Leveraging institutions for collective action to improve markets for smallholder producers in less-favored areas

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Abstract

Using survey data from the community, producer marketing groups (PMGs) and farm households in Kenya, this paper investigates the potential of rural institutions (farmer organizations, their rules and enforcement mechanisms) for remedying pervasive market imperfections and facilitate access to new technology in rural areas. Qualitative and quantitative analyses show that while the functioning of markets is constrained by high transaction costs and coordination failures, PMGs present new opportunities for small producers through vertical and horizontal coordination of production and grain marketing. They pay 20 to 25% higher prices than other buyers and facilitate the adoption of improved varieties that help increase marketable surplus. Their accumulated assets and traded volumes are influenced by participatory decision making, member contributions and initial start-up capital. While participation declines with farm size, the associated benefits depend on marketed amounts. Moreover, the time lag to payment for deliveries makes PMGs less attractive marketing channels for the poor. The success of such groups requires policy support, increased capital access, rural finance and market information.

Keywords: Market imperfections; Transaction costs; Institutions; Collective action; Producer marketing groups; Kenya

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Grâce à l'utilisation des données du sondage de la communauté, les groupes de commercialisation des producteurs (PMGs en anglais) et les exploitations agricoles au Kenya, cet article étudie la capacité des institutions rurales (organisations des fermiers, leurs règles et les mécanismes de renforcement) à remédier aux imperfections omniprésentes du marché et à faciliter l'accès aux nouvelles technologies dans les zones rurales. Alors que le fonctionnement des marchés se trouve gêné par les coûts élevés des transactions et les défaillances en matière de coordination, les analyses quantitatives et qualitatives montrent que les PMGs offrent de nouvelles possibilités aux petits producteurs grâce à la coordination verticale et horizontale de la production et de la commercialisation des céréales. Ils paient de 20 à 30% de plus que les autres acheteurs et facilitent l'adoption de variétés améliorées qui permet d'augmenter un surplus commercialisable. Leurs biens accumulés et les volumes échangés sont influencés par la prise de décisions participative, les contributions des membres et le capital de départ. Alors que la participation baisse selon la taille de la ferme, les bénéfices associés dépendent des sommes commercialisées. De plus, les délais de paiement des livraisons font des PMGs des canaux de distribution moins intéressants pour les pauvres. Le succès de tels groupes exige un soutien en matière de politique, un accès au capital facilité, une finance rurale et une information sur le marché.

Mots clés : *Imperfections du marché ; Coûts de transaction ; Institutions ; Action collective ; groupes de commercialisation des producteurs ; Kenya*

1. Introduction

Despite economic liberalization and the implementation of poverty reduction strategies aimed at opening up new market-led opportunities for economic growth, the results in many sub-Saharan countries have been mixed (Winter-Nelson & Temu, 2002; Fafchamps, 2004). A large proportion of smallholders still engage in subsistence agriculture and are thus unable to benefit from liberalized markets. Poor infrastructure (e.g. Dorward et al., 2005) and lack of market institutions (World Bank, 2002) are common in the subsector, leading to high transaction costs, coordination failure and pervasive market imperfections. Moreover, systemic partial policy implementation and reversals seem to have muted the positive effects of liberalization (Jayne et al., 2002). Nevertheless, there are avenues that make use of collective action to complement the government and the private sector for enhanced coordination in rural commodity markets. This is especially true in semi-arid areas where investments in infrastructure are small and distances to markets are large. Under these conditions, private investment and agro-enterprise development are less favorable even when the agricultural potential is high.

We argue that farmer organizations can form the basis for enhancing market access and entrepreneurial skills through collective action and that successful collective action in marketing requires better coordination of various activities for delivering desirable high quality and standardized products. Moreover, new forms of organization for spatially dispersed smallholders involve transaction costs, and require good leadership and new skills. The negative experiences of cooperatives in the past attest to the importance of these

factors in the management and resilience of farmer organizations (World Bank, 2002; Kydd & Dorward, 2004). Despite the increased interest in new forms of farmer organization and market institutions (Dorward et al., 2005; Poulton et al., 2006), there is insufficient empirical evidence on alternative forms of collective action, participation determinants, the effectiveness of marketing groups, and how complementary institutions and policy support can enhance the role of collective marketing groups.

This paper analyzes the role of institutional and organizational innovations in improving the performance of rural markets in less-favored areas. Following Pender and Hazell (2000), we define less-favored areas as those with relatively low potential and often neglected in terms of rural infrastructure and also those with good agricultural potential but limited access to markets. Using a case study of producer marketing groups (PMGs) in semi-arid Eastern Kenya, the paper identifies the potential and limitations of rural institutions in providing market services for small-scale producers of dryland crops. It investigates the effect of farmer marketing groups on producer prices and the uptake of improved technologies, evaluates the institutional and organizational factors that affect the performance of these groups, and discusses how collective action and policy issues affect capital constraints and the growth and development of these groups.

