

5 Rural Institutions and Imperfect Agricultural Markets in Africa: Experiences from Producer Marketing Groups in Kenya

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Many Sub-Saharan African countries have liberalized their economies and developed poverty reduction strategies aimed at opening up new market-led opportunities for economic recovery and accelerated growth. The outcomes of these policy reforms have, however, been quite mixed (Winter-Nelson and Temu 2002; Dorward and Kydd 2004; Fafchamps 2004). Many smallholder farmers continue to engage in subsistence agriculture and are therefore unable to benefit from liberalized markets. Structural problems of poor infrastructure (Kydd and Dorward 2004; Dorward et al. 2005) and lack of market-enabling institutions (World Bank 2002, 2003) continue to characterize the subsector, contributing to high transaction costs, coordination failure, and pervasive market imperfections. Moreover, partial implementation of reforms and policy reversals in terms of increasing the use of discretionary trade policy instruments by the state or parastatal marketing boards have tended to mute the positive effects of liberalization (Jayne et al. 2002; Jayne, Chapoto, and Shiferaw 2009).

Although the opportunities afforded by liberalization have not been fully exploited, the expectation that removing or rationalizing state marketing boards would open opportunities for the private sector to take over these functions has not been fully realized in many areas. This is mainly because of underdeveloped infrastructure and missing institutions that support the proper functioning of markets. The private-sector traders are unlikely to offer input and output marketing services to smallholder producers in such less favored areas, where market infrastructure or enabling institutions are weak or missing. Lack of such infrastructure and institutions diminishes the incentives for the private sector to invest in agribusiness development and the provision of marketing functions, especially for food staples and other low-value grains produced in these areas. However, avenues exist in market institutions that make use of collective action to complement government and private-sector responses for enhanced coordination in rural commodity markets. This is because the individual marketing of produce may not make economic sense due to small quantities, large spatial distances from input and output markets, and the associated high transportation costs, all characteristics of small-scale production in Sub-Saharan Africa.

This chapter aims to analyze the role that institutional innovations can play in improving the performance of rural markets in less favored areas lacking market infrastructure. Presenting a case study of producer marketing groups (PMGs) in eastern Kenya, the chapter identifies potentials and constraints of rural institutions in providing market services for small-scale producers of food staples and grain legumes. Marketing outcomes and the potential sources of the differential success of marketing groups in relation to marketing and other collective action functions are highlighted. The rest of the chapter is organized as follows. First we review market institutions and their emerging roles in remedying market imperfections in rural areas. Next we outline the methodological approach used in the case study. Then we present our main results, followed by a summary of the key findings and policy implications in the concluding section.

As for the conceptual framework in Chapter 2, this study illustrates how institutions of collective action can enable the poor to enhance their access to markets in order to increase their incomes while maintaining the sustainability of their marketing efforts. The study examines the role of assets (natural, human, and public) in creating incentives to join PMGs and also provides insight into how collective action can be leveraged to achieve certain poverty reduction outcomes for small-scale producers and how the legal frameworks can constrain the emergence and further development of such institutions. The central focus of the chapter is on food staple marketing in the semiarid areas of Kenya (the action arena). The actors discussed are mainly the internal ones (PMG members and nonmembers), and there is some mention of the state (and other nongovernmental agencies) as an external actor that creates certain contextual conditions for the emergence of new forms of cooperation around marketing activities (patterns of interaction). PMG bylaws (another pattern of interaction) are also discussed in detail to show their linkages with assets and their influence on outcomes (the economic viability of the marketing groups). The inclusiveness of PMGs is mentioned in relation to the asset endowments as well.

This chapter, similar to Chapters 3 and 4, stands at the important intersection between the natural resource management (NRM) literature and non-NRM poverty studies by focusing not only on the role of collective action institutions in overcoming certain structural constraints that the poor face (in this case, in marketing their agricultural products) but also on the structure and functioning of the groups themselves, which allow the farmers to achieve these outcomes. Collective action in marketing has been gaining attention in the literature in recent years but has focused mostly on the operational rather than institutional side. This study contributes to the study of collective action institutions in non-NRM areas, for example, by examining the incentives to organize around marketing as well as the impact of rules and asset heterogeneity on group sustainability and inclusiveness.

Institutions in Imperfect Rural Markets

How Institutions Help Overcome Market Impediments

Institutions constitute formal constraints (that is, rules, laws, and constitutions) and informal constraints (that is, norms of behavior, conventions, and self-imposed codes of conduct) that structure human interactions and their enforcement characteristics (North 1990). Similarly, the World Bank defines *institutions* as the rules, including behavioral norms, by which agents interact and the organizations that implement rules and codes of conduct to achieve desired outcomes (World Bank 2002). The formal institutions include rules written into law by governments, as well as rules codified and adopted by the private sector and by public and private organizations operating under public law. Informal institutions, however, operate outside of the formal legal system and reflect the unwritten codes of social behavior. Both formal and informal institutions have their own external enforcement mechanisms, such as the judicial system and third-party arbitration. At initial stages of development, markets and trade rely more on the norm and on network-based informal institutions that reduce the transaction costs of collecting and processing information and the risks associated with market transactions. As the complexity of markets and trade increases, the number and range of partners involved in transactions expand significantly, and informal institutions fail to absorb costs and risks to allow efficient market transactions. The importance of formal institutions becomes more evident as the economies grow, the number of actors increases, and markets become more integrated. For example, interregional trade and participation in international markets require international rules and standards that facilitate market exchanges (World Bank 2002).

Market failures are often caused by underlying policy and institutional failures that lead to asymmetric information, high transaction costs, and imperfectly specified property rights (Shiferaw and Muricho 2009). They tend to be more pronounced in areas with underdeveloped public goods and market infrastructure (for instance, road and communication networks), which are typical of many rural areas in Sub-Saharan Africa (Shiferaw and Muricho 2009).¹ Without supporting market institutions, rural markets in these areas tend to be thin and imperfect, leading to high marketing and transaction costs. These costs undermine the exchange process (Kranton 1996; Gabre-Madhin 2001), leading to segmented and imperfect rural markets characterized by weak linkages among producers and different end users (Chowdhury, Negessa, and Torero 2005). Given such market arrangements, households respond by producing a

1. Market failure is a subjective concept associated with conditions when markets fail to facilitate mutually beneficial transactions due to certain constraints related to lack of information, exclusion, or inadequate provision of public goods. These underlying constraints often arise from policy failures or inadequate institutions.

limited range of goods and services for their own consumption, especially when they cannot rely on markets to ensure household food security (de Janvry, Fafchamps, and Sadoulet 1991). Further, missing complementary investments at one point in the supply chain undermine the incentives for important market players along the chain to undertake profitable investments, progressively leading to coordination failures that hinder market performance (Dorward et al. 2005; Poulton, Kydd, and Dorward 2006). Associated shocks and vulnerabilities to production risks (that is, weather, pests, and sickness) and market risk also exacerbate market imperfections and lead to transaction failures (Dorward and Kydd 2004).

How, then, can institutions support market development? The important role of institutions is in reducing transaction costs related to inadequate information, infrastructure, incomplete definition and enforcement of property rights, and barriers to entry (World Bank 2002). This suggests that institutions (including the formal rules and informal norms of collective action and their enforcement mechanisms) perform multiple functions for markets:

- transmit information,
- mediate transactions,
- facilitate the transfer and enforcement of property rights and contracts, and
- manage the degree of competition.

They can therefore be used to help remedy market imperfections and impediments in rural markets. This suggests that institutional innovations that reduce transaction costs and enhance market coordination—such as marketing groups and producer organizations that make use of collective action—can be instrumental in overcoming some of these problems in imperfect markets.

Farmer Organizations for Improving Markets

The potential of producer organizations lies in their ability to convey market information, coordinate marketing functions, define and enforce property rights and contracts, and, more critically, enhance competitiveness and mobilize the membership to engage in markets (Shiferaw and Muricho 2009). Farmer organizations can be of several types, ranging from informal groups to formal cooperatives or collectively owned agro-enterprises. Depending on their anticipated functions and legal provisions in different countries, their organizational designs may take different forms—cooperatives, associations, and societies. A farmer association is a nonprofit organization that leverages collective action to access certain services (for example, agricultural extension), enable the exchange of information, and provide members with representation and a voice. On the other hand, farmer cooperatives can engage in commercial activities, including the collective marketing of produce and the buying of commercial inputs.

Farmer cooperatives continue to play an important role in organizing the production and marketing functions of family farms in developed countries. There are more than 30,000 cooperatives representing over 9 million members within the E.U. alone, accounting for 50 percent of the market share for delivery of inputs and 60 percent for agricultural produce (World Bank 2008). Historically, farmer cooperatives were introduced in Sub-Saharan Africa during the colonial period for the purpose of promoting the production of cash crops by peasant farmers (Hussi et al. 1993). After the countries of the area achieved independence, many governments as well as donors promoted cooperatives and other rural organizations as potential sources of decentralized grassroots participation in agricultural credit, input, and commodity markets (Lele and Christiansen 1989; Hussi et al. 1993). However, despite the important contributions they made to the integration of producers into markets in the initial phase, the performance of cooperatives gradually declined over time. In Kenya, for example, semiautonomous agencies—such as the Kenya Tea Development Authority, and the coffee and dairy cooperatives—were important to the growth of smallholder production, while some parastatals and cooperatives showed mediocre results. Unsatisfactory performances are often attributed to technological problems, external interference, and poor management (Wolf 1986; Lele and Christiansen 1989).

