Horizontal coordination and free-riding in a group of certified organic crop growers: An empirical study of the Ezemvelo Farmers' Organization in KwaZulu-Natal, South Africa

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Abstract

This study investigated the prevalence and determinants of free-riding in the Ezemvelo Farmers' Organization (EFO), a group of certified organic crop growers in South Africa, using data gathered in a census survey of its 151 partially and fully certified members. The computed free-riding index scores suggested that free-riding posed a serious threat to the group's collective marketing efforts. Regression analysis showed that members who were male, poorly educated, aware of loopholes in the grading system, and who did not trust the buyer, were more likely to free-ride. In the longer term, the EFO should address institutionalized free-riding by issuing tradable ownership rights. In the short term, it must engage with the packhouse (buyer) to remove flaws in the grading process that conceal the origin of low quality produce. Transparent and mediated negotiations leading to an incentive compliant contract with the buyer may also help to build trust and reduce free-riding within the EFO.

Keywords: Smallholders; organic crops; collective marketing; free-riding

Cette étude examine la prévalence et les déterminants du parasitage au sein de l'Organisation des Cultivateurs d'Ezemvelo (EFO, en anglais), un groupe de petits cultivateurs certifié biologique en Afrique du Sud, et ceci grâce à l'utilisation de données obtenues lors d'un recensement auprès de ses 151 membres certifiés partiellement et à part entière. L'indice calculé en matière de parasitage suggère que les efforts collectifs du groupe au niveau marketing ont été confrontés à une sérieuse menace. Une analyse de la régression a montré que les membres de sexe masculin, peu éduqués, conscients des lacunes du système de classification et affectionnant peu de confiance à l'égard des acheteurs, se sont révélés plus enclins au parasitage. À plus long terme, l'organisation EFO devrait aborder le parasitage institutionnalisé en émettant des droits de propriété commercialisables. Sur le court terme, elle doit s'engager auprès du magasin de distribution (acheteur) afin de supprimer les imperfections du processus de classification qui dissimulent l'origine d'un produit de qualité médiocre. Des négociations transparentes et arbitrées, débouchant sur un contrat avec l'acheteur et comportant des intéressements, peuvent également aider à établir une confiance et réduire le parasitage au sein de l'EFO.

Mots-clés : *Petits cultivateurs; agriculture biologique; marketing collectif; parasitage*

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1. Introduction

Smallholder farmers are often excluded from supply chains by high transaction costs (Simmons 2002). In many cases, vertical coordination must be preceded by horizontal coordination between smallholders so that agents who sell farm inputs or who buy farm products are not faced with a multitude of small transactions. Poulton & Lyne (forthcoming) argue that horizontal coordination can range from informal agreements between farmers to coordinate purchases and sales, to groups that are formally constituted to facilitate collective action (such as farmers' associations and organizations), and ultimately to groups that elect or hire managers (such as farmers' cooperatives and investor-owned firms). These last represent horizontal integration as opposed to horizontal coordination where collective action still involves some degree of shared decision making.

While horizontal coordination and integration can reduce transaction costs and improve smallholder access to more reliable markets, group arrangements can introduce costs and institutional problems that discourage smallholder participation and investment. Gadzikwa et al. (2006) examined costs and other determinants of continued participation in the Ezemvelo Farmers' Organization (EFO), a group of certified organic crop growers in KwaZulu-Natal, South Africa, and identified free-riding as a potential threat to the group's performance. Ostrom (1992) and Gripsrud et al. (2000) view free-riding as one of three types of opportunistic behavior, in addition to rent-seeking and corruption, found in many smallholder group institutions. Cook and Iliopoulos (1999, 2002) and Sykuta and Cook (2001) highlight the adverse effects of free-riding on the performance of traditional marketing cooperatives and attribute the problem to ill-defined property rights within these organizations.