The rest of the paper is organized as follows. Section 2 reviews market institutions and their emerging roles in remedying market imperfections in rural areas, Section 3 outlines the data and methods used in the case study, Section 4 presents the main results, and the concluding section summarizes the key findings and discusses policy implications.

2. Role of institutions in imperfect rural markets

According to North (1990), institutions constitute formal constraints (i.e. rules, laws, constitutions) and informal constraints (i.e. norms of behavior, conventions, and self-imposed codes of conduct) that structure human interactions, and their enforcement characteristics. The World Bank (2002) states that institutions are the rules, including behavioral norms, by which agents interact, and organizations that implement rules and codes of conduct to achieve desired outcomes. This suggests that institutions provide multiple functions to markets: they transmit information, mediate transactions, facilitate the transfer and enforcement of property rights and contracts, and manage the degree of competition, thus providing alternative mechanisms through which market failures in rural areas can be remedied.

Market failures arise out of asymmetric information, high transaction costs and imperfectly specified property rights. They are more pronounced in areas with underdeveloped road and communication networks and other market infrastructure, which is typical of many semi-arid regions in sub-Saharan Africa. Without supporting market institutions, markets in such areas tend to be thin and imperfect, with high marketing and transaction costs. The high costs undermine the exchange process and give rise to atomized rural markets with little rural-urban linkage (Kranton, 1996). Under these circumstances, households tend to withdraw from markets and focus predominantly on subsistence production when food

security using markets is not assured (de Janvry et al., 1991). Furthermore, without complementary investments along the value chain, important market players fail to undertake profitable investments, which leads to coordination failure and encumbers market performance (Dorward et al., 2005; Poulton et al., 2006). Moreover, production and market risks also exacerbate market imperfections and transaction failures (Kydd & Dorward, 2004). Institutional innovations that reduce transaction costs and enhance market coordination (e.g. marketing groups that make use of collective action, such as the PMGs observed in this study) would be instrumental in overcoming these problems.

Farmer organizations have the potential to mitigate the effects of imperfect markets by enabling contractual links to input and output markets and by promoting economic coordination in liberalized markets, hence leveraging market functions for smallholder farmers. Realizing this potential will, however, depend on the ability to convey market information, coordinate production and marketing functions, define and enforce property rights and contracts and, more critically, mobilize producers to participate in markets and enhance the competitiveness of agro-enterprises.

Efforts that promote PMGs with supportive innovative mechanisms for market functions will need to account for the challenges of a new generation of cooperatives emerging as business oriented enterprises. This is because farmer cooperatives in Africa have had a legacy of not being exemplary in providing business opportunities and marketing services to small producers (Akwabi-Ameyaw, 1997). The lessons learned from this indicate that farmer organizations can succeed if farmers are allowed and encouraged to manage these groups with minimal government interference, and if collective action reduces transaction costs and improves competitiveness (Akwabi-Ameyaw, 1997). This means that a new set of policies and institutional reforms are needed to help transform farmer groups into private sector enterprises with clear business plans to support and facilitate the commercialization of smallholder production through better market access and integration. Activating collective action would therefore be critical in realizing this goal. Collective action is likely to happen if the gains in terms of reduced transaction costs, better input and/or product prices, empowerment and capacity enhancement outweigh the costs of complying with collective rules and norms. We investigate these possibilities further.

3. Data and methods

The study uses two sets of data that were collected in 2003 (baseline) and 2005 (follow-up survey) by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in the Mbeere and Makueni districts of semi-arid Eastern Kenya, where market infrastructure is underdeveloped and frequent droughts reduce agricultural productivity and pose threats to rural livelihoods. These districts were targeted as areas where dryland legumes such as pigeonpea and chickpea could be exploited to reduce poverty and vulnerability.

As part of a research project aimed at piloting alternative institutional innovations for improving market access for smallholders, 400 households (240 in Mbeere and 160 in

Makueni) in target villages were randomly sampled in 2003 before the PMGs were established. As part of the project activities, farmers were sensitized to form PMGs through voluntary participation.[1] Interested farmers came together and established ten PMGs. These were formed by building on existing local networks that had various functions. The groups agreed on the PMG constitution and elected the leadership. They were then formally registered as welfare societies as per Kenyan law. Some households that had at first expressed interest in joining the groups did not. From an initial sample of 400 households, the distribution of members and non-members was decided on the basis of commitment to and paid-up fees for PMG membership. The average number of active PMG members varied from 93 in Makueni to 117 in Mbeere, while the average joining fee and annual subscription fees were about Ksh64 and 266 per member, respectively.[2] Information about poverty indicators, agricultural production, market participation and adoption of agricultural technologies was elicited from the respondents.