Hence, the track record of farmer cooperatives in Africa during the pre-adjustment era in relation to the provision of essential services to members and poverty reduction has not been exemplary (Lele 1981; Hussi et al. 1993; Akwabi-Ameyaw 1997). Supported by governments, they functioned primarily as social service cooperatives rather than as business enterprises owned and governed by the members. They were not allowed sufficient marketing margins to cover their operational expenses and could not evolve into commercially viable enterprises. This deficiency gradually discouraged member participation and eroded the confidence of the stakeholders in the cooperative leadership (Lele 1981; Shiferaw and Muricho 2009). With structural adjustment and economic reforms, many of the service cooperatives lost their special protection from the state, which further reduced their viability in the ensuing competitive environment. In addition to the unsuccessful past efforts, which continue to overshadow future directions, today's farmer organizations face several internal and external challenges that could undermine their ability to compete more effectively or provide desired services to members at low costs.

Given these unsuccessful experiences of farmer cooperatives, African farmers are highly suspicious of and anxious about collective action in marketing. The new generation of farmer organizations must go through a slow process of confidence building to overcome persistent suspicion and fear on the part of their members, potential members, and business partners. This confidence can be nurtured only through greater participatory and democratic governance, openness and transparency in financial management that enhances the organizations' accountability to members, good business ethics, and finally, the rewards

that they bring to their constituency. It is in this regard that PMGs as member-controlled and -governed farmer organizations can be useful in enhancing access to markets and in facilitating the transition from the discredited cooperatives of the past to the new generation of market-led and economically viable farmer cooperatives. The lessons from the past cooperative movement indicate that farmer organizations can succeed if farmers are allowed to manage them autonomously with minimal government interference and participate actively in decisionmaking at every stage of the process and if collective action reduces transaction costs and improves competitiveness. All this implies that new policies and institutional reforms would be needed to facilitate the evolution of these organizations as private-sector enterprises with clear business plans.

Although what we have just written shows that PMGs have the potential to enhance market opportunities for small producers through facilitated access to better markets, reduced marketing costs, and buying and selling practices synchronized to seasonal price conditions, collective action is a critical factor in realizing this potential. Participation in groups will depend on the magnitude of the expected benefits and their associated costs. Collective action is likely to materialize if the gains in terms of reduced transaction costs, better input or product prices, empowerment, and capacity enhancement outweigh the associated costs of complying with collective rules and norms.

Data and Context

Two sets of data that were obtained from a baseline survey in 2003 and a follow-up survey in 2005 are used in this study. We conducted the surveys in Mbeere and Makueni districts of semiarid eastern Kenya, where poverty is pervasive and smallholders frequently face drought-induced shocks. These districts were targeted by the International Crops Research Institute for the Semiarid Tropics (ICRISAT) as areas where dryland legumes such as pigeon peas and chickpeas could potentially be exploited to reduce poverty and vulnerability. The two districts are located in the part of the larger semiarid lands characterized by a low density of paved roads and limited access to major marketing centers. Farmers there produce limited marketable surplus. Despite climatic variability and recurrent droughts, smallholder agriculture is almost entirely dependent on rains.

The baseline survey of 400 households (240 in Mbeere and 160 in Makueni) was undertaken in 2003 before the PMGs were formed as part of an ICRISAT-led research project that aimed to pilot alternative institutional innovations for improving market access for smallholders. The households were randomly sampled from a list of all households in the target villages. Farmers were sensitized to PMG participation and assisted in forming PMGs.² Interested farmers

2. The form of assistance provided included mobilizing farmers to discuss production and marketing strategies for dryland legumes, training them on quality seed production and marketing, and providing information on organizing marketing groups. No direct subsidies or incentives were provided to farmers to join groups.

voluntarily established five PMGs in each district. The groups were formally registered, and each was provided a certificate of its legal constitution as a welfare society (self-help group) issued by the Ministry of Gender, Sports, Culture, and Social Services. Some of the households that had initially expressed interest in joining a group subsequently decided not to join. From the initial sample of 400 households, the distribution of members and nonmembers was decided after the PMGs were established based on the number of committed and paid-up members. Information on poverty indicators, agricultural production, market participation, and adoption of agricultural technologies was collected from the respondents.

During a follow-up survey conducted in 2005 in the same districts, data were collected at several levels: the community or village, the PMG, and the farm household. At the community or village level, 20 communities (two from each PMG) were purposely selected for the survey on the basis of which villages had the highest number of registered members in their respective PMGs. A group of about nine gender-balanced key informants was selected from each village based on peer perception and the village chief's advice regarding their ability to provide quality information that could be used to form socioeconomic profiles of the village economy. At the PMG level, all the 10 PMGs were surveyed separately. The key informants on the PMG activities included five to seven respondents selected from the PMG management and the ordinary membership. The data obtained included information on the objectives and aspirations of the groups, group characteristics, asset ownership, credit access, grading and quality control, bulking and marketing, governance, and major constraints to collective marketing. Finally, at the household level data were collected from 400 randomly selected households (210 from Mbeere and 190 from Makueni districts) in the PMG villages, including 250 PMG members and 150 nonmembers. This subsample consisted of 150 households resampled from 235 baseline households that had remained PMG members and 100 households resampled from 165 households that had remained non-PMG members. The information obtained included data on socioeconomic characteristics, assets, credit and savings, production, buying and selling, and participation in collective marketing.

Table 5.1 presents descriptive statistics for selected variables for all households, by participation or nonparticipation in PMGs (selling grain to a PMG). About 4.3 percent of the sample households sold grain to a PMG.

Econometric Specification

Do farmers participating in collective action (PMG membership) or selling grain to PMGs systematically receive higher grain prices for their produce? To answer these questions, we need a proper counterfactual that allows statistical comparisons between groups of households that are alike in all ways except

TABLE 5.1 Descriptive statistics for households surveyed in Mbeere and Makueni districts of Kenya (grouped by participation or nonparticipation in producer marketing groups), 2005

Description	Participant (<i>n</i> = 27)	Nonparticipant (<i>n</i> = 597)	All (<i>n</i> = 624)
Distance to the nearest village market (km)	2.389 (1.188)	2.052 (1.221)	2.067 (1.221)
Distance to the nearest main market (km)	4.389 (2.946)	7.934 (6.395)	7.780 (6.325)
Age of household head (years)	52.889 (12.738)	51.873 (14.217)	51.917 (14.149)
Gender of household head (1 = male; 0 = female)	0.889 (0.320)	0.834 (0.372)	0.837 (0.370)
Total household workforce	3.213 (1.962)	2.447 (1.408)	2.480 (1.443)
Dependency ratio	1.795 (1.492)	1.577 (1.509)	1.586 (1.508)
Whether household owns an oxcart (1 = yes; 0 = otherwise)	0.296 (0.465)	0.260 (0.439)	0.261 (0.440)
Whether household is located in a wet area (1 = yes; 0 = otherwise) ^a	0.148 (0.362)	0.075 (0.264)	0.079 (0.269)
Whether household is located in a dry area (1 = yes; 0 = otherwise) ^a	0.593 (0.501)	0.250 (0.433)	0.264 (0.441)
Per capita livestock assets (1,000 Ksh)	3.055 (2.773)	5.040 (6.518)	4.954 (6.413)
Per capita physical assets (1,000 Ksh)	0.805 (0.721)	2.970 (19.019)	2.877 (18.608)
Per capita total cultivated land (acres)	1.986 (2.253)	2.482 (2.185)	2.460 (2.188)
Land and livestock interaction (1,000) ^b	44.513 (5.846)	9.132 (19.467)	8.932 (19.101)
Per capita total number of oxen owned	0.100 (0.173)	0.253 (0.322)	0.247 (0.319)
Per capita household education stock (years)	6.479 (2.236)	5.653 (2.117)	5.689 (2.127)
Main occupation of household head (1 = farming; 0 = otherwise)	0.741 (0.447)	0.796 (0.404)	0.793 (0.405)
Whether household owns ICT assets (1 = yes; 0 = otherwise) ^c	0.815 (0.396)	0.824 (0.381)	0.824 (0.381)
Whether household has contact with NGOs (1 = yes; 0 = otherwise)	0.519 (0.509)	0.400 (0.790)	0.405 (0.491)

SOURCE: Authors' calculations.

NOTES: Figures in parentheses are standard deviations. Ksh means Kenyan shilling; NGO means nongovernmental organization; *n* = number of observations.

^aDryness or wetness is relative in the semi-arid areas. The reference is households located in high-rainfall areas.

^bThis is an interaction variable that was created after multiplying the land holding (hectares) with total livestock value (KSh), thus it is not possible to state the units.