The EFO was started in 2001 by the University of KwaZulu-Natal as a project for producing traditional vegetables and was certified as organic in 2003. The organization's members produce organic crops individually and market them collectively to a packhouse in Durban. The packhouse supplies a retail chain well known for its high quality products in South Africa. Membership comprises 48 fully organic certified farmers who founded the organization, and 103 partially certified members who joined later and are in transition to fully certified status. The principal crops cultivated include *amadumbe* (taro), sweet potatoes, and potatoes. The EFO's constitution entrenches several principles that underpin traditional cooperatives, such as net margins distributed according to patronage, democratic control (one member one vote) and open membership. Unlike a cooperative, the EFO has no equity ownership scheme and therefore does not offer shares in return for capital invested by its members. The arguments presented by Cook and Iliopoulos (2002) suggest that the EFO is likely to suffer from several free-rider related problems because the gains from cooperative action can be accessed by individuals who did not fully invest in creating them.

Empirical studies of free-riding behavior have been predominantly experimental in nature, intent on identifying the incidence of free-riding while controlling for social and cultural factors (Andreoni 1995; Chong 2001). Some empirical studies have analyzed the impact of group size on free-riding in real world contexts, sometimes ignoring other important variables such as group heterogeneity (Naidu 2005). Chong (2001) noted that the incentive to free-ride is influenced by socioeconomic variables and strongly linked to the nature of the public good. This study seeks to measure free-riding within the EFO in order to gauge its significance and identify its determinants. It uses principal components analysis (PCA) to construct an index of free-riding from data gathered in a census survey of the EFO's 151 members, and regression analysis to identify its determinants. Evidence of serious free-riding would suggest that the EFO should change its institutional rules to better align individual costs and benefits.

In the following section the paper introduces theories about factors influencing free-riding. In Section 3 it discusses variables that measure various aspects of free-riding at the EFO and which could be reduced to a single index using PCA. Section 4 postulates a regression model to explain variation in the index, Section 5 presents the results of the PCA and the OLS model, and the final section draws conclusions and offers recommendations for institutional change at the EFO.

2. Factors influencing free-riding

The free-rider problem is highly pervasive and often occurs in situations where collective action is required (Esteban & Ray 2001). Free-riders avoid the full cost of benefits they receive from collective action. Group formation is undermined by what members think of free-riding, while the productivity of individual group members is affected by the suspicion that members are free-riding (Kidwell & Bennett 1993). Free-riding can be distinguished as external and internal. External free-riding occurs when non-members of an organization cannot be excluded from accessing group membership benefits. Internal free-riding occurs when members shirk their membership obligations, but at the same time access full membership benefits. The theory of free-riding is therefore relevant to problems of the commons (Edney 1980), social traps (Platt 1973) and social dilemmas (Orbell & Dawes 1981).

Economists usually assume that individuals are inherently selfish and are therefore likely to adopt free-riding as a dominant strategy in the provision of public goods (Ledyard 1995). Unlike private goods, public goods are characterized by non-excludability and low rivalry. Between the two extremes of public and private goods are toll goods (low rivalry, high excludability) and common pool resources (low excludability and high rivalry). Groups of organic certified smallholders are often more concerned with acquiring these intermediate goods than acquiring public goods. Some of the services managed by the EFO constitute intermediate goods (e.g. storage and transport) while others resemble public goods (e.g. product inspection and market access). Free-rider problems occur in both instances and could harm the EFO's ability to provide members with access to a reliable niche market.

Organizing collective action incurs costs. Rational individuals, acting selfishly, would be unwilling to bear these costs personally if the benefits accrue to free-riders. The influence of group size on free-riding once a group has been formed is a function of noticeability, perceptibility and individual share in the benefits of collective action (Albanese & Van Fleet 1985). Small group sizes increase the noticeability of free-riders, and members tend to perceive that their contributions will make a difference, inducing contributions from others. In large groups, noticeability of member contributions diminishes and group administrators tend to have less information about each member to verify individual behavior (Rokkan & Buvik 2003). Growth in the size of the group is therefore expected to increase the cost of monitoring and enforcing members' contributions, while simultaneously diluting their individual benefits. In short, members of large collective action groups have greater opportunity to free-ride and less incentive not to free-ride than do members of smaller groups. Olson (1965: 48) concedes that the dominant strategy in large groups will be to free-ride in the absence of coercion or selective (e.g. proportional) benefits, but argues that some members may be willing to pay all of the costs themselves if they stand to capture a significant share of the benefits. Although the EFO's constitution does not provide for proportional benefits, it is possible that a skewed distribution of incentives might alleviate some of the adverse effects that a rapidly growing

membership is expected to have on its performance. Larger farmers may tolerate some free-riding by smaller farmers as they stand to benefit more from the niche market.