In the 2005 survey, data were collected both at PMG and household levels. At PMG level about five to seven randomly selected key informants consisting of PMG management and ordinary members provided information about the marketing activities (including constraints), governance and internal dynamics in an open discussion forums. Additional information included the group's objectives and aspirations, characteristics, asset ownership and credit access. At the household level, data were collected from 400 households (210 from Mbeere and 190 from Makueni districts) in the ten PMG villages. The respondents comprised 250 members and 150 non-members and included 150 households re-sampled from the 235 baseline PMG members and 100 households from 165 non-PMG members. Information about socioeconomic characteristics, assets, credit and savings, production, buying and selling, and participation in other networks and in collective marketing was obtained from the respondents.

PMG data were used to determine constraints to collective marketing, identify indicators of collective action, and assess the performance of marketing groups in grain marketing. Household data were used to quantitatively determine the marketable surplus and to understand the structure and performance of rural markets for different crops. To determine whether the resource-poor are excluded from PMGs, we used a bivariate Probit model to analyze the effect of household assets and wealth indicators on PMG membership. The bivariate specification was chosen because many farmers belonged to multiple groups or networks besides PMGs,[3] meaning that the decision to participate is likely to be jointly determined if the group cross-equation errors are contemporaneously correlated. Further, we used a price determination model to identify factors that influence grain prices in point transactions and to test whether PMGs prices are significantly higher than those of competitors after controlling for grain quality, seasonality and distance. We also used a

[1] Project assistance included farmer mobilization to discuss legume production and marketing strategies and training in quality seed production, marketing and group organization strategies. No direct subsidies or incentives were provided.

[2] In 2005 the exchange rate was on average US$1 = Ksh 76.

[3] About 11% of the non-PMG and 20% of the PMG members belonged to agricultural production networks (APNs). The APNs are informal groups dealing with village production of crops and handicraft and some saving and marketing activities. They facilitate exchange of information and sharing of family labor during peak farming seasons.

Probit model to test whether PMG membership facilitated the uptake of improved varieties. Since the group membership variable is endogenous, we instrumented it using its predicted values from the bivariate Probit model. The descriptive statistics for selected variables are given in Table 1.

Table 1: Descriptive statistics of selected model variables

Variable	Members (N=250)	Non-members (N=150)	Total (N=400)
Distance to collection centre (km)	1.60 (1.12)	1.80 (1.25)	1.68 (1.18)
Distance to nearest main market (km)	6.97 (5.23)	6.95 (6.05)	6.97 (5.54)
Gender of household head (male=1)	0.8 (0.40)	0.78 (0.42)	0.80 (0.41)
Education of household head (years)	6.54 (3.80)	6.39 (4.14)	6.48 (3.92)
Male workforce[a]	1.45 (1.10)	1.16 (0.89)	1.34 (1.04)
Female workforce[a]	1.54 (1.01)	1.24 (0.77)	1.43 (0.94)
Dependency ratio[b]	1.93 (1.80)	2.07 (1.83)	1.98 (1.81)
Household owns ICT (TV, radio or telephone) (yes=1)	0.80 (0.40)	0.84 (0.37)	0.82 (0.39)
Household located in an average rainfall area (yes=1)	0.20 (0.40)	0.20 (0.40)	0.20 (0.40)
Household located in a low rainfall area (yes=1)	0.32 (0.47)	0.33 (0.47)	0.33 (0.50)
Membership in agricultural production networks (APNs) (yes=1)	0.20 (0.40)	0.11 (0.31)	0.17 (0.37)
Adopted improved pigeonpea (yes=1)	0.40 (0.49)	0.27 (0.45)	0.35 (0.48)
Adopted improved greengram (yes=1)	0.28 (0.45)	0.24 (0.43)	0.27 (0.44)
Per capita livestock assets (1000 Ksh)	3.88 (4.24)	3.87 (5.35)	3.87 (4.68)
Per capita physical assets (1000 Ksh)	1.65 (5.43)	3.72 (22.28)	2.43 (14.31)
Per capita farm size (acres)	1.28 (1.51)	1.42 (1.72)	1.33 (1.59)
Per capita oxen numbers	0.19 (0.25)	0.21 (0.29)	0.20 (0.27)
Per capita family education (years)	5.97 (2.00)	5.26 (2.21)	5.71 (2.10)
Farming as main occupation (yes=1)	0.76 (0.43)	0.69 (0.47)	0.73 (0.45)
No contact with NGOs (yes=1)	0.16 (0.37)	0.23 (0.42)	0.19 (0.39)

Source: Survey data
Notes: Figures in parenthesis are standard deviations.
[a] Family workforce (adult worker equivalents) = 1.0* (Number of full-time farm workers aged 16–60 years) + 0.5*(Number of part-time farm workers aged 16–60 years) + 0.25*(Number of full-time farm workers aged 11–15 years)
[b] Dependency ratio = (Family size – Total workforce)/Total workforce