^cInformation and communication technology (ICT) assets include radios, televisions, and mobile phones.

participation in or selling grain to PMGs. We use the propensity score matching (PSM) method to address the potential selection bias resulting from PMG participation. Our main purpose in using the PSM method is to match “treatment” (PMG participation) and “control” (PMG nonparticipation) households that are similar in terms of observable characteristics that are expected to jointly affect their PMG participation status and the outcome variable (market price of the grain).³ The seminal explanation of the PSM method is available in Rosenbaum and Rubin (1983), and its strengths and weaknesses were elaborated in subsequent literature, including Heckman et al. (1998), Dehejia and Wahba (2002), Smith and Todd (2005), and Caliendo and Kopeinig (2008).

Estimation of the propensity score per se is not sufficient to estimate the average participation effect (average treatment effect on the treated, or ATT). Because the propensity score is a continuous variable, the probability of observing two individuals with exactly the same propensity score is, in principle, zero. Various matching algorithms have been proposed in the literature to overcome this problem. Asymptotically, all matching algorithms should yield the same results. However, in practice, trade-offs in terms of bias and efficiency are associated with each algorithm (Caliendo and Kopeinig 2008). We therefore implemented three matching algorithms: (1) one-to-one nearest neighbor matching with replacement, (2) radius matching, and (3) kernel-based matching using the Epanechnikov kernel. Basically, these methods numerically search for “neighbors” that have propensity scores for nontreated individuals that are very close to the propensity scores of treated individuals.

Matching deals only with selection based on observables; if there are unobserved variables that simultaneously affect the participation decision and the outcome variable, a selection or hidden bias problem due to unobserved variables might arise, to which matching estimators are not robust. We checked the sensitivity of the estimated average participation effect to unobserved variables using the Rosenbaum bounds sensitivity approach (Rosenbaum 2002). The purpose of the sensitivity analysis was to investigate whether inferences about the participation effect could be changed by unobserved variables. It is not possible to estimate the magnitude of such selection bias using observational data. Instead, the sensitivity analysis involves calculating upper and lower bounds using the Wilcoxon sign rank test to test the null hypothesis that there is no participation effect for different hypothesized values of unobserved selection bias.

3. The outcome variable (price index, PI) is defined as a ratio of the price received by the farmer to the average price of the crop in the sample:

$$PI_i = \frac{p_{ij}}{\bar{p}_j} (100),$$

where PI_i is the price index for household i , p_{ij} is the unit price received by household i for crop j , and \bar{p}_j is the average unit price of crop j in the sample.

Finally, in order to determine whether resource-poor smallholder farmers are excluded from PMGs, we used a bivariate probit model by analyzing the effect of household assets and wealth indicators on PMG membership. The bivariate specification was selected mainly because PMG membership is likely to be jointly determined with membership in other networks prevalent in rural areas. The bivariate probit specification is useful if the error terms for membership to different groups are correlated. This is a natural extension of Zellner's (1962) seemingly unrelated regression model for binary choice variables.

Results

Grain Markets and Marketing Channels

The key characteristics of rural grain markets in Africa are segmentation, the dominance of few traders, asymmetric information, high transaction costs, and high marketing risks. Analysis of the market structure in terms of transactions (number and volume of sales) by distance and market participation during 2003/04 in the study area shows that rural wholesalers accounted for 45 percent of the sales transactions and 49 percent of the volume traded, while brokers or assemblers accounted for 38 percent of the transactions and the traded volume (Table 5.2). Hence, rural wholesalers and assemblers jointly control more than 80 percent of the transactions and traded volumes. This is because they are well organized and agile and have the necessary capital and mobility to buy directly from dispersed farmers. PMGs accounted for 4 percent of the sales transactions and 2 percent of the volume, and rural consumers (that is, deficit producers) accounted for less than 10 percent of the sales and the volume purchased from farmers. Further, 45 percent of the traded volume was sold and 36 percent of the transactions were conducted at the farmgate.

A review of the relation between spatial distances and market engagement reveals that about 34 percent of the transactions (accounting for 25 percent of the traded volume) were conducted within 3 kilometers of the farmgate. Generally, with increasing distance from the farmgate the number of transactions and the volumes traded by market participant declined. These effects can be attributed to increasing transportation and transaction costs for the small quantities marketed as distances increase. They are consistent with the findings by Fafchamps and Hill (2005) for coffee marketing in Uganda. The prices also varied significantly over time, increasing gradually as local supplies declined and declining again as local produce reached local markets after harvest. About 79 percent of the selling occurred immediately after harvest, about 19 percent within two to three months after harvest, and only 11 percent more than four to five months after harvest. This finding illustrates potential business opportunities for PMGs through bulk marketing and spatial and temporal arbitrage.

TABLE 5.2 Total number of sales and volumes (tons) for all crops in Kenyan grain markets, 2004/05

Buyer	Distance of sales from farmgate											
	Total		Share (percent)		Farmgate		<3 km		3–5 km		>5 km	
	Sales	Volume	Sales	Volume	Sales	Volume	Sales	Volume	Sales	Volume	Sales	Volume
Consumer	33	6.5	5	3	21	4.7	6	0.7	3	0.5	3	0.7
Producer marketing group	27	3.7	4	2	4	0.8	10	0.7	12	2.2	1	0.1
Rural wholesaler	283	101.8	45	49	25	27.5	167	43.3	82	29.9	9	1.0
Broker or assembler	237	77.7	38	38	175	60.0	24	5.2	16	2.9	22	9.7
Urban wholesaler	13	6.4	2	3	1	0.0	3	0.2	3	0.2	6	6.1
Cotton ginnery	12	4.7	2	2	—	—	2	0.4	9	4.1	1	0.2
School	19	4.9	3	2	—	—	2	0.7	10	2.1	7	2.0
Total	624	205.7	100	100	226	93.0	214	51.1	135	41.9	49	19.7
Share (percent)	n.a.	n.a.	n.a.	n.a.	36	45	34	25	22	20	8	10

SOURCE: Authors' calculations.

NOTES: — means that the buyer did not buy at that particular distance from the farmgate; n.a. means not applicable.

However, the drought situation that prevailed during the 2004/05 production season significantly depressed the marketed surplus and the number of transactions in 2005. The effect of the drought-induced shock on pigeon pea marketing and on both the market shares and the prices paid by different buyers are shown in Table 5.3. As a result of the drought, the number of transactions completed by the surveyed households declined from 243 in 2003 to just 50 in 2005 as the traded volume plummeted from about 41.0 tons to 4.7 tons. The total volume (of all crops) purchased by the PMGs declined from over 60.0 tons in 2004 to about 15.0 tons the following year. Such a drastic change in market participation is significant given that pigeon peas are one of the most drought-tolerant crops grown in these areas. The results also show that the farmgate prices paid by the PMGs, 27 Kenyan shillings (Ksh) per kilogram, were generally higher than those paid by other participants, who offered Ksh 23–25 per kilogram. However, it is important to emphasize that this difference may not have been the result of selling to the PMGs but instead may have been due to differences in observed and unobserved household characteristics. Therefore, we test this further using propensity score matching methods.

Collective Marketing and Its Outcomes

In this section we present and discuss the empirical results from the PSM method, starting with the results from probit estimates of the decision to participate in a PMG (an estimation of propensity scores) and following with the results from the PSM estimation of the average participation effects.

ESTIMATION OF PROPENSITY SCORE. Table 5.4 reports the results from the probit analysis of PMG participation decision and the variables used in the matching procedures. The participation regression results show that distance to the nearest village market, a household's location in a drier village, the total household female workforce, household education, and contacts with NGOs have a positive and significant influence on the household's decision to sell grain through a PMG. The fact that farmers located far from the nearest markets are likely to sell their grain through PMGs ($p > 0.01$) underscores the importance of collective action in mitigating constraints on market access for smallholder farmers located in remote areas. Similarly, the fact that households located in drier areas are more likely to sell through PMGs ($p < 0.05$) could point to the conclusion that farmers in these areas have limited market opportunities, and collective action through PMGs offers a viable alternative. These farmers probably find it beneficial to bulk their individually produced small marketable surpluses into economical quantities, thereby increasing their bargaining power or enabling them to access niche markets that they would be unable to access if they acted individually. In addition, the interaction of land and livestock has a small but very significant positive effect on a household's propensity to sell grain through the PMGs ($p < 0.05$). The positive effect of a larger family workforce seems to be related to the ability to generate marketable

TABLE 5.3 Pigeon pea marketed volumes, sales, and channel use in semi-arid eastern Kenya, by participant and distance to market, 2003 and 2005

Buyer	Traded volume (tons)		Volume share (percent)		Number of transactions		Total sales, by distance of sales from farmgate						Mean price (Ksh/kg)			
	2003	2005	2003	2005	2003	2005	Farmgate		<3 km		3–5 km		>5 km		2003	2005
Consumer	2.0	0.36	5	8	3	3	20	0	2	1	1	2	0	0	22	25
Producer marketing group	—	0.35	—	7	—	7	—	1	—	3	—	3	—	0	—	27
Rural wholesaler	11.9	1.65	25	35	93	22	9	2	56	12	22	6	6	2	15.3	23
Broker or assembler	24.6	2.06	60	44	110	15	76	10	14	1	5	1	15	3	18.6	25
Urban grain trader	2.8	0.29	7	6	17	3	3	0	3	1	0	1	11	1	24.8	24
Total	41.3	4.68	100	100	243	50	108	13	75	18	28	13	32	6	18.1	25
Share (percent)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	44	26	31	36	12	26	13	12	n.a.	n.a.