Most empirical studies of free-riding behavior have focused on Olson's (1965: 34) proposition that an increase in group size encourages free-riding (Sweeney 1974; Marwell & Ames 1979; Tillock & Morrison 1979; Alfano & Marwell 1980; Isaac & Walker 1988). The majority of these studies found that group size is positively associated with free-riding tendencies (Sweeney 1974; Alfano & Marwell 1980; Isaac & Walker 1988). However, others (Marwell & Ames 1979; Tillock & Morrison 1979) did not – possibly because group size effects may be offset by common goals, a skewed distribution of potential benefits, coercion or institutional arrangements that provide for proportional incentives. For example, the group may organize along the lines of an investor-owned firm (IOF) where shareholders earn dividends and capital gains in direct proportion to their equity contributions.

Free-riding theory also deals with coercion and incentives, particularly in large groups, to ensure that benefits are fairly shared. Coercion may include policies and procedures, controls, management directives and threats of expulsion. Special incentives could include shares, personal recognition and bonuses that improve proportionality between individual costs and benefits. A group member's decision to free-ride, according to Stroebe and Frey (1982), is influenced by the net benefit of contributing to a group's activities versus the net benefit of free-riding, which depends on the probability of detection and the penalties attached to free-riding (Fjeldstad 2004). Free-riding would be less likely where there are increased chances of detection and severe penalties. The EFO does not enforce a penalty system. For the purpose of this study, individual net benefits were approximated as the difference between the average rankings assigned by members to the benefits and the costs of participating in the EFO (see Section 4). These rankings reflect member perceptions and therefore indicate the relative importance of individual net benefits. For example, a member with a high off-farm income might claim fewer benefits and pay higher costs for participating in the EFO than would a member who depends heavily on farm income – even if they derive the same absolute net benefit. To some extent this captures both interest and wealth heterogeneity within the group – factors that influenced cooperation between members of forestry user groups studied by Naidu (2005) in India.

Trust can be defined as the level of mutual confidence that group members are dependable and competent (McAllister 1995), act with integrity (Robinson 1996), and will care for other members' interests (Mischel 1973) and not put each other at risk (Jarvenpaa et al. 2004). Higher levels of trust reduce transaction costs (such as the costs of negotiating rules and monitoring and enforcing compliance) and therefore strengthen incentives to cooperate. Alesina and La Ferrara (2000) contend that individual and socioeconomic characteristics (such as education, income and past experiences) influence how much people trust each other.

Clark & Sefton (2001) argue that trust reinforces reciprocity attitudes that reduce free-riding. It therefore follows that higher degrees of trust are associated with greater cooperation (Putnam 1993). This makes trust an important determinant of free-riding behavior. Dirks (1999) argues that less free-riding is expected where group members trust each other *and* any external parties central to the survival of the group: trust in an external party reduces transaction costs and therefore discourages free-riding by increasing the individual benefits of collective action. While acknowledging the importance of trust within a group, this study measures trust in terms of members' perceptions of the integrity of the buyer (the packhouse).

Boyd (1996) emphasizes the role played by information. Free-riding behavior is closely linked to problems of moral hazard and adverse selection that arise in contracts where

asymmetries of information are present. Nabli & Nugent (1989: 1337) argue that information asymmetry invites opportunistic behavior, raising transaction costs and encouraging free-riding. For example, grading procedures agreed upon by the EFO and the packhouse are flawed because produce cannot be traced to its point of origin (produce is pooled before it is graded by the packhouse). The packhouse cited costs and time constraints as the major reasons for failing to inspect and grade individual produce before bulking. Members who are aware of this flaw might deliberately channel inferior produce through the packhouse and so free-ride on (less well-informed) members who supply high quality produce.

