007, Feder, et al., 1985, Lin, 1991, Liu and Zhuang, 2000). We therefore find evidence of positive returns to schooling in our model in terms of crop net income.

The coefficient on acres of land owned was positive and significant at the 1% level. An extra acre of land owned increased net crop production by Kshs 732 (US \$10). This is expected, with the exception of cases where there is a severe labor constraint. From the group survey interviews conducted, it was clear that labor was not a constraint in many of the areas in the study. And there was a well-functioning labor market; hence, households with more land produced more. Again, this is consistent with other studies in literature (Feder, et al., 1985, Idiong, 2007, Latruffe, et al., 2002). The magnitude of the increase in this study (the marginal product of an acre of land) is low. This might reflect that larger farms have lower quality land on average. However, this needs to be investigated further.

The longer it took to sell the product in the market, the lower the net crop income. The coefficient of selling time is negative and significant at the 10% level. There is reduction of US \$1.70 in crop production value for every extra minute it took to market the product. The variable captured the length of time it took to sell the product in the market in minutes. Hence, it captures the effect of transaction costs on crop production value. As expected, higher transaction costs reduce household mean crop production value. This variable could also be picking up the effect of farmers who produce lower quality products relative to their peers receiving lower prices and



having to take longer times to sell their products. Or it could be that those who live in more remote areas receive lower prices and have to take a longer time to find buyers because of their remoteness.

The transport cost variable captures part of the marketing costs. As expected, the coefficient is negative and significant at the 1% level. There is a reduction of US \$ 1.30 in crop net income for every increase in transport cost of US \$ 0.01 per trip<sup>65</sup>. That shows that farmers who were further away from the market or who lived in areas with poor road infrastructure had lower net crop production. Hence a PMG with good storage facilities and marketing abilities could play an important role in increasing farmers' crop production and thereby income.

Individuals who received most of their market information from government extension services had reduced net crop income by Kshs 6,651 (US \$ 89). The coefficient on government agencies is negative and significant at the 1% level. The variable could be capturing the fact that individuals who are more market oriented and therefore with higher production will not wait for government extension services to get their marketing information. They will use other avenues to get price and marketing information to get better returns for their products. On the other hand, poor farmers who produce less crop value are still reliant on government information services. An alternative explanation could be that government marketing information is poor and does not help farmers. Government extension services could be targeting its activities more to the poor and those in remote areas where prices are lower for greater impact.

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<sup>65</sup> The transport cost was collected per trip and not per kilogram of the produce. In general, transport cost for produce in Kenya is not per weight but per trip for a certain amount and in the data collection, it was difficult to collect data per weight. Therefore, it is difficult to assess the marginal cost per kg and judge the arbitrage opportunity.

As expected, a 1% increase in rainfall in the study areas increases net crop production value by a significant amount—Kshs 11,956 (US \$ 160). The implication is that the regions studied were in general moisture deficit condition and any technology that can conserve whatever little rainfall occurs in the year could have big impact in crop production and therefore food security. Simple technologies like zero or double tillage, soil conservation and early planting may greatly improve crop production. Though this study was not meant to look at the types of crops produced in the area, with such low rainfall, a crop mix that emphasizes drought-resistant crops could also be helpful in improving food security and producers' welfare.

Controlling for livestock value captures the effect of owning livestock on net crop production. An increase in livestock value increases the crop net income. The coefficient on livestock is positive and significant at the 1% level. However, the actual magnitude is negligible. The variable could be capturing the fact that livestock is used for animal traction in tillage or even relaxing credit constraints, since some livestock is easily liquidated. However, it could also be capturing the wealth effect since wealthier households are likely to have more livestock. The small magnitude of the effect could reflect that those who had livestock generally had lands less suited for crop production (mainly grazing areas).

Households who get their information from traders have a higher crop net income by 21,778 KSh (US \$ 290). The coefficient is positive and significant at the 1% level. Wealthier farmers could be more likely to market their produce through traders and are able to negotiate higher prices due the quantity they produce. However, there is need for further investigation to find out reasons for this phenomenon.