4. Results

4.1 Performance of grain markets

An analysis of the market structure in terms of transactions by distance and market participants during 2005 shows that rural wholesalers accounted for 45% of sales and 49% of the volume traded, while brokers/assemblers accounted for 38% of sales and 38% of volume (Table 2). Rural assemblers and wholesalers jointly control more than 80% of the grain transactions and traded volumes, which demonstrates that these traders are well positioned to buy directly from dispersed farmers residing in scattered rural villages. Nevertheless, the high search and grain assembly costs mean increased transaction costs (Fafchamps & Hill, 2005) and reduced farmers' share of the consumer price. The nascent PMGs accounted for only 4% of the sales and 2% of the volume, while the rest (10–12%) was handled by other local buyers.

Table 2: Total transactions (number of sales) and volumes (tons) in 2004/05

Buyer	Total		Share (%)		Farm gate		< 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
PMG	27	3.7	4	2	4	0.8	10	0.7	12	2.2	1	0.1
Rural wholesalers	283	101.8	45	49	25	27.5	167	43.3	82	29.9	9	1.0
Broker/assemblers	237	77.7	38	38	175	60.0	24	5.2	16	2.9	22	9.7
Urban wholesalers	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 (%)	-	-	-	-	36	45	34	25	22	20	8	10

Source: Survey data

Whereas 45% of the traded volume and 36% of the transactions were conducted right at the farm gate, about 34% of the transactions (accounting for 25% of the traded volume), were conducted within 3 km of the farm gate. Transactions and volumes declined with distance as less than 8% of the transactions and 10% of the traded volume were conducted in markets more than 5 km away from the farm. This can be attributed to increasing transport and transaction costs for the small marketed quantities as distance increases (Fafchamps & Hill, 2005). Prices also varied over time – increasing gradually as local supplies declined and declining again as local produce reached local markets after harvest – illustrating potential business opportunities for PMGs through bulk marketing, and spatial and temporal arbitrage.

4.2 PMG membership

A critical policy question about farmer organizations is whether resource-poor farmers would actually participate and derive benefits from collective action. To explore this question, we tested whether the PMGs excluded the resource-poor farmers in favor of wealthier households. We used a bivariate Probit model to identify the determinants of PMG membership. Model variables included location, infrastructure, household

characteristics, human capital, and access to information. Further, farm size, value of livestock, interaction between livestock and farm size, value of physical assets, number of oxen (all in per capita terms) and ownership of means of transport, were included to capture wealth and asset endowment effects. Access to information was captured through ownership of ICT (information and communication technology – radio, mobile phones, and TV) and contact with NGO extension personnel. In the absence of effective public extension services, NGOs play a vital role in the economic development process in semi-arid areas. Location effects were captured through distance to markets and historical rainfall in the PMG villages. The results are presented in Table 3.

Table 3: Bivariate Probit coefficients for the determinants of PMG and APN membership

Variable	PMG	APN
Distance to village market (km)	-0.083(0.061)	-0.090(0.070)
Distance to nearest main market (km)	0.006(0.014)	-0.023(0.018)
Age (years)	-0.006(0.006)	0.003(0.007)
Gender (1=male)	0.182(0.178)	-0.111(0.207)
Family male workforce	0.024(0.082)	-0.104(0.091)
Family female workforce	0.206(0.087)**	0.056(0.103)
Dependency ratio	0.029(0.044)	0.094(0.047)**
Household owns ox-cart (1=yes, 0= otherwise)	0.138(0.178)	0.094(0.198)
Household located in average rainy area (1=yes, 0= otherwise)	-0.120(0.200)	0.041(0.219)
Household located in dry area (1=yes, 0= otherwise)	-0.155(0.173)	0.396(0.200)**
Log of per capita livestock asset (Ksh)	0.842(0.533)	-0.507(0.647)
Log of per capita physical asset (Ksh)	0.916(0.703)	-0.346(0.854)
Log per capita farm size (acres)	-2.093(1.162)*	-2.408(1.330)*
Log of per capita livestock* log per capita farm size	0.766(0.376)**	0.866(0.397)**
Per capita oxen numbers	-0.389(0.316)	-0.922(0.506)*
Per capita family education stock	0.097(0.040)**	0.069(0.045)
Main occupation (farming=1)	0.301(0.171)*	0.217(0.202)
Household owns ICT (1=yes, 0=otherwise)	-0.347(0.190)*	-0.102(0.224)
Average contact with NGOs (1=yes, 0=otherwise)[a]	-0.179(0.164)	0.243(0.203)
No contact with NGOs (1=yes, 0=otherwise)[a]	-0.351(0.210)*	0.490(0.240)**
Constant	-2.744(1.845)	-0.989(2.236)
athrho	0.229(0.108)**	
Wald χ^2[df]	[46] 98.20: Prob >χ^2 = 0.000	
Log pseudo-likelihood	-395.854	
Wald test of ρ=0	χ^2 [1] = 4.501: Prob >χ^2 =0.034	

Notes: Robust standard errors are in parenthesis; [df] are degrees of freedom
[a] Reference group is households with frequent contact with NGOs.
Figures in parenthesis are robust standard errors.
** and * indicate significant at 0.05 and 0.10 probability levels, respectively.