The influence of household and context variables on household economic outcomes has been widely explored in the literature (Ehrenberg & Smith 2000). These variables may indirectly measure constructs such as trust, transaction costs and a member's ability to participate fully in an organization. Household and personal characteristics identified as significant determinants of free-riding tendencies include age, gender, family size and education (Putnam 1993; Wagner III 1995; Cadsby & Maynes 1998; Chong 2001). Wagner III (1995) found race and age to be significant determinants of cooperation in his study of cooperation among students at Michigan State University. Chong (2001) found age, education of household head and length of association to be negatively associated with free-riding amongst households in the obtaining of water services in Nicaragua and Guatemala.

Putnam (1993) argued that people who have interacted over long periods develop increased cooperation, which may result in reduced free-riding. Although fully certified members of the EFO have cooperated for more than four years, reservations about new entrants (partially certified members) free-riding on the effort and capital that they have invested in establishing the organization and its services (the 'horizon problem' described in Section 3) could easily offset any gains from cooperating over a long period. Orbell & Dawes (1981) evaluated the effect of suspicions of free-riding on group performance in an experimental study and found that members averse to carrying free-riders eventually reduced their efforts, a phenomenon known as the 'sucker effect' (Kerr 1983). The following sections develop a means of measuring the extent of free-riding within the EFO, analyze its importance and identify its significant determinants.

3. Modeling free-rider behavior at the EFO

This study uses principal components analysis (PCA) to construct an index from four related measures of free-riding. PCA is a data reduction technique that is often used to investigate relationships between variables (Doll & Chin 1970; Essa & Nieuwoudt 2003) and to construct uncorrelated indexes of correlated variables (Nieuwoudt 1972, 1977).

PCA achieves parsimony and reduces dimensionality by extracting the smallest number of principal components (PC_i) that account for most of the variation in the original multivariate dataset and summarizes the data with little loss of information:

$$PC_i = \sum_{j=1}^{p} a_{ij} x_j, \quad i = 1,2,...,p \tag{1}$$

where x_j are the p variables under study. The coefficients α_{ij} are computed such that the first principal component or index (PC_1) accounts for the largest share of variance in the original x_j that is possible, and the second index (PC_2) is chosen to be uncorrelated with the first and to account for the largest possible share of the remaining variance, and so on (Nieuwoudt 1977). PC_i with eigen values smaller than unity can be ignored as they account for less variation than do any of the original x_j. In this study the first principal component had an eigen value of 1.63 and accounted for 54% of the variation in the original x_j (section 5). This index (labeled FRINDEX) was used to compute a free-riding score for each member of the EFO. Descriptive statistics computed for FRINDEX (Section 5) shed light on the prevalence and seriousness of free-riding within the organization.

Free-riding could have been measured directly as the proportion of each member's produce rejected by the packhouse, but produce delivered to the packhouse could not be traced back to individual growers. Instead, three alternative variables are used to construct the composite measure FRINDEX. Two of these variables (attendance at meetings and packhouse sales expressed as a proportion of total organic sales) are directly observable measures of free-riding, while willingness to contribute to investments reflect subjective free-riding within the organization.

At the time of the survey, a total of 11 monthly meetings had been called by the EFO since the beginning of 2004. The majority of decisions that affected members were taken at these monthly general meetings. This study viewed non-attendance at monthly meetings as shirking and therefore as an indicator of free-riding by the member. Another indicator of free-riding was the share of organic goods a member sold to the packhouse compared with the total amount of organic goods the member sold: this was expected to be lower for free-riding members, as these members sell their best produce on other markets, thereby benefiting from the non-traceability of produce rejected for its poor quality.

With regard to the subjective measure of free-riding, members were asked if they would be willing to contribute capital to the organization to finance shared improvements such as storage facilities. A 'no' answer could indicate the existence of free-rider problems arising from a lack of proportional benefits or that there was a 'horizon' problem. The horizon problem has been analyzed in the context of traditional marketing cooperatives (Cook & Iliopoulos 1999, 2002; Sykuta & Cook 2001). It is caused by residual claims that do not extend as far as the economic life of the underlying asset (Porter & Scully 1987). Under these conditions, members tend to underinvest in long-term and intangible assets because they cannot realize capital gains by retiring shares at their market value. New members become free-riders as they benefit from past investments without paying fully for them in the form of higher share prices. The EFO's constitution does not assign tradable (benefits and voting) rights to members and therefore exposes members to a free-rider problem that discourages investment.