#### **4.6.7 Price volatility regression results**

In this section, we present three models on price volatility, of which one is for the dominant crop in Western Kenya because we had data for only one year in that area. The other are two for Eastern Kenya, estimated for 2005 and 2007. Because we are looking at intra-annual price volatility, we are not using the DiD model for this analysis but we estimate the intra-annual price volatility a household faces each of the periods the data was collected. The dependent variable is the crop price standard deviation from the mean price received by PMG members (for those who were members of the marketing groups) or by non-members (for those who did not belong to PMGS) for each region. An argument can be raised that those facing greater price volatility are more likely to join the PMGs, bringing the possibilities of endogeneity problems into the model. Therefore, this was tested using Davidson-MacKinnon test for exogeneity. The results (exogeneity: 1.7555 F(1,611) P-value = 0.1857) show that the estimated coefficient of the residual was not significantly different from zero, and thus the test failed to reject the null hypothesis that the decision to join the PMG was exogenous.

The coefficient for the variable group membership in 2007 models is negative but not significant (see table 4-5 below) and in 2005 it is positive but again not significant at the 10% level. Therefore, there is no significant difference in price volatility between the PMG members and non-members. From theory, we expected that being a member would allow the group to negotiate a better and stable price for its produce. However, as explained earlier, it takes time for these producer groups to gain enough clout in the marketing of the produce to have a significant impact in the area of marketing.

#### 4.6.6.2 Impact of PMG membership on price volatility

**Table 4-5 Determinants of crop price volatility for Eastern and Western Kenya**

	Eastern Kenya†		Western Kenya‡
	2005	2007	2007
<b>Individual characteristics</b>			
PMG member	1.04	-1.06	-0.70
	(1.51)	(0.94)	(0.45)
Age	-0.00	0.03	0.05
	(0.10)	(1.00)	(1.39)
Male	0.92*	-0.33	-1.03
	(1.72)	(0.45)	(0.98)
Education	0.00	0.03	-0.02
	(0.04)	(0.32)	(0.16)
<b>Location characteristics</b>			
Village population	0.00	-0.00	0.002
	(0.03)	(0.51)	(0.09)
Log rainfall		-0.27	
		(0.06)	
<b>Household wealth</b>			
Land cultivated	0.05	0.09**	0.30**
	(1.23)	(2.00)	(2.02)
<b>Marketing cost</b>			
Transport cost	0.04***	-0.01*	-0.01
	(2.82)	(1.91)	(0.60)
<b>Group characteristic</b>			
Decision index	0.00	0.00	-0.02
	(0.44)	(0.10)	(0.95)
<b>Sources of Price information</b>			
Government agents	-0.99	1.84	3.06**
	(1.11)	(1.63)	(2.22)
Traders	0.72	1.75*	3.61***
	(0.92)	(1.74)	(2.66)
Mass media	-0.15	0.16	1.38
	(0.22)	(0.19)	(1.16)
Mobile phone		2.78**	
<b>Spatial location</b>			
Siaya			-1.63
			(1.45)
			-1.54
			(0.98)
Makueni	0.49	-5.60	
	(0.87)	(1.47)	

<b>Table 4-5 cont'd</b>			
Constant	-0.26	8.84	
	(0.15)	(0.33)	
Observations	49	380	
R-squared	0.31	0.14	
Robust t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
† Price St. Dev of pigeon peas is the dependent variable in Eastern Kenya			
‡ Price St. Dev of groundnuts is the dependent variable in Western Kenya			

The whole process is very slow and goes in stages. The first stage is setting up a PMG by a few devoted members. Then they have to market the idea to other producers. Due to past failures in such efforts, this is a tough task. As the membership grows, they have to convince other members to market a large proportion of their produce together. Eventually, if the group is successful in demonstrating its usefulness, more members join, and with enough volume of products successful collective marketing is achieved. If a certain volume threshold is achieved, a PMG can have a big enough market power to negotiate a higher and/or more stable price. With higher and stable price, there will be a cascading effect where everyone will want to join a group. Being outside of the group will be undesirable and increase the price variability.

Producers who cultivated bigger parcels of land had higher price volatility in 2007. The coefficient on land owned is positive and significant at the 5% level in both regions. In the net crop production model in table 4-4, cultivating more land increases net crop production value; hence, we expect these farmers to have a bigger bargaining power. Bigger producers, however, face higher price risk than do smaller farmers, and if the PMGs manage to lower the risk, then it possible to attract these famers to be members. An alternative explanation for the greater price variance faced by large farmers could be that big producers consistently produce more products, and hence sell throughout the year in significant quantities, while the small farmers only produce small quantities in the year. The small producers' sales would all be clustered around the same

time, while the large producers would be selling throughout the year and thus facing more price volatility. Similarly, if the large producers have more liquidity, they may not be forced to sell everything right after harvest to meet cash flow needs. Thus, they could be selling throughout the season, and hence face more seasonal price changes than the small farmers, forced to sell right after harvest.