SOURCE: Authors' calculations.

NOTES: Ksh means Kenyan shilling, — means buyer did not buy pigeon pea grain in that survey year, n.a. means not applicable.

TABLE 5.4 Probit estimates of Kenyan households' propensity to sell grain to producer marketing groups, 2005

Variable	Coefficient	Robust standard error
Distance to nearest village market (km)	0.305***	0.104
Distance to nearest main market (km)	-0.046*	0.026
Age of household head (years)	0.002	0.011
Gender of household head (1 = male)	0.440	0.298
Total household female workforce	0.293**	0.114
Total household male workforce	0.083	0.118
Dependency ratio	0.103	0.071
Whether household owns an oxcart (1 = yes)	0.146	0.256
Whether household is located in a medium-rainfall area (1 = yes) ^a	0.319	0.356
Whether household is located in a dry area (1 = yes) ^a	0.618**	0.258
Per capita livestock assets (Ksh)	-0.097*	0.054
Per capita physical assets (Ksh)	-0.069**	0.029
Per capita total cultivated land	-0.035	0.053
Whether there is land and livestock interaction	0.000**	0.000
Per capita total number of oxen owned	-0.998	0.704
Per capita household education stock (years)	0.187***	0.072
Main occupation of household head (1 = farming)	-0.122	0.287
Whether household owns ICT assets (1 = yes) ^b	-0.340	0.301
Average contacts with NGOs	0.487*	0.284
Whether household has contact with NGOs (1 = yes; 0 = otherwise) ^c	n.a.	
Constant	-4.167***	1.005
Summary statistics		
Pseudo R^2	0.229	
Model chi-squared	55.054***	
Log likelihood	-84.512	
Number of observations	588	

SOURCE: Authors' estimation.

NOTES: Ksh means Kenyan shilling; n.a. means not applicable; NGO means nongovernmental organization; blank cells indicate no data. * means significant at the 10 percent level; ** means significant at the 5 percent level; *** means significant at the 1 percent level.

^aDryness or wetness is relative in the semiarid areas. The reference is households located in high-rainfall areas.

^bInformation and communication technology (ICT) assets include radios, televisions, and mobile phones.

^cThis variable was dropped because no contact with NGO = 0 predicts failure perfectly.

surplus and contribute to collective action. On the other hand, household education seems to enhance the ability of the household to more accurately analyze the gains to be realized by using the PMG channel ($p < 0.01$).

The results also show that the per capita value of livestock, land, and physical assets owned by household ($p < 0.001$) and the distance to the main market ($p < 0.1$) had negative effects on the household's propensity to use PMG channels for selling grain. It seems that greater asset wealth opens other alternative marketing opportunities for farmers. For example, farmers with bicycles or other forms of motorized transport are more likely to sell their grain directly to traders located in towns. This also indicates that the PMGs have the potential to be pro-poor marketing outlets for selling grain. The weak negative effect of distance to the main market seems to capture some spatial interaction effect, indicating that in some remote villages where access to the main market is limited, brokers and assemblers may be more efficient than small marketing groups in collecting and moving grain to the main marketing centers.

PROPNESITY SCORE MATCHING ESTIMATION OF THE AVERAGE PARTICIPATION EFFECTS.

The impact of PMG participation (in this use of collective action to sell produce) on grain prices was estimated using three PSM techniques (Table 5.5). The analysis was done by implementing the common support and caliper; hence, the distributions of PMG participant and nonparticipant households were located in the same domain.⁴ As suggested by Rosenbaum and Rubin (1985), we used a caliper size of one-fourth of the standard deviation of the propensity scores. Bootstrap standard errors based on 200 replications are reported. The outcome variable (as defined earlier) was the ratio of crop price received to the average price of the same crop in the sample. The matching estimates show that those households that sold their grain to PMGs received between 21 percent and 29 percent higher prices for their products than those using other channels. For completeness, we show the participation effects with and without matching, but the participation effect is higher when one takes into account matching on observables. This average participation effect is statistically significant and robust across the three matching algorithms.

Another potential source of selection problems results from the potential hidden bias resulting from observable characteristics that are expected to jointly affect PMG membership status and the outcome variable (the market price of the grain). The key issue here is whether PMG membership as such has any systematic effect on prices received by farmers. In order to test this effect, we followed the same procedure as outlined earlier for participation by selling through the PMGs and estimated the ATT of PMG membership on producer

4. Following Rosenbaum and Rubin (1985), Sianesi (2004), and Caliendo and Kopeinig (2008), we have checked the matching quality and balancing property of covariates. After matching, the balancing property is satisfied where there is no significant difference in means of covariates between participants and nonparticipants and the mean standardized difference is reduced significantly.

TABLE 5.5 Estimation of the average participation effect (ATT) of selling through producer marketing groups on prices received by Kenyan farmers, 2005

Matching method	Sample	Treated	Controls	Difference	Standard error	t-statistic
Nearest neighbor matching	Unmatched	120.03	99.09	20.93	5.49	3.80***
	ATT	120.03	97.56	22.47	9.57	2.35***
Kernel-based matching	Unmatched	120.03	99.09	20.93	5.49	3.81***
	ATT	120.03	97.17	22.86	7.94	2.88***
Radius matching	Unmatched	120.03	99.09	20.93	5.49	3.81***
	ATT	120.03	96.29	23.18	8.21	2.82***

SOURCE: Authors' estimation.

NOTES: The dependent variable is an index of the price ratio. Number of observations (n) = 588. *** means significant at the 1 percent level.

prices. The probit model used for estimating the propensity score was similar to the univariate model shown later in Table 5.10. The results from this analysis using different matching methods are presented in Table 5.6. The findings indicate that PMG membership on its own does not lead to differential producer price patterns. This indicates that, unlike when selling through PMGs, which ensures higher prices for producers (shown earlier), members of the PMGs do not necessarily receive higher prices if they do not use collective marketing channels.

What about the potential effect of unobservable factors on producer prices? Would this change these conclusions? The results of the Rosenbaum bounds sensitivity analysis to test this potential hidden bias are presented in Table 5.7. As noted by Hujer, Caliendo, and Thomsen (2004), sensitivity analysis for estimation of insignificant average participation effects of PMG membership (Table 5.6) is not meaningful, and thus we omit it here. For the statistically significant participation effect of selling through PMGs (Table 5.5), we increased the level of hidden bias, gamma, Γ (see Rosenbaum 2002) until the inference about the participation effect was changed. The p values represent the upper bound from the Wilcoxon signed rank test for estimation of the average participation effect for each level of unobserved selection bias (Γ). Given that the estimated participation effect (of selling through PMGs) is positive, the lower bounds under the assumption that the true participation effect has been underestimated were less interesting (Becker and Caliendo 2007) and hence not reported. For the assumption that the participation effects are overestimated, the results show that the estimated effect is not sensitive to unobserved selection bias (Table 5.7). The participation effect remains significantly positive even if we allow participants and nonparticipants to differ by a factor of 2.85 in terms of unobserved characteristics. The critical value of Γ , at which point we would have to question our conclusion that there is a positive effect of participation,

TABLE 5.6 Estimation of the average participation effect (ATT) of producer marketing group membership on prices received by Kenyan farmers, 2005

Matching method	Sample	Treated	Controls	Difference	Standard error	<i>t</i> -statistic
Nearest neighbor matching	Unmatched	101.28	97.80	3.48	2.34	1.49
	ATT	101.20	99.72	1.48	5.07	0.29
Kernel-based matching	Unmatched	101.28	97.80	3.48	2.34	1.49
	ATT	101.20	98.07	3.12	3.04	1.02
Radius matching	Unmatched	101.28	97.80	3.48	2.34	1.49
	ATT	101.20	97.67	3.54	3.11	1.14

SOURCE: Authors' estimation.

NOTES: The dependent variable is an index of the price ratio. Number of observations (*n*) = 616.**TABLE 5.7** Rosenbaum bounds sensitivity tests to check the influence of unobservable factors on the effect of selling through producer marketing groups on producer prices, 2005

Level of hidden bias (Γ)	<i>p</i> -critical
1.00	0.001
1.25	0.003
1.50	0.008
1.75	0.017
2.00	0.030
2.25	0.046
2.50	0.066
2.75	0.087
2.80	0.092
2.85	0.097
2.90	0.101

SOURCE: Authors' estimation.

starts from $\Gamma = 2.90$, indicating that the unobserved covariate would have to increase the odds of participation by 190 percent or more to change the significant participation effect. This is a large value because we included important variables that affect both the participation decision and the outcome variable. Based on this result, we can conclude that the average participation effect estimates in Table 5.5 are a pure effect of PMG participation.