4. Modeling the determinants of free-riding at the EFO

The study hypothesized that FRINDEX scores computed for each member would be explained by membership costs and benefits, the member's level of trust in the buyer, asymmetric information, group size effects and personal characteristics. Information about membership costs was captured by asking respondents to rate the burden of membership fees, their time spent in meetings/group activities, additional work effort in crop production and increased expenditure on hired labor and other operating inputs on a Lickert-type scale

ranging from 1 (none) to 4 (severe). These scores were then averaged to compute a composite 'cost score' for each respondent. The EFO membership provides benefits such as fencing for fields, better access to tractor services, better access to information about organic crop production, access to reliable markets, better prices for crops, better access to inputs, subsidization of organic certification fees and a voice with which to lobby for support. Several of these benefits were subsidized by outside parties, especially the Provincial Departments of Agriculture, Transport, and Economic Development. Information about the benefits of collective action was elicited by asking respondents to rate the EFO's performance in realizing expected gains on a Lickert-type scale ranging from 1 (none) to 4 (major). These scores were then averaged to compute a composite 'benefit score' for each respondent from which the composite 'cost score' was subtracted to yield a 'net benefit' score.

Members' perceptions of trust between the EFO and the packhouse were measured on a Lickert-type scale of 1 (no trust) to 4 (strong trust). Following Dirks (1999), it was anticipated that members with higher perceptions of trust would be less inclined to free-ride. The presence of asymmetric information, which is expected to aggravate free-riding, was indicated by a dummy variable scoring one if the respondent was aware of the flawed grading procedures, and zero otherwise.

Information about changes in group size cannot be observed directly in a cross-sectional survey of one group. Instead, information about group size effects was captured indirectly by eliciting members' perceptions of how an increase in group size would affect the EFO's performance. A dummy variable was constructed, scoring one if the respondent thought the group would get weaker with increasing group size, and zero otherwise. Members' age, education, gender, certification status (a proxy for experience) and family size were included as explanatory variables to capture the impact of personal and household characteristics on free-riding scores. No a priori predictions were made about the direction of the impact that these variables might have on free-riding behavior, given the ambiguous findings and mixed results from previous studies. Nevertheless, these variables could influence perceptions of trust, costs and ability to participate, and hence levels of free-riding. The following OLS regression model was estimated for the free-riding model:

$$FRINDEX_i = \alpha_0+\alpha_1X_{1i}+\alpha_2X_{2i}+\alpha_3X_{3i}+\alpha_4X_{4i}+\alpha_5X_{5i}+\alpha_6X_{6i}+\alpha_7X_{7i}+\alpha_8X_{8i}+ \alpha_9X_{9i} +\mu_i \quad (2)$$

where *FRINDEXi* = principal component score computed for the ith member in standardized units,

X_{1i} = age of the *ith* member in years,

X_{2i} = gender, a dummy variable scoring 1if the *ith* members was female, and 0 otherwise,

X_{3i} = education of the *ith* member in years of formal schooling,

X_{4i} = the *ith* member's family size,

X_{5i} = certification status, a dummy variable scoring 1 if the *ith* member was fully certified, and 0 if partially certified,

X_{6i} = group size effects, a dummy variable scoring 1 if the *ith* respondent thought the group would get weaker with increasing group size, and 0 otherwise,

X_{7i} = asymmetric information, a dummy variable scoring 1 if the *ith* respondent was aware of flawed grading procedures, and 0 otherwise,

X_{8i} = net benefit score.

X_{9i} = trust score, a categorical variable ranked from 1 to 4.

5. Results and discussion

5.1 Prevalence of free-riding

Table 1 presents descriptive statistics for the variables used to compute the free-riding index. On average, members had attended only slightly more than half of the monthly meetings held since the beginning of 2004, and less than 38% of sales were channeled through the packhouse. These directly observable variables suggest that group performance was constrained by free-riding. The subjective preferences expressed by members painted a less gloomy picture of free-riding within the group. Two thirds of the members stated that they would be willing to contribute towards the cost of shared improvements (INVEST).