Higher transport cost to the market per trip, as shown by the coefficient of transport cost, has ambiguous correlation with intra-annual price volatility. It is positive and significant at the 1% level in the Eastern region for 2005. It is also negative and significant at 10% level in the same region in 2007. The variable is a proxy for the remoteness in terms of location of the producer in relation to the market. The logical explanation for the negative correlation is that these producers are far away from the market, few middlemen go to their farms to buy their produce at farm gate. So the few traders who venture in these areas then offer similar prices to the farmers with little variation due to lack of alternatives markets. Hence, although in our case the price variation is measure of risk, less risk in this case might not necessary be a good thing. They could be getting less variable but lower prices than they would get if there were greater competition among the buyers. However, it is difficult to account for the reversal of the sign between 2005 and 2007. Therefore, more research needs to be done in these areas to account for the ambiguity.

Producers who get their market price information from a trader experienced a higher annual price variation. The coefficient is positive and significant at the 1% level for groundnuts in Western Kenya and at the 10% level for pigeon peas in Eastern Kenya in 2007. Two things could be going on here. One is that since farmers still sell their produce to the local buyers, the variable could be capturing the inherent price risk in these areas. On the other hand, it could also

be capturing the fact that the buyers generally give varying prices to their customers and the variable is capturing this fact. However, the coefficient for receiving information from a government extension agent is also positive and significant at the 5% level for the groundnuts in Western Kenya in 2007. This is against the expectations. Those who received price information from government extension agents also had lower crop production values. Therefore, more research needs to be conducted on government extension services operations and their quality in the study areas.

Farmers in Eastern Kenya (growing pigeon peas) in 2007 who accessed price information through a cell phone received prices that were more volatile. The coefficient on cell phone information is positive and significant at the 5% level. A cell phone allows a farmer to search for market in more markets than is usually possible without the facility. Therefore, it is likely that such a farmer will sell in several markets or deal with many different traders offering varied prices. Hence, this variable could be capturing this variation in different market participation.

#### **4.7 Conclusions**

In this chapter, we sought to investigate the impact of being a member of a PMG on farmers' crop revenue and on price risk.

The first objective was to look for evidence of the impact of producer groups on the crop net income. The models find that there is indeed evidence that membership in a PMG leads to an increase in the net crop income among the members through increased production or through price effects. We also find that overall in the same areas there was an increase in net crop income to the community as whole despite adverse weather conditions in the area of study. This could point to the fact that new seed technology was widely accepted and adopted by the farmers in general.

Another important finding is the impact of transaction and marketing costs on net crop production value. Few studies have captured TC directly, and this study contributes to the literature by showing the impact these costs have on net crop production values and thereby farmers' welfare. We show that TC and marketing costs directly reduce net crop income of individual households.

On the second objective, we find no evidence of any difference between the intra-annual price volatility faced by PMG members and non-members. Maybe in the long run, a group might gain enough market clout and stabilize the price. Therefore, policy makers should take a long-term view on the price stabilization ability of these institutional arrangements. Promotion of the groups should have a long-term plan on how to work with the groups until they get enough market power to stabilize prices through contracts or a better bargaining power. These groups should not be looked at as a quick fix for the small-scale farmers' price risks problems.

We find that PMGs can be utilized as a tool to alleviate poor food security situations in marginal areas. This study gives credence to those who have argued in the past that farmer groups could be used to alleviate poverty among the poor rural farmers in developing countries.



## **Chapter 5 : Conclusions**

The three analytical chapters in this study explore how collective action, in the form of producer marketing groups, is applied in a smallholder farmers' context in semi-arid areas of Kenya, and the impacts it has on farmers who embrace it. Whereas agriculture can be used to alleviate poverty and food security problems among the rural poor in developing countries (World-Bank, 2008) and in particular Sub-Saharan Africa, its record in SSA has had mixed results. However, there is the renewed hope that the rapid growth in domestic and global markets, innovations in communication technologies, and the revolution in biotechnology may provide the opportunities these farmers have missed in the past. But realizing this promise requires that farmers in developing countries and especially the smallholder farmers have access to input and output markets and other supporting services. Producer marketing groups could be one of the tools that can be used to exploit this potential.