We also conducted a simulation analysis to test the price advantage of PMGs over that offered by middlemen (brokers or assemblers). The simulation results showed that the prices paid by the PMGs to the member farmers—after covering operational costs—were about 22–24 percent higher than the prices paid by middlemen, the major competitors in rural areas (Table 5.8). However,

TABLE 5.8 The effect of collective marketing on pigeon pea prices in eastern Kenya, 2005

Buyer	Season	Point of sale	Price (Ksh/kg)	Producer marketing group (PMG) price advantage (percent)
PMG	Immediately after harvest	Farmgate	29.81	24.00
Broker or assembler	Immediately after harvest	Farmgate	24.04	
PMG	Immediately after harvest	5 km away	29.93	23.88
Broker or assembler	Immediately after harvest	5 km away	24.16	
PMG	4–5 months after harvest	Farmgate	31.16	22.72
Broker or assembler	4–5 months after harvest	Farmgate	25.39	
PMG	4–5 months after harvest	5 km away	31.29	22.62
Broker or assembler	4–5 months after harvest	5 km away	25.52	

SOURCE: Authors' calculations.

NOTE: Ksh means Kenyan shilling.

this gain came at the cost of delayed payments (on average, five weeks) to grain sellers. In contrast, other competing buyers paid on delivery or shortly thereafter. This explains why cash-constrained farmers opt to sell through other channels, even at the cost of lower prices. As we discuss later, capital constrains and lack of access to credit are major constraints on the growth and expansion of PMGs in Kenya.

The key question is whether the observed price differential is sufficient to provide economic incentives for smallholders to join marketing groups. This depends on the additional income that farmers gain from group membership after having paid the associated fees and indirect costs. A simple net benefit analyses of grain marketing using alternative prices—those offered by brokers and PMGs at the farmgate—can show these gains. Using the 24 percent farmgate price differentials for selling immediately after harvest (Table 5.8), Table 5.9 (first half) presents the estimated gains of members from selling through PMGs compared to using the broker channel. The associated average costs of membership (annualized joining fee and annual contributions) and the opportunity cost of capital for delayed payments were included as costs of collective action. The average income gain was about Ksh 678 per household but varied across household groups depending on the amount marketed. Although the income gain per unit sold was constant, farmers with larger amounts of marketed surplus obtained higher benefits. In our case, these varied from Ksh 152 for the bottom third of farms in terms of sizes to Ksh 1,133 for the upper third. These income gains were modest for two reasons: (1) the average amount marketed was severely reduced because of the drought that prevailed during the 2004/05 production season, and (2) about 60 percent of the member farmers

TABLE 5.9 Income effects associated with selling through marketing groups compared to the broker channel in Kenya, 2005

Variable	Value of grain sold (Ksh)							
	Income gain from using groups, by farm size class ($n = 23$) ^a			Member lost income by not using groups by farm size class ($n = 150$)				
	Small	Medium	Large	Total	Small	Medium	Large	Total
Using producer marketing group price	2,303	5,387	7,418	5,155	14,381	19,284	22,452	18,705
Using broker price	1,872	4,413	5,988	4,188	10,518	14,407	16,743	13,889
Difference	431	974	1,429	967	3,862	4,877	5,708	4,816
Cost of collective action ^b	279	290	296	289	314	330	339	328
Net income gain or loss	152	684	1133	678	3,548	4,547	5,369	4,488

SOURCE: Authors' calculations.

NOTE: Ksh means Kenyan shilling; n stands for number of observations.

^aThe farm size classes represent the lower, middle, and upper thirds of household groups.

^bThe cost of collective action includes the annualized costs of the joining fee, the annual subscription fee, and the opportunity cost of delayed payments (calculated using the annual interest rate of 4.3 percent on savings by the commercial banks in Kenya).

chose to sell through non-PMG channels, partly because: (1) these buyers paid promptly, meeting the immediate cash needs of resource-poor farmers, and (2) some larger farmers faced lower transaction costs and opted to market their grain individually outside the village.

Because the main alternative marketing outlet at the farmgate is the broker or assembler channel, we used the amount marketed by the members outside the PMG channel to assess the income loss they sustained by not using the collective marketing channel. This is shown in the second half of Table 5.9. The average income lost by selling through the broker channel (instead of the PMG) was about Ksh 4,488 per year. This was about 7.4 percent of the poverty line income in these areas. The average annual household income from all sources for the sample was about Ksh 139,280. The income loss increased with the amount marketed through the broker channel. Nevertheless, the actual losses may have been slightly lower than indicated, because some larger farmers often sell outside of their village at prices slightly higher than the broker price. As indicated earlier, some farmers may also be compelled to use the non-PMG channels to settle loans provided by the grain traders or to meet immediate cash needs for various commitments. In many cases, grain markets represent the only option for resource-poor farmers to acquire cash in situations in which local credit markets are either missing or highly imperfect.

PMG Membership

The preceding analysis confirms that producer organizations exploiting the power of collective marketing could help increase the prices paid to farmers. However, this does not answer the question on the extent of participation and exclusion in group marketing functions. Could resource-poor and smallholder farmers benefit from such collective action? Here we analyze the determinants of farmers' participation in such groups and assess whether the poor are included or excluded due to various entry barriers. It is important to highlight that the performance and economic viability of farmer marketing groups require that they set certain restrictions on membership, including fees.⁵ These fees are generally determined by groups in such a way as to make them affordable and to keep them from becoming significant barriers to joining, but so they are high enough to signify a member's commitment to the principles of collective action. Although economies of scale increase with group size, increasing size may escalate the transaction costs to mobilize dispersed farmers and may increase heterogeneity, undermining group cohesion. Similarly, inclusiveness and interest in tackling poverty may suggest wider and open membership, but the resource-poor may lack the ability to gener-

5. This includes a joining fee of about US\$1 and an annual subscription fee that varies from none to about US\$25 per member. Membership may also require good social standing in the community to win the trust and confidence of the other group members. These may lead to exclusion of some households.

ate marketable surplus or assets that foster trust and creditworthiness. This shows the balance that producer organizations have to maintain to minimize the potential trade-offs between economic viability and inclusiveness to facilitate poverty reduction (Bernard and Spielman 2009).

In order to shed some light on these questions, we investigated whether the PMGs in the districts we studied—voluntarily formed by farmers—were biased toward the wealthier households and excluded resource-poor and marginal farmers. This required careful analyses of the determinants of PMG membership and particularly tests of the effects of household assets and wealth indicators. Because households often belong to more than one group, we used a bivariate probit model to identify the determinants of PMG membership.⁶ The bivariate specification was particularly used to test whether PMG membership is jointly determined with membership in other closely related groups, agricultural production networks (APNs). Membership in APNs thus constituted the second equation in the bivariate specification. The explanatory variables included village fixed effects (location, market access, infrastructure), household asset endowments, household characteristics, human capital, and access to information. Household characteristics were captured by dependency ratios, age and gender of household heads, male and female family workforces, per capita family human capital (education stock) in years, and the main occupation of the household head. Six variables were included to capture the effects of wealth and asset endowment: farm size, value of livestock, interaction between livestock and farm size, value of physical assets, ownership of means of transport (an oxcart), and oxen numbers (all in per capita terms). Access to information was captured through ownership of information and communication technology (ICT) (radios, mobile phones, and televisions) and contact with NGO extension personnel. In the absence of effective public extension services, NGOs continue to play a vital role in the economic development process in semiarid areas. In this case, the Catholic Relief Services was instrumental in farmer mobilization and sensitization for establishing PMGs, while ICRISAT facilitated access to improved germplasm and crop cultivars. Location effects were captured through distance to local and main markets and the average rainfall of the PMG villages. For comparison, we also report the univariate probit model results (see Table 5.10).

The results from the bivariate model show that the residuals of the two network membership equations are not independent ($p > 0.034$). The ancillary parameter ρ which measures the correlation of the residuals, shows that the two equations were strongly associated ($p = 0.034$), indicating the superiority of the bivariate specification. The results from the univariate specification, however, are compa-

6. About 11 percent of the non-PMG and 20 percent of the PMG member farmers belonged to agricultural production networks (APNs). These are informal groups involved mainly in agricultural production through the sharing of labor and information. The membership of the sample farmers in other local groups included 54 percent in resource conservation groups, 75 percent in saving groups (merry-go-rounds), and 50 percent in other social networks.

rable to those from the bivariate model (in both magnitude and sign). The high Wald chi-squared (χ^2) statistic indicates the statistical validity of both models, but the bivariate model is significant at less than the 99 percent level. Therefore, the discussion hereafter focuses on the results from the bivariate model.

The variables with significant effects on membership included the size of the female workforce in the household ($p = 0.018$), the ownership of ICT ($p = 0.067$), the log of per capita farm size ($p = 0.072$), the asset interaction term (log of per capita farm size \times log per capita livestock) ($p = 0.042$), the stock of household education ($p = 0.014$), household occupation ($p = 0.078$), and access to information ($p = 0.095$). The distance and location effects were not significant. The size of the family workforce generally had a positive effect, but only the female workforce had a significant effect on PMG membership, indicating that PMGs could potentially enhance the participation and integration of the female workforce in markets. The other household characteristics were not significant.