The bivariate model results show that the residuals of the two network membership equations are not independent. The residuals correlation parameter ρ shows that the two equations were correlated (P = 0.034), affirming the superiority of the bivariate Probit specification.

Female workforce in the household (P=0.018), ownership of ICT (P=0.067), per capita farm size (P=0.072), the asset-livestock interaction term (P=0.042), stock of household education (P=0.014), household occupation (P=0.078) and access to information (P=0.095) significantly influenced the likelihood of households joining PMGs. Family workforce variables have a positive effect, but only female workforce was significant, indicating that PMGs are likely to facilitate participation of the female workforce in agricultural markets.

The most important policy variables for assessing the potential exclusion of the resource-poor are the household assets. The results show that PMG membership increases with per capita livestock wealth but decreases with per capita farmland, indicating an opposing marginal effect of these assets. This opposing effect illustrates a livestock wealth-cropland trade-off. *Ceteris paribus*, smaller cropland reduces the marketed surplus but increases the gains from collective marketing, which suggests that households with small landholdings are more likely to participate in collective marketing. However, participation in APNs decreases with larger land and draught animal (oxen) assets, suggesting that large farmers are less likely to engage in such informal exchanges. ICT ownership reduces the probability of participating in collective marketing, which indicates some degree of substitution between market information channels. However, limited contact with extension (proxied through frequency of contact with NGOs) reduces the likelihood of PMG membership but improves APN membership. Furthermore, education and farm orientation increase the likelihood of PMG membership. Combined with better education, NGO sensitization and information flow appear to be good instruments for facilitating participation in group marketing.

4.3 Outcomes of collective marketing

How does collective marketing affect prices received by farmers and the adoption of new varieties? We test the hypothesis that participation in PMGs increases farm gate prices and enhances technology uptake.

4.3.1 Effects on producer prices

Collective action in marketing is aimed at reducing transaction costs and improving producer prices. In addition, a reduction in local market volatility and price risks could be beneficial to small producers, but this is difficult to measure without time-series data. We used cross-sectional grain sales data and estimated a regression model to identify the determinants of actual prices received by farmers and whether PMG prices were higher than the competitors. Under imperfect rural markets, farmer output prices depend on, among other things, where the product is sold, when it is sold, buyer type, access to market information, marketing skills and ability to negotiate deals (de Janvry et al., 1991; Fafchamps & Hill, 2005). Of the farm household variables, we included distance to the selling market, type of buyer, grain type, season, grain quality, gender and human capital

(education) in the price model to capture the effect of imperfect markets on the producer prices. The gender and education variables were included as proxies to test any differential effects of access to market information and marketing skills on prices received by farmers. However, these household variables were not significant and hence not included in the final estimated model.

The model was significant ($P < 0.001$) and explained about 61% of the variation (adjusted $R^2 = 0.612$). Distance to the point of transaction, crop type, location (district), selected buyer type, and the sale season influence grain prices (Table 4). Prices increase by about Ksh 0.2/kg for every 10 km from the farm gate ($P < 0.1$). Despite this increase, the marginal effect for the range of distances covered (less than 10 km) appears unattractive for farmers, unless the quantity sold is large enough to exploit economies of scale.

Table 4: Determinants of grain prices received by farmers in different rural markets

Variable[a]	Descriptive statistics (mean)	Estimated coefficient
Amount sold (kg)	324.95	-0.001(-0.99)
Amount sold squared (1000 kg)	439	0.000(0.16)
Distance to selling point (km)	4.6	0.023(1.98)**
Crop dummies:		
Beans	0.06	15.151(15.04)***
Pigeonpea	0.08	11.250(12.1)***
Chickpea	0.03	13.529(9.35)***
Greengram	0.27	12.342(19.65)***
Cowpea	0.03	4.107(3.04)***
Cotton	0.04	7.791(4.81)***
Vegetables	0.04	7.492(5.59)***
Quality (1= if fair average quality)	0.92	0.186(0.22)
District (1= Makueni)	0.16	-2.254(-3.07)***
Buyer dummies:		
Consumer	0.05	6.7476.02)***
PMG	0.04	5.950(5.05)***
Rural wholesaler	0.45	-0.609(-1.19)
Urban trader	0.02	0.959(0.51)
Cotton ginnery	0.02	1.074(0.52)
School buyer	0.03	3.630(2.72)***
Season dummies:		
Harvest season	0.71	-1.448(-1.91)*
2 to 3 months after harvest	0.19	-1.133(-1.29)
Owns ICT (yes=1)	0.82	0.157(0.26)
Constant	-	14.069(10.41)***
N		624
F(21, 602)		0.60
Adj R^2		45.06

Notes: Figures in parenthesis are robust standard errors
***, ** and * indicate significant at 0.01, 0.05 and 0.10 probability levels, respectively.
[a] Reference variables: crop price = maize; quality = above average; district = Mbeere district; buyer = broker/assembler; season = 4–5 months after harvest.