Table 1: Variables used to compute free-riding index (FRINDEX), EFO, KwaZulu-Natal, 2004

Variables	Unit	Mean	Std error
Number of monthly meetings attended (MEETINGS)	#	6.16	3.27
Willing to contribute towards group investments (INVEST)	%	66.89	47.22
Pack house sales as a proportion of organic sales (SALES)	%	37.36	41.35

The principal components were extracted from the correlation matrix computed for the variables in Table 1. This implies that the component coefficients (α_{ij}) are standardized and therefore indicate the relative contribution of each variable to the principal component. Only the first principal component had an eigen value large enough (1.634) for it to be considered an index of free-riding. This component accounted for 54% of the total variation in the data – similar to the 57% reported by Naidu (2005) for his index of cooperation amongst users of common pool forests in India. The first principal component was computed as:

$$FRINDEX_i = 0.782(MEETINGS_i^*) - 0.702(INVEST_i^*) - 0.729(SALES_i^*) \quad (3)$$

Where the asterisks denote standardized variables.

These variables contributed almost equally to the index as the coefficients are all of similar magnitude. Following the arguments presented in Section 3, FRINDEX can be interpreted as a positive measure of free-riding. Index scores ranged from -1.68 for the least free-riding member to 1.91 for the most free-riding one. Figure 1 illustrates the distribution of FRINDEX

scores after they had been classified into four categories consisting of low, moderately low, moderately high and high free-riders.