The other important variables for the purpose of this study were household assets (wealth indicators). These showed that membership is likely to increase with livestock wealth but to decrease with the size of farmland per capita. This indicates that households with larger farm sizes alone are less likely to participate in collective marketing. For a given amount of livestock wealth, households with lower per capita farmland have a higher probability of participation. However, households with more land and livestock assets together are more likely to become members. Although the effect of livestock wealth alone was not significant, this potentially opposing effect may result when greater livestock wealth is associated with smaller areas of cropland, which reduces the marketed surplus and increases the gains from collective marketing. The results indicate that it is primarily those farmers with small landholdings (but not necessarily the resource poor) who participate in collective marketing. These are households that produce small surpluses and probably face higher transaction costs in marketing their produce. This finding is consistent with a similar middle-class effect on participation in farmer cooperatives found in Ethiopia (Bernard and Spielman 2009). We also found that education and farm orientation increase the likelihood of PMG membership. Farm size and the asset interaction terms had similar effects on the probability of participation in APNs. Participation in agricultural networks generally decreases with land and draught animal (oxen) assets, indicating that large farmers are less likely to engage in such exchanges. These findings are also consistent with those of Mude (2006) on coffee marketing in Kenya, although coffee is a high-value cash crop, unlike the food staples, the focus of our study.

We also found that households with limited contact with extension services (proxied by frequency of contact with NGOs) are less likely to join PMGs, showing the benefits of sensitization and education, but interestingly participation in indigenous APNs seems to be greater among households that have less contact with NGOs (common providers of agricultural extension in the area).

TABLE 5.10 Univariate and seemingly unrelated bivariate probit determinants of producer marketing group membership in Kenya, 2005

Variable	Bivariate probit				Univariate probit PMG membership $p > z $	
	Producer marketing group (PMG)		Agricultural production network			
	Coefficient	$p > z $	Coefficient	$p > z $		
Distance to village market (km)	-0.083 (0.061)	0.174	-0.090 (0.070)	0.202	-0.082 (0.061)	0.176
Distance to nearest main market (km)	0.006 (0.014)	0.661	-0.023 (0.018)	0.192	0.006 (0.013)	0.679
Age of household head (years)	-0.006 (0.006)	0.282	0.003 (0.007)	0.683	-0.006 (0.006)	0.285
Gender of household head (1 = male; 0 = female)	0.182 (0.178)	0.306	-0.111 (0.207)	0.593	0.179 (0.179)	0.316
Total household male workforce	0.024 (0.082)	0.771	-0.104 (0.091)	0.251	0.026 (0.083)	0.754
Total household female workforce	0.206 (0.087)	0.018	0.056 (0.103)	0.590	0.204 (0.087)	0.018
Dependency ratio	0.029 (0.044)	0.508	0.094 (0.047)	0.044	0.028 (0.044)	0.526
Whether household owns an oxcart (1 = yes; 0 = otherwise)	0.138 (0.178)	0.438	0.094 (0.198)	0.636	0.131 (0.177)	0.461
Whether household is located in a rainy area (1 = yes; 0 = otherwise) ^a	-0.120 (0.200)	0.550	0.041 (0.219)	0.851	-0.127 (0.200)	0.526
Whether household is located in a dry area (1 = yes; 0 = otherwise) ^a	-0.155 (0.173)	0.370	0.396 (0.200)	0.047	-0.158 (0.173)	0.361
Log of per capita livestock assets (K.sh)	0.842 (0.533)	0.114	-0.507 (0.647)	0.433	0.837 (0.531)	0.115

Log of per capita physical assets (Ksh)	0.916 (0.703)	0.193	-0.346 (0.854)	0.686	0.911 (0.699)	0.193
Log of per capita farm size (acres)	-2.093 (1.162)	0.072	-2.408 (1.330)	0.070	-2.114 (1.169)	0.071
Log of per capita livestock \times log of per capita farm size	0.766 (0.376)	0.042	0.866 (0.397)	0.029	0.772 (0.381)	0.043
Per capita oxen numbers	-0.389 (0.316)	0.218	-0.922 (0.506)	0.068	-0.388 (0.321)	0.226
Per capita family education stock	0.097 (0.040)	0.014	0.069 (0.045)	0.126	0.099 (0.040)	0.013
Main occupation of household head (1 = farming; 0 = otherwise)	0.301 (0.171)	0.078	0.217 (0.202)	0.284	0.299 (0.171)	0.081
Whether household owns ICT assets (1 = yes; 0 = otherwise) ^b	-0.347 (0.190)	0.067	-0.102 (0.224)	0.647	-0.352 (0.192)	0.067
Whether household has average contact with NGOs (1 = yes; 0 = otherwise)	-0.179 (0.164)	0.273	0.243 (0.203)	0.231	-0.176 (0.164)	0.281
Whether household has no contact with NGOs (1 = yes; 0 = otherwise)	-0.351 (0.210)	0.095	0.490 (0.240)	0.041	-0.354 (0.210)	0.091
Constant	-2.744 (1.845)	0.137	-0.989 (2.236)	0.658	-2.726 (1.832)	0.137
Atrho	0.229 (0.108)	0.034				
<i>p</i>	0.225 (0.103)					
Wald chi-squared [df]	[46] 98.20: Probability $> \chi^2 = 0.000$				[23] 39.44: $p > \chi^2 = 0.0178$	
Log pseudo-likelihood	-395.854				-243.069	
Wald test of $\rho = 0$	$\chi^2 [1] = 4.501$: Probability $> \chi^2 = 0.034$					

NOTES: Robust standard errors are in parentheses. Ksh means Kenyan shilling; df means degrees of freedom; NGO means nongovernmental organization.

^aDryness or wetness is relative in the semi-arid areas. The reference is households located in high-rainfall areas.

^bInformation and communication technology (ICT) assets include radios, televisions, and mobile phones.

This shows that some NGOs may have better leverage in strengthening farmer organizations and facilitating formation of groups for collective marketing. Along with better education, NGO sensitization and information flow seem to be good instruments for facilitating participation in group marketing.

Governance of Marketing Groups

The governance of PMGs is inspired and defined by their constitution (bylaws), which lays out the norms of operations as well as the roles and responsibilities of various organs and members versus the management that oversees the running of the PMGs on behalf of members. All the PMGs we studied have written bylaws governing the running of their groups. The bylaws focus on the obligations of the members to the group but are relatively silent on the obligations of the group to members. For example, the bylaws require that members sell their grain through the PMG, make requisite payments or contributions, prioritize the farming of marketable crops (for instance, pigeon peas), and contribute actively to the development of the group. Successful governance can be inferred from the level of adherence to the bylaws. On average, 77 percent of active members abided by established bylaws. Members gave a number of reasons for violations of the bylaws, including ignorance of the bylaws, cash constraints that limited their ability to honor their payment obligations, lack of trust in the PMG leadership, and lack of commitment to the PMG cause (Table 5.11). Those members who violated the bylaws were either fined or expelled, especially if they were repeat offenders.

The PMGs had executive committees that were elected through a non-secret vote-counting process and given the responsibility of running the PMGs on behalf of the members.⁷ The membership of these committees included a chairperson, vice chairperson, secretary, vice secretary, treasurer, vice treasurer, marketing representative, and a varying number of ordinary members. The mean number of annual executive meetings was 15, with a median of 12. The groups had convened 16 (in Mbeere) to 14 (in Makueni) general assembly meetings since their formation (Table 5.12). The percentage of members attending the general assembly meetings ranged from 65 percent in Makueni to 72 percent in Mbeere. The respondents also identified several factors that affect the governance and management of the PMGs. The quality of the chairperson (median = 2.0) was ranked as the most important factor, followed by the quality of the executive committee (median = 2.5), while other factors such as transparency in accounting, rules and norms for coordination, and rules and norms for conflict resolution (median = 3.0) were equally ranked (Table 5.13).

7. Nonsecret ballots could be vulnerable to manipulation and rent-seeking behavior, which might have a negative impact on group performance (for instance, see Mude 2006). Although most PMG leaders were elected through an open vote-counting process, some were “elected” through acclamation. There is a need to adopt proper democratic procedures for elections that also determine the period of service of elected leaders.

TABLE 5.11 Reasons stated by Kenyan producer marketing group (PMG) members for not following bylaws, 2005

Reason	Percentage of cases
Lack of awareness of bylaws	63
Lack of trust in group leadership and vision	63
Too busy with other commitments	38
Cash constraints (unable to pay PMG fees)	38
Lack of commitment to PMG goods	13

SOURCE: Authors' calculations.

TABLE 5.12 Producer marketing group (PMG) meetings and attendance levels in two districts of Kenya, 2004

Meetings and attendance	Mbeere (<i>n</i> = 5)	Makueni (<i>n</i> = 5)	Total (<i>n</i> = 10)
Executive meetings held since establishment	16 (12)	14 (12)	15 (12)
Executive meeting attendance (percent)	72	65	69
General assembly meetings since establishment	7 (5)	9 (6)	8 (6)
General assembly meetings in 2004	3 (3)	5 (3)	4 (3)
General assembly meeting attendance in 2004 (percent)	63	42	52

SOURCE: Authors' calculations.

NOTES: Figures in parentheses are medians; *n* refers to the number of PMGs.