Prices vary significantly across crops ($P < 0.01$). Compared to maize (the reference crop) the price varies between Ksh 4/kg for cowpea to about Ksh 15/kg for beans. Pigeonpea and greengram – two predominant cash crops in the study districts – sell at Ksh 12 above the maize price while chickpea fetches about Ksh 14/kg more than maize. Interestingly, grain quality does not seem to matter in price determination, which suggests the existence of an asymmetric information problem (Akerlof, 1970).

Consumers, PMGs and schools paid about Ksh 7, 6, and 4, respectively, more than brokers/assemblers ($P < 0.01$), which indicates that PMGs can be attractive marketing channels for farmers. The school feeding programs also provide an alternative market outlet to smallholders at higher prices ($P < 0.01$). About 70% of the grain is sold immediately after harvest (Season1). This, however, means a loss of about Ksh 1.5/kg compared to selling four to five months later (the reference season) ($P < 0.051$). But gains from longer storage seem less attractive as price differentials from delaying sales for two to three months after harvest (Season2) were not significantly lower than the reference season. This means that PMGs could exploit brief seasonal price differentials through temporal arbitrage involving bulking and storage.

A simulation analysis using the above econometric results shows that PMG prices (net of operational costs) are about 22% to 24% higher than those by middlemen (Table 5). However, the opportunity cost of this price gain is a delay in payments of about of five weeks compared to other buyers who pay on delivery or shortly thereafter.

Table 5: Effects of collective marketing on pigeonpea prices

Buyer	Season	Point of sale	Price (Ksh/kg)	PMG price advantage (%)
PMG	Immediately after harvest	Farm gate	29.81	24.00
Brokers/assemblers			24.04	
PMG		5 km	29.93	23.88
Brokers/assemblers			24.16	
PMG	4–5 months after harvest	Farm gate	31.16	22.72
Brokers/assemblers			25.39	
PMG		5 km	31.29	22.62
Brokers/assemblers			25.52	

Given that PMGs pay higher prices than competitors, the critical question then is whether this incentive is sufficient to induce and sustain collective marketing. A cost-benefit analysis of grain marketing using prices offered by brokers and PMGs at the farm gate can provide useful insights. Using the 24% farm gate price differentials for selling immediately after harvest, Table 6 presents the estimated gains using the PMG channel compared to brokers/assemblers. The average cost of membership (i.e. annualized joining fee and annual

contributions) and the opportunity cost of deferred payments are included as direct and indirect costs of collective action. The simulation results show that the average income gain is about Ksh 678 per household, but varies across household groups and depends on the marketed quantity. While the income gain per unit sold is constant, farmers with a larger marketed surplus obtain higher benefits, ranging from Ksh 152 for the bottom third to Ksh 1133 for the upper third of the farm size classes.[4]

Table 6: Income effects of selling through marketing groups

Value of grain sold (Ksh)	Income gain from using groups by farm size class[b]				Member lost income by not using groups by farm size class[b]			
	Small	*Medium*	*Large*	*Total*	*Small*	*Medium*	*Large*	*Total*
Using PMG price	2303	5387	7418	5155	14381	19284	22452	18705
Using broker price	1872	4413	5988	4188	10518	14407	16743	13889
Difference	431	974	1429	967	3862	4877	5708	4816
Cost of collective action[a]	279	290	296	289	314	330	339	328
Net gain/lost income	152	684	1133	678	3548	4547	5369	4488

[a] The cost of collective action includes the annualized costs of joining fee, annual subscription fee and the opportunity cost of delayed payments calculated using the annual interest rate of 4.3% on savings for commercial banks in Kenya.
[b] The farm size classes represent the lower, medium and upper third of members selling using the PMG and non-PMG channels.

Assuming that the main alternative to the farm gate is using the broker channel, we use the amount marketed by the members through this channel to estimate the income loss that they sustain by not exploiting the collective marketing provided by PMGs. The average income loss by selling to brokers instead of to the PMGs is about Ksh 4,488 per year. This is about 7.4% of the poverty-line income and it increases further with the amount diverted away from the PMG channel.