Although smallholder farmers are usually efficient producers, they need supporting organizational structures that understand the marketplace and the unique characteristics of rain-fed smallholder farming. Without an enabling environment or institutions that support the interface between the traders and farmers, low and volatile farm incomes have been the result in many instances. However, PMGs can be applied to bridge the gap between the smallholder farmers and the private sector, government agencies as well as other service providers. Yet the main constraint has been the understanding of how to apply collective action appropriately to these farmers.

The gap in the literature has been the understanding of the dynamics of collective action within the context of smallholder farming. Therefore, the second chapter of this study explored in depth the conditions necessary for effective and sustainable PMGs. The third chapter explored

factors that determine participation in PMGs, patronage and the number of CA efforts a farmer joins. The fourth chapter contributes to the debate on the impact of PMG membership on crop income and price risk.

Research on CA is very wide, but this study concentrates on a subset of collective action called farmers' organizations. Among a wide array of CA referred to as farmers' organizations, the study focused on producer marketing groups, mainly formed by smallholder farmers. The study finds that if farmers produce a product characterized by high asset specificity, in the presence of an altruistic leader it is more likely for PMGs to emerge and be sustainable. An alternative to a single altruistic individual was the presence of a small core group that was dedicated to the collective action effort who form the nucleus around which a group is formed and operated.

From the qualitative and quantitative analyses in chapter two, we found a common set of factors that foster success of PMGs. In addition to the presence of an altruistic leader or core group that forms as a nucleus around which other members work, good governance structures were also found to be important for group success. These structures include bylaws well understood by members, enforceable and enforced. For a group also to remain relevant and attract patronage, it needs to have diverse activities that increase members' benefits from the PMG and increase the cost of being excluded in case one is not cooperative. Regular monetary subscription requirements by a group increases active members' commitment to the effort. It can also be used to signal members' cooperative characteristics. Successful groups were also found to serve a smaller geographical location, which eases group coordination.

To improve development agents' and government service providers' understanding of PMGs, a Group Analysis Framework was developed. This framework can be utilized to pinpoint areas of interventions to improve a variety of CA effort success rate. The framework is also tested in a case-study approach as well as using quantitative analysis. This is an important addition to the literature of CA among smallholder farmers, since development and various government agencies promote group formation but lack a yardstick to identify areas of interventions specific to each group. These agencies are usually important in providing education to groups in the early life of a group growth cycle. They also play an important role initially in connecting groups with various market actors and other service providers. Therefore, the agencies' understanding of each group they work with could prove to be very important for a group's success probability.

Chapter three investigates the determinants of household participation in PMGs, patronage, and the number of groups joined. The study finds some factors that are common drivers in at least two areas. An increase in age of the household head and an increase in the diversity of the individuals in an area had ambiguous effects, both increasing the probability of joining a group but decreasing the percentage of sales through it. The presence of a more democratic group increased the probability of a farmer joining a group as well as increasing the number of groups joined. The study also tested the impact of previous assistance by a development agent on collective action. We find that farmers who had received assistance from a development agent were more likely to join a group and increase patronage. This is contrary to the findings in sociology literature as discussed earlier.

Chapter four investigates the impact PMGs had on crop production and the price risk members face compared to the non-members. The study does not find any evidence that groups'

members face different price risk compared to the non-members. This could be explained by the fact that in the early stages of a PMG group and its role in product marketing is limited.

However, the study finds that PMGs improved net crop income for its members compared to the non-members.

### **5.1 Policy implications**

From the study, we find that there is evidence that participating in a PMG group improves net crop income. Therefore, PMGs can be used to improve rural farmers' food security and increase their incomes. However, for groups to emerge and be successful, good leadership plays a crucial role. Therefore, great emphasis should be put in providing farmers with education on group dynamics and sensitizing them on the importance of PMGs and good management practices. Formation of a new group should be encouraged only in the presence of a core group of individuals or an altruistic leader to spearhead the efforts. Emerging groups ideally should draw their memberships from a small geographical area and have few members. This fosters bonding to increase social capital that is needed to mitigate the free-rider problem and draw proper governance structures. The group also should have diverse activities to increase its value to the members and raise the cost of being uncooperative.

### **5.2 Study limitations and recommendations for further studies**

The study used a panel of five years. Hence, more research in this area is needed to verify these results with a longer panel data and in particular on impact assessment with better measurement indicators utilized. More testing is also necessary for the group analysis framework to ensure that it can be applied to a wide form of collective efforts.

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