TABLE 5.13 Mean and median rankings of factors important for producer marketing group (PMG) governance and management in two districts of Kenya, 2004

Attribute	Mbeere (<i>n</i> = 5)	Makueni (<i>n</i> = 5)	Total (<i>n</i> = 10)
Quality of the chairperson	2.6 (2.0)	2.2 (2.0)	2.4 (2.0)
Transparency in budget accounting	2.6 (3.0)	2.2 (2.0)	2.4 (2.5)
Quality of the executive committee	3.0 (3.0)	2.8 (3.0)	2.9 (3.0)
Rules and norms for coordination	2.8 (3.0)	3.0 (3.0)	2.9 (3.0)
Rules and norms for conflict resolution	3.0 (3.0)	3.0 (3.0)	3.0 (3.0)

SOURCE: Authors' calculations.

NOTES: Figures in parentheses are medians; 1.0 indicates most important; *n* refers to the number of PMGs.

The Performance of Collective Marketing Groups

One of the challenges in collective action studies is to measure the level of collective action and the lack of evidence of how such group action contributes to final performance outcomes. Generally, there are no standardized measures or indicators that can be used to assess the level, viability, and effectiveness (performance) of collective action (for example, see Place et al. 2002). However, depending on the situation, certain indicators may be identified as proxies for the differential level of collective action and the degree of effectiveness of such action in attaining stated group objectives. We used the PMG survey data to identify some indicators of the levels of cooperation and its effectiveness (performance) in attaining certain marketing outcomes.

The levels of collective action across groups can be inferred by attributes of the commitment of the individual members to the group activities and objectives. These include the extent to which individual members related to other members of the group within the confines of the existing institutional mechanisms and governance structures and their commitment to group ideals or the extent to which they shared a common vision. Accordingly, six indicators of collective action were identified: the number of elections since the group's formation, the share of members respecting the bylaws, attendance of meetings, annual member contributions to the group, cash capital, and agreed annual subscription fees. In order to facilitate comparison across groups, the indicators were standardized in per capita or percentage values. The agreed annual subscription fees varied from none (four PMGs) to Ksh 1,800 (about US\$25) for Group E, which was significantly higher than all other groups with such agreed fees. The member contributions to the groups during 2004 also varied significantly across PMGs, ranging from zero to Ksh 247 for Group I and Ksh 264 for Group H. The liquidity of the groups in terms of per capita cash capital available for grain purchases in 2005 was also highest for these two PMGs, indicating high levels of collective action and ability to mobilize member resources.

An analysis of the standardized indicators reveals that the level of collective action varied across PMGs (Table 5.14). Based on the selected six indicators of the level of collective action, the PMGs were ranked according to the values of each indicator (1 = most successful) to identify those with a relatively higher level of collective action. A simple average rank was then computed across the six indicators. Although the assumption of equal weights for the six indicators is unlikely to hold for all groups, it was sufficient to show the relative ordering of the different groups on a scale of collective action indicators. The mean rankings show that groups with ranks less than the mean rank (5), namely Group I (3.0), Group E (3.2), and Group H (4.3), were more successful than the rest (Table 5.15). The identified PMGs have generally done well in terms of several of the indicators, and this finding is consistent with our field observations.

The correlations among the rankings of the six indicators were analyzed using a nonparametric test, Spearman's rank correlation. The ranks were not sig-

TABLE 5.14 Selected indicators of the level of collective action by Kenyan marketing groups, 2004 and 2005

Producer marketing group (PMG) ^a	Average annual elections since formation	Percentage of members respecting bylaws	Member attendance of general meetings in 2004 (percent)	Member contribution in 2004 (Ksh/member)	Per capita capital in 2005 (Ksh/ member)	Annual subscription fee (Ksh/member)
A	1.0	75	65	0	63	120
B	0.5	65	57	21	34	20
C	1.0	70	76	0	0	0
D	0.5	80	85	0	0	0
E	2.0	100	48	160	123	1,800
F	1.0	100	61	0	43	240
G	1.0	90	95	0	43	0
H	1.0	67	67	264	265	120
I	1.0	71	64	247	319	360
J	1.0	50	46	2	180	0

SOURCE: Authors' calculations.

NOTE: Ksh means Kenyan shilling.

^aWithout loss of generality, the identity of the PMGs is withheld, mainly to protect the respondents and to avoid unhealthy competition due to ranking their performances.

TABLE 5.15 Rankings of Kenyan marketing groups based on collective action indicators, 2004 and 2005

Producer marketing group (PMG) ^a	Average annual elections since formation	Percentage of members respecting bylaws	Member attendance of general meetings in 2004 (percent)	Member contributions in 2004	Per capita capital in 2005	Annual subscription fee	Mean rank
I	2	5	6	2	1	2	3.0
E	1	1	9	3	4	1	3.2
H	2	7	4	1	2	10	4.3
A	2	4	5	10	5	3	4.8
G	2	2	1	10	6	10	5.2
B	3	8	8	4	7	4	5.7
F	2	1	7	10	6	10	6.0
D	3	3	2	10	10	10	6.3
J	2	9	10	5	3	10	6.5
C	2	6	3	10	10	10	6.8

SOURCE: Authors' calculations.

NOTE: 1 indicates best.

^aWithout loss of generality, the identity of the PMGs is withheld, mainly to protect the respondents and to avoid unhealthy competition due to ranking their performances.

nificantly correlated ($p < 10$ percent) for any of the indicators except two—member contributions (2004) and per capita capital (2005). The rankings for member contributions closely parallel the rankings for per capita capital for the groups ($r = 0.735$), indicating the potential to use either of them as an indicator in situations in which data are not available on both variables. The lower rank correlations among the other variables means that these indicators were generally independent of one other and were measuring different aspects of collective action and that the potential for substitution among these indicators is quite limited. It may be argued, hence, that using a combination of different indicators was useful.

In order to see whether a good level of cooperation is associated with high performance in marketing functions, PMGs were compared on the basis of two outcome indicators: total assets built over time and total volume of grains traded (both standardized per member). The distribution of these indicators across PMGs is shown in Table 5.16. The aggregate rankings across the three indicators (that is, combining assets built over time and crop sales per capita) show that Group H (1.3), Group I (3.3), and Group E (3.5) performed much better than the others (Table 5.17). These are the three PMGs with higher levels of collective action, confirming that greater effectiveness and better perfor-

TABLE 5.16 Selected indicators of performance of Kenyan marketing groups, 2003–04

Producer marketing group (PMG) ^a	Per capita assets built over time (Ksh/member)	Per capita sales volume (kg/member)		Per capita total sales volume (kg/member)
		2003 ^b	2004	2003–04
A	63	—	8	8
B	34	—	7	7
C	177	34	23	57
D	333	192	0	192
E	301	—	123	123
F	268	92	0	92
G	395	3	0	3
H	6,393	212	30	242
I	3,130	46	8	54
J	335	10	0	10

SOURCE: Authors' calculations.

NOTE: Ksh means Kenyan shilling.

^aWithout loss of generality, the identity of the PMGs is withheld mainly to protect the respondents and to avoid unhealthy competition due to ranking their performances.

^bDashes indicate missing data because PMGs were established later in 2003 and did not sell during that year.

TABLE 5.17 Rankings of Kenyan marketing groups based on performance indicators, 2003 and 2004

Producer marketing group (PMG) ^a	Per capita assets built over time	Per capita sales, 2003 ^b	Per capita sales, 2004	Mean	
				Per capita crop sales	Aggregate crop sales
H	1	1	2	1.5	1.3
I	2	4	4	4.0	3.3
E	6	—	1	1.0	3.5
C	8	5	3	4.0	5.3
D	4	2	10	6.0	5.3
A	9	—	4	4.0	6.5
F	7	3	10	6.5	6.7
G	3	7	10	8.5	6.7
J	4	6	10	8.0	6.7
B	10	—	5	5.0	7.5

SOURCE: Authors' calculations.

^aWithout loss of generality, the identity of the PMGs is withheld, mainly to protect the respondents and to avoid unhealthy competition due to ranking their performances.

^bDashes indicate missing data because PMGs were established later in 2003 and did not sell during that year.

mance of groups is correlated with higher levels of collective action. Again, this finding is consistent with field observations on the level of group action and its effectiveness.

As in the case of collective action indicators, Spearman's rank correlation test was used to check the degree to which the groups were ranked similarly across the different performance indicators. The results show that the ranks of the performance indicators are closely related—that is, the ranks of cumulative assets owned were significantly correlated ($p < 0.01$) with cumulative sales (but not with annual sales values). The strong rank correlations between the cumulative assets and aggregate sales values mean that these two indicators are not necessarily independent. But the lower correlations between assets and annual sales values indicate that using a combination of these indicators was useful because they ranked groups differently—perhaps as a consequence of the high variability in production and marketed values in these drought-prone villages. However, the average rank of collective action indicators shown in Table 5.15 was strongly correlated ($r = 0.985$) with the average rank of the performance indicators given in Table 5.17. This reconfirms that groups that did well in terms of the different aspects of collective action were also the groups that performed better in terms of achieving their collective marketing functions.