4.3.2 Effects on technology adoption

A key policy question is whether PMGs could also help smallholder farmers access improved technology. The PMGs in eastern Kenya have been involved in the production and marketing of improved seeds of dryland crops. Selected PMG members are trained in quality seed production methods. With support from some NGOs they produce identified new varieties and market the seeds to members at affordable prices. Occasionally, non-members buy the seeds from the PMG outlets but at higher prices. To test the postulation

[4] Higher rates of time preference (i.e. higher opportunity cost of capital) will lower the gains from using the groups. For example, the income gains to lower and upper farm size groups decrease to Ksh 132 and 1070, respectively, if a higher annual rate of interest (15%) is used to value the cost of a five-week delay in payments.

that PMGs enhance technology adoption, we used a Probit model with an instrumented PMG membership variable, among others. We ran separate regressions for pigeonpea and greengram for which a significant share of farmers said they used improved varieties.

The results show that PMG membership has significant and positive effects on the uptake of new pigeonpea and greengram varieties (P<0.001) (Table 7). Adoption of improved varieties is significantly higher in the drier zones, which suggests the importance of these crops for food and sources of cash. Households with a higher number of dependent family members are less likely to adopt the improved varieties, perhaps because of financial stress or priority given to staple cereals for food security. Contact with formal extension systems does not have any effect on the adoption of pigeonpea varieties but seemed to discourage the uptake of greengram. This may be due to the predominant focus of formal extension systems on major staples rather than dryland legumes. Nonetheless, NGOs have a significant effect on the promotion of improved legume varieties, especially pigeonpea.

Table 7: Probit coefficients for the effect of PMG membership on technology adoption

Variable	Pigeonpea	Greengram
Predicted membership	5.494(1.46)***	2.690(1.03)***
Age of head	0.012(0.01)*	0.002(0.01)
Head is male	-0.255(0.21)	0.305(0.25)
Male workforce	-0.098(0.09)	-0.039(0.10)
Female workforce	-0.405(0.14)***	-0.105(0.12)
Dependency ratio	-0.037(0.05)	-0.162(0.07)**
Owns radio, phone or TV	0.303(0.27)	0.553(0.25)**
Owns ox-drawn cart	-0.247(0.19)	0.281(0.21)
Lives in medium rainfall area	0.673(0.21)***	
Lives in dry area	0.807(0.17)***	-0.167(0.18)
Log of per capita land	1.316(1.63)	1.287(1.43)
Log of per capita livestock	-0.485(0.20)**	-0.163(0.20)
Log of per capita physical assets	0.277(0.16)	-0.119(0.17)
Log per capital land * log per capita livestock	-0.482(0.49)	-0.351(0.44)
Per capital oxen numbers	0.356(0.49)	1.224(0.40)***
Per capita education	-0.081(0.06)	-0.131(0.06)**
Farming as main occupation (yes=1)	-0.647(0.23)***	-0.104(0.24)
Average contact with NGO (yes=1)	1.295(0.27)***	0.122(0.33)
No contact with NGOs (yes=1)	1.027(0.35)***	
Has extension contact (yes=1)	-0.048(0.15)	-0.514(0.16)***
Predicted error	-1.226(1.47)	0.423(1.58)
Constant	-2.687(0.90)***	-1.001(1.04)

Notes: Figures in parenthesis are robust standard errors
***, ** and * indicate significant at 0.01, 0.05 and 0.10 probability levels, respectively.

4.4 Performance of collective marketing groups

In the absence of standardized measures or indicators to assess the level, viability and effectiveness (performance) of collective action (Meinzen-Dick et al., 2004; McCarthy et al., 2004), we used the PMG survey data to identify proxy indicators of performance against which we measured PMG marketing outcomes.[5]

The PMGs were compared using per capita total assets built over time and total volume of grains traded as outcome indicators for effectiveness of collective marketing. The relative values for the PMG performance indicators are shown in Table 8. The distribution of these indicators across PMGs show that per capita assets were lowest in Nthingini (Ksh 34) and highest in Kathonzweni (about Ksh 6393), while the per capita total sales for 2003/2004 ranged from a low of 3 kg in Thavu to 242 kg in Kathonzweni. When the sales are disaggregated by year, it becomes evident that some PMGs did not trade in one year or the other while some traded in both years. As consistency in grain marketing is a good indicator of performance, the volume of trade is separately ranked for the two years.

Table 8: Performance of marketing groups

PMG	Per capita assets built over time (Ksh/member)	Per capita sales volume (kg/member)		Per capita total sales volume (kg/member)	Mean rank for performance indicators	Mean rank for collective action indicators (not shown)
		2003[a]	2004	2003-2004		
Kathonzweni	6393	212	30	242	1.3	4.3
Kalamba	3130	46	8	54	3.3	3.0
Makima	301	-	123	123	3.5	3.2
Kilia	177	34	23	57	5.3	6.8
KMY	333	192	0	192	5.3	6.3
Wango	63	-	8	8	6.5	4.8
Emali	268	92	0	92	6.7	6.0
Thavu	395	3	0	3	6.7	5.2
KYM	335	10	0	10	6.7	6.5
Nthingini	34	-	7	7	7.5	5.7

Source: Survey data
[a] Missing data indicates that PMGs were established later in 2003 and did not sell during that year.