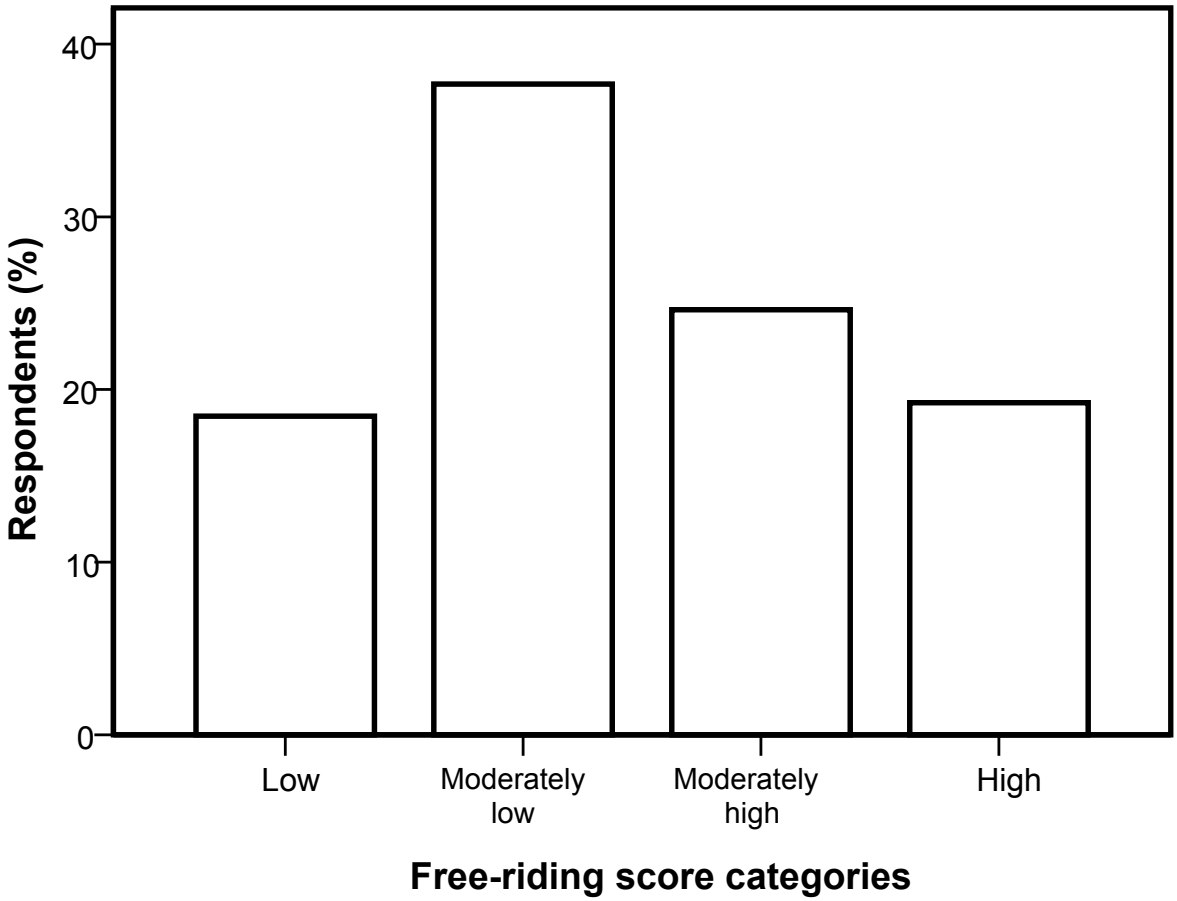

Figure 1: Distribution of free-riding scores at EFO, KwaZulu-Natal, 2004

The moderately low free-riding category is the modal class, with more than 43.8% of the cases above it, suggesting that a substantial share of the EFO's members are moderate to high free-riders. However, as explained in Section 2, it is important to establish which members are free-riding, since free-riding by 'small' members is less damaging for group performance than free-riding by 'large' members. Larger farmers stand to benefit more from collective marketing than do smaller ones, and may therefore tolerate some free-riding by small farmers.

A cross-tabulation of the categorized index scores with categorized farm sizes showed that the largest farmers (>2 hectares) were also those with the largest index values, as shown in Table 2.

Table 2: Cross tabulation between free-rider categories and farm size at EFO, KwaZulu-Natal, 2004

Farm size (ha)	Free-riding score categories				Total
	Low	Moderately low	Moderately high	High	
0 through 1	21	42	22	19	104
1.001 through 2	3	4	3	4	14
2.001 through 3	0	0	3	1	4
3.001 through 100	0	0	3	0	3
Total	24	46	31	24	125

The chi-square was statistically significant (χ^2=11.9, p=0.008), indicating a positive relationship between farm size and free-riding. The implication is that high index scores could well constrain the EFO's performance. In summary, while it is not possible to make definitive statements about the incidence of free-riding at the EFO, it is clear that free-riding will affect a majority of farmers whose participation is essential for group performance, and that variation in FRINDEX can be exploited to identify significant determinants of free-riding.

5.2 Descriptive statistics of the explanatory variables

Table 3 presents descriptive statistics computed for the explanatory variables in the regression models. The average age of members was 50 years, and the majority (75%) were women. The mean level of education among the EFO members was low at 4.61 years of formal schooling.

Table 3: Descriptive statistics of explanatory variables of free-riding, EFO, KwaZulu-Natal, 2004

Variables	Unit	Mean*
Age	Years	50.05 (13.94)
Gender (female =1)	%	74.83
Education (years of formal schooling)	Years	4.61 (4.41)
Family size	#	8.36 (4.37)
Certification status (fully certified =1)	%	31.79
Group size effects (group gets weaker =1)	%	5.96
Asymmetric information (present =1)	%	45.70
Net benefit score	#	5.96 (6.57)
Trust score	#	2.58 (0.25)

* mean values with standard errors in parenthesis

About 6% of the members perceived a negative correlation between increasing group size and group performance. The net benefit score, which ranged from negative eight to positive 22, averaged 5.96. Less than half of the EFO members were aware of the flawed grading procedures. The trust score had a mean value of 2.58, indicating that few members reported strong feelings of trust or distrust in the buyer.

5.3 Determinants of free-riding

Table 4 presents the results of the OLS regression model. The model was statistically significant and explained 41% of the variation in FRINDEX, a relatively 'good fit' for a model estimated from cross-sectional data. There is some evidence that women are less inclined to free-ride than men, as the gender coefficient is negative and statistically significant. This supports Bryson's (2006) finding that in New Zealand men were more likely to free-ride than women. Free-riding levels are also negatively associated with levels of education. The estimated education variable coefficient is statistically significant, implying that the relatively more educated organic group members are less likely to free-ride. This is consistent with arguments presented in Section 2 and with Chong's (2001) finding that better educated individuals are more cooperative.