Constraints on Collective Marketing

If the marketing groups offer new opportunities to improve the performance of imperfect rural grain markets, what are the policy-relevant factors of their growth and expansion? Our study identified several such constraints. The median ranks of the three most important constraints to collective marketing were given as lack of credit (1.0), price variability (3.0), and low volume of marketed surplus (3.0) (Table 5.18). Other less important operational constraints to group performance and effectiveness included weak linkages with buyers (poor demand) (4.0) and lack of business skills (6.0). In order to exploit the full potential of PMGs, future policies need to address these constraints.

The prominence of lack of credit as a major constraint is consistent with the pervasive financial market imperfections in rural areas (for instance, see Poulton, Dorward, and Kydd 1998; Kelly, Adesina, and Gordon 2003) and the wide recognition of the roll that this service can play in marketing and enterprise development (Kirkpatrick and Maimbo 2002; Bingen, Serrano, and Howard 2003). Credit constraints may be addressed through rural microcredit facilities, contract or outgrower schemes, and inventory credit arrangements.

The problem of price variability can be attributed to supply fluctuations and weak market linkages. With limited local demand, covariate risk leads to a negative correlation between local supply and prices. In rainfed systems, production and supply problems are often caused by changes in rainfall and its distribution. In some cases, farmers could turn such seasonal price changes to their advantage through temporal arbitrage. Nevertheless, the challenge of low volumes can be addressed only through increasing crop productivity or procuring

TABLE 5.18 Rankings of producer marketing group (PMG) collective marketing constraints in Kenya, 2005

Constraint	Mbeere (<i>n</i> = 5)	Makueni (<i>n</i> = 5)	Total (<i>n</i> = 10)
Lack of credit	1.4 (1.0)	1.2 (1.0)	1.3 (1.0)
Price variability	4.6 (5.0)	2.6 (2.0)	3.6 (3.0)
Low volumes	4.8 (3.0)	3.2 (3.0)	4.0 (3.0)
Lack of buyers	5.4 (4.0)	4.0 (4.0)	4.7 (4.0)
Lack of business skills	4.8 (6.0)	6.0 (6.0)	5.4 (6.0)
Low quality	7.2 (7.0)	6.2 (6.0)	6.7 (7.0)
Storage pests	7.6 (8.0)	7.6 (7.0)	7.6 (7.5)
Internal conflicts	8.0 (8.0)	8.2 (8.0)	8.1 (8.0)
Poor leadership	7.8 (9.0)	9.6 (10.0)	8.7 (9.0)
Lack of storage	11.3 (1.02)	8.2 (7.0)	9.4 (10.0)
Theft in storage	10.8 (11.0)	11.2 (12.0)	11.0 (11.0)

SOURCE: Authors' calculations.

NOTES: Figures in parentheses are medians; 1 indicates most important; *n* refers to the number of PMGs.

produce over a wider catchment area. The latter, however, implies coordination of marketing functions at a higher level of aggregation (for example, through a union of PMGs) to allow the spreading of some fixed costs.

Given the low level of market development and the lack of service providers in many rural areas, the PMGs are unlikely to prosper in a “business-as-usual” policy environment. There is a need for an enabling legal framework, improved access to market information, support to strengthen business skills, and access to essential finance and credit facilities. The PMGs were registered in Kenya as self-help groups; hence, they lack legal status as agribusiness enterprises. This restricts their access to essential credit from formal financial institutions—a major collective marketing constraint identified by the PMGs. Lack of legal status to operate as agro-enterprises also means that PMGs can neither be sued nor sue in case of any liability. This drastically diminishes the incentive for financial institutions to do business with PMGs in terms of providing essential financial services (credit, insurance, and so on). Hence, legal recognition as business entities is critical for their future development.

Another issue for the future of PMGs is the need to form a legal framework that facilitates their transition to cooperative societies. According to the Kenya Cooperative Societies amendment bill, Article 28, 2004, a cooperative society is required to have a committee of between five and nine members (Republic of Kenya 2004).⁸ The committee is empowered to enter into contracts and carry out other business functions in accordance with the established bylaws. The act empowers the members to be responsible for their own registered cooperatives and stresses the need for elected committees to run their societies in accordance with accepted cooperative principles. The relationship between societies and the government is through the commissioner of cooperatives, who is responsible for the cooperatives’ development and growth and provides organization, registration, operation, advancement, and dissolution services.

Although the amended act appears to provide for a stronger regulatory framework within which cooperative societies can operate (Manyara 2003; Argwings-Kodhek 2004), it fails to provide sufficient mechanisms for nascent farmer organizations, now registered as welfare groups, to develop fully and transit into cooperative societies. Without proper mechanisms for facilitating and supporting younger producer organizations, the strong regulatory framework stipulated in the act could also inhibit further development and competitiveness.⁹ Moreover, agricultural marketing systems require grades and standards, as well as rules and regulations that facilitate trade and exchange through

8. The supplement includes amendments to the Cooperatives Act 12 of 1997, which was also a result of an amendment of the Cooperative Societies Chap. 490 of 1966. The latest amendments were motivated by the need to enable cooperative societies to operate as business entities.

9. Among other things, the framework requires that societies elect new office bearers annually and maintain financial statements that meet international standards. Failure to meet these requirements may lead to dissolution.

contract formation and enforcement. These may necessitate laws dealing with the adoption of quality grades and standards, good agricultural practices, and environmental and consumer protection issues to motivate acceptable norms of behavior for efficient market performance.

These findings contribute to poverty studies by highlighting the importance of the enabling legal and political environment for the effective functioning of local institutions, not just in NRM but in other poverty-related areas, such as smallholder marketing. Our study shows that unfavorable legal mechanisms (failure to give PMGs the status of agribusinesses) coupled with lower stocks of natural (land) and public (infrastructure, services) capitals pose constraints for smallholders in raising their incomes through market exchanges but at the same time create incentives for cooperation around these activities. The chapter also presents interesting findings on the impact of assets on the structure of collective action institutions by describing the “middle-class” effect that is seen around collective marketing. It shows the benefits of collective action in increasing incomes and overall welfare (that is, poverty reduction outcomes); at the same time, it describes how certain patterns of interaction (the creation of rules regarding such things as membership fees) can lead to exclusion of the less endowed households, echoing the findings from Chapter 3. The finding that higher levels of collective action result in a greater impact on poverty outcomes (that is, the higher marketing performance of groups) makes an important contribution to the study of collective action in the non-NRM poverty literature.

Conclusions

Many studies have emphasized that market liberalization is a necessary but not sufficient condition for increasing access to markets by smallholder farmers in many countries of Sub-Saharan Africa. Although full liberalization has not occurred and many countries have reinstated grain marketing boards with discretionary powers, the economic growth expected from the market reform policies has largely remained unrealized. With limited market infrastructure and institutions to support market development, the liberalization strategies were bound to fail in integrating smallholder farmers in less favored areas into the market system. Producer organizations and collective marketing groups provide alternative institutional innovations to enhance the adoption of productivity-enhancing technologies, to link farmers to markets, and to foster market participation and the commercialization of smallholder production, providing another illustration of the instrumental role of collective action in enabling development pathways for improving livelihoods.

The analysis and evidence presented here have shown that farmers selling to PMGs receive higher prices than otherwise, opening new opportunities for smallholder farmers to benefit from markets. Although the marketing channels in the study areas are characterized by long and complex chains and high trans-

action costs, which considerably lower the farmers' share of the consumer prices, PMGs improved market access for small producers by bulking, storage, grading, sorting, and selling the produce directly to buyers at the upper end of the value chain. The links to secondary and tertiary markets were enhanced through better coordination of production and marketing activities. There is no evidence that the PMGs benefited only the wealthier, resource-rich farmers. On the contrary, the incentive for joining collective marketing groups seems to be higher for those with smaller farmlands, but not necessarily for the poorest.

Nevertheless, only relatively successful PMGs were able to exploit this potential. The key challenges are related to mobilizing farmers in participatory governance and the provision of start-up capital to PMGs, coupled with training managers and members in marketing and agribusiness skills. In addition, the PMGs need to be supported in transitioning from their role as welfare-like societies, which restricts their ability to access essential financial and other services from the formal sector, to that of legal business entities. The economic viability of the PMGs was hampered by their lack of cash capital that would have allowed them to pay in time for produce deliveries by farmers. Many cash-constrained farmers are unable to delay cash payments, even when future prices would be significantly higher. These findings confirm the importance of the favorable legal and political environment for the effective functioning of local institutions, as highlighted in the conceptual framework (Chapter 2 of this volume). Provision of credit and access to financial capital are critical for the development of such groups. One strategy would be to test warehouse receipt systems in which crop inventory can be used as collateral for financial credit and to subsequently encourage financial institutions to extend credit services to organized farmer groups. The PMGs might also pay farmers a portion of the value of their grain on delivery to help them meet their immediate needs but defer full payments until the grain can be sold at better prices. Many farmers expressed interest in such a policy.

Establishment of second- and third-tier unions of PMGs would also help in expanding the horizontal and vertical coordination of production and marketing activities to address the problems of low volume and price variability and to make the groups economically attractive to service providers such as financial institutions. These strategies for enhancing institutions to improve the performance of imperfect markets should be pursued together with alternative options for smoothing and expanding supply through investments in drought-mitigating and water-harvesting techniques that would enable farmers in drought-prone areas to manage their production risks more effectively.

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