[5] In addition, six indicators of collective action were identified: number of elections since formation, share of members respecting bylaws, attendance at meetings, annual member contributions to the group, cash capital and agreed annual subscription fees. Due to space limitations, only the aggregate ranks are shown in Table 8.

The aggregate rankings across the selected performance indicators (i.e. combining assets built over time and crop sales per capita) show that Kathonzweni (1.3), Kalamba (3.3) and Makima (3.5) performed much better than others. The mean rankings for the six indicators of the degree of collective action (Table 8, last column) indicate that these same groups performed best, namely Kalamba (3.0), Makima (3.2), and Kathonzweni (4.3). A Spearman's rank correlation test showed that the average ranks for the level and effectiveness of collective action were strongly correlated ($r = 0.985$). This confirms that higher effectiveness in group marketing functions is closely correlated with higher levels of collective action, a result consistent with field observations of the level of group action and its effectiveness.

4.5 Policy issues for collective marketing

If farmer marketing groups offer new opportunities to make markets work for small producers, what are the external limiting factors for their growth and expansion? The most important constraints to collective marketing were identified as lack of credit, price variability and low volumes. Other less important operational constraints include lack of buyers and low business skills.

The prominence of lack of credit as a major constraint is consistent with the pervasive financial market imperfections in rural areas (Poulton et al., 1998; Kelly et al., 2003) and the wide recognition of the role credit can play in marketing and enterprise development (Kirkpatrick & Maimbo, 2002; Bingen et al., 2003). However, mechanisms such as rural micro-credit facilities, contract or out-grower schemes and inventory credit arrangements may be used to address these constraints. A Grameen bank type of micro-finance scheme may be useful but available loans tend to be small and unsuitable for grain marketing operations. This suggests that while access to significant capital is needed, selective subsidies may also be required to kick-start agricultural markets as they play an important role in relieving critical seasonal and cash constraints and reducing market and input supply uncertainties (Dorward et al., 2005).

These findings suggest that, given the low level of market development and lack of service providers in many semi-arid rural areas, the PMGs are unlikely to prosper in a 'business as usual' policy environment. There is a need for supportive policies that spur their growth and gradual transition to profitable farmer cooperatives and business enterprises. This would include suitable legal status and protection, access to market information, support to enhance business skills, and access to essential finance and credit facilities.

5. Conclusions and policy implications

Although market liberalization is a necessary condition for increasing access to markets by smallholder farmers in sub-Saharan Africa, it is not sufficient. With imperfect markets and limited institutions to support market functions, liberalization strategies were bound to fail to integrate smallholders in less-favored areas into markets. In a situation of limited market infrastructure and pervasive rural market imperfections in input and output markets,

producer organizations and collective marketing groups provide alternative institutional mechanisms to enhance the uptake of market-oriented and productivity-enhancing technologies, to link farmers to markets, and to foster market participation and the commercialization of smallholder production.

This paper has shown that PMGs were able to pay higher prices to members. They facilitated access to improved seed and the adoption of new varieties for dryland crops. This finding is important considering the relative lack of policy interest in dryland crops and the importance of access to improved technologies and quality seed of high-yielding and low-risk varieties as key determinants in generating marketable surplus and helping commercialize smallholder agriculture (Barrett, 2008). There was no evidence that the PMGs benefited only the wealthier and resource-rich farmers. On the contrary, the incentive for joining collective marketing groups seems to be higher for those with smaller farmland and facing higher marketing costs.

It is evident that only the relatively successful PMGs were able to exploit the potential of collective marketing to improve markets for smallholders. The key insights for understanding the effectiveness of group marketing are related to mobilizing farmers in participatory governance, providing start-up capital and finance for grain marketing, and training in business skills to manage PMGs as business enterprises. In addition, the PMGs need to be supported to transit into legal business entities. The effectiveness of the PMGs was hampered by lack of cash capital to pay farmers on time, making it difficult for cash-starved farmers to wait even when promised prices were high. One strategy to address this would be to explore the use of crop inventory as collateral for financial credit and encourage formal financial institutions to extend inventory credit services to organized farmer groups. Alternatively, farmers would be paid a proportion of their grain value at the time of delivery and defer full payments until the grain is sold at higher prices. This would allow them to meet immediate cash needs while benefiting from better prices through collective marketing. These policy options should be pursued in concert with alternative strategies for increasing marketable surplus and smoothing supply through investments in extension and seed systems as well as drought-mitigating and water-harvesting techniques for effective risk management.

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