Certification status is a highly significant determinant of free-riding behavior. The EFO's new (partially certified) members are more likely to free-ride than founding (fully certified) members. This finding is entirely consistent with the horizon problem described by Cook and Iliopoulos (1999, 2002) where, in the absence of tradable benefits and voting rights, new entrants free-ride on investments made by founding members.

Table 4: Marginal effects of explanatory variables on free-riding, EFO, KwaZulu-Natal, 2004

	Dependent variable = FRINDEX		
Explanatory variables	**β**	**Std error**	**t-value**
Constant	2.742	0.589	4.655
Age (years)	-0.004	0.006	-0.731
Gender (female=1)	-0.189*	0.116	-1.629
Education (years of formal schooling)	-0.034*	0.019	-1.776
Family size (#)	-0.018	0.020	-0.928
Certification status (fully certified =1)	-0.954***	0.185	-5.157
Group size effects (group gets weaker =1)	0.277	0.387	0.715
Asymmetric information (present=1)	0.227*	0.140	1.621
Trust score	-0.356**	0.170	-2.088
Net benefit score	-0.007	0.013	-0.553
Adjusted R-squared		0.410	
N		151	

*Significant at 10% level of probability ** Significant at 5% level of probability *** Significant at 1% level of probability

There is also some support for the argument that the presence of asymmetric information encourages free-riding. The asymmetric information variable has a positive regression coefficient and is statistically at the 5% level of probability. This may suggest that members aware of the flawed grading procedures may act opportunistically and free-ride.

Other studies of trust and cooperation have raised concerns that the trust variable might be endogenously determined, giving rise to an endogeneity problem (James et al. 2006; Mushayanyama & Darroch 2006). The study conducted a Hausman specification test for endogeneity as recommended by Gujarati (2003: 756) and failed to reject the hypothesis of

exogeneity at the 5% level.[1] All variables including trust were then entered into the model as exogenous variables. The regression coefficient estimated for trust is statistically significant and carries a negative sign supporting Dirks's (1999) contention that increasing trust in external agents (the buyer) reduces free-riding within the group.

It was anticipated that concerns about the large increase in the EFO's membership would represent a significant determinant of free-riding in the absence of proportionality between individual costs and benefits. While perceptions that the group would weaken with increasing size do appear to contribute positively to free-riding, the effect is not statistically significant, possibly reflecting the subjective nature of the variable used to measure changes in group size. The other insignificant variables include age, family size and net benefit score.

6. Conclusions and recommendations

This study set out to identify the presence of free-riding and its determinants in the Ezemvelo Farmers' Organization, a group of certified organic crop growers operating in KwaZulu-Natal. Principal components analysis (PCA) was used to combine variables measuring various aspects of free-riding into a single index. Members' scores on this index highlighted the presence of free-riding, and cross-tabulation of the index with farm size benchmarked the seriousness of the problem. Larger farmers essential to the EFO's collective marketing effort exhibited relatively high levels of free-riding behavior. The results of the OLS model suggest that members who are male, poorly educated, partially certified, aware of asymmetrical information related to grading procedures and who do not trust the buyer are more likely to free-ride.

In the longer term, the EFO should eliminate institutionalized free-riding by reorganizing along the lines of an investor-owned firm that issues tradable ownership rights proportional to individual investment. This will facilitate the partnerships needed to finance value-adding investments that improve the flow of net benefits to members. In the short term, the EFO must engage with the packhouse to remove flaws in the grading process that conceal the origin of low quality produce, and introduce adult literacy programs for its members. Transparent and mediated negotiations leading to an incentive compliant contract with the buyer may also help to build trust and so reduce free-riding within the EFO. Information about the goals and benefits of membership should be actively disseminated. Penalties for non-compliance might also be considered. While the study emphasized the importance of an incentive compliant contract with the packhouse, it did not analyze the existing contract to reveal all of its weaknesses. This is the subject of a future study.

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[1] The paper ran specifications using instruments to correct for the endogeneity of trust following approaches used by La Porta et al. (1997), James (2003) and James & Sykuta (2006). Using variables highly correlated with trust (commitment, communication, and years as an organic farmer) as instruments of trust in a two-stage model yielded similar results, in both magnitude and significance.

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