Contributions of Social Capital Theory in Predicting Collective Action Behavior among Livestock Keeping Communities in Kenya

Emily Ouma[1][*] and Awudu Abdulai[2]

[1] International Institute of Tropical Agriculture, c/o ISABU, Bujumbura B.P. 795 Burundi.
[2] Department of Food Economics and Consumption Studies, University of Kiel, Germany.

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[*] Corresponding author
Email addresses: e.a.ouma@cgiar.org and aabdula@food-econ.uni-kiel.de

Abstract

Social capital and collective action initiatives provide important avenues for access and uptake of improved livestock technologies through communal breeding programs among resource poor communities in developing countries. This study examines the factors that influence collective action behavior in crop-livestock and pastoralist production systems in Kenya by employing a binary logit model. The results show that age, gender of household members and education level of the household head exert significant influence on the decision to take up collective action. In addition, wealthy households are less likely to participate in collective action initiatives compared to the resource constrained. These results suggest that policies that encourage group formation may be effective in targeting improvement in livelihoods of poor populations through access to improved livestock.

Keywords: collective action; communal breed improvement programs; binary logit

1. Introduction

Social capital has increasingly gained recognition in many aspects of agriculture, natural resource management and rural development in developing countries due to its perceived positive consequences for development and opportunity for those who lack possession of and access to financial, human or natural capital[†]. Social capital theory provides a useful framework for explaining social connections or relationships that can generate collective action advantageous to a group (Meinzen-Dick et al., 2004). Past studies such as Mancini et al (2007) have shown the importance of collective action for the successful uptake of technologies for which cooperation is a prerequisite, such as integrated pest and disease management. This study discusses the potentials of collective action initiatives in access and uptake of improved livestock breeds in a developing country context. Breed improvement programs that utilize advanced breeding technology provide sustainable and viable pathways for improving livestock productivity particularly in Sub-Saharan Africa where productivity remains low compared to the rest of the world (Otte and Chilonda, 2002). Previous studies such as Wollny (2003) have identified community based livestock breeding initiatives as potentially sustainable pathways for poor livestock keepers to access improved livestock, whether from nucleus breeding herds from on-station breeds or existing breeds in village herds for village based breeding schemes.

Alternative access pathways such as artificial insemination using semen from superior breeding bulls from nucleus herds is often infeasible in developing countries due to the remoteness of rural communities and inadequate infrastructure such as electricity, necessary for storing semen in liquid nitrogen. The option of purchasing breeding bulls or pregnant heifers

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[†] Social capital has been defined by Putnam (1995) as "features of social life - networks, norms, and trust - that enable participants to act together more effectively to pursue shared objectives".

which have been inseminated with semen from superior breeding bulls may be limited to only a few livestock keepers who can afford it, locking out the more resource-constrained livestock keepers. Although collective action initiatives have potentially high contribution to improved livestock access, literature on factors that influence an individual's choice to take up collective action decision is relatively thin. Such information would be useful in developing appropriate interventions to enable facilitation and success of collective action initiatives. This study contributes by investigating factors that influence collective action in crop-livestock and pastoralist production systems in Kenya. The rest of the paper is organized as follows; Section 2 discusses the framework and empirical formulation of the collective action model. Section 3 presents a description of the survey data. Empirical results for the collective action model are presented and discussed in section 4 while section 5 presents concluding remarks.

2. Framework for Collective Action and Empirical Model

The theory of collective action is based on the institutional approach to the solution of societal problems and is thus concerned with the conditions under which groups of people with a common interest will perceive that interest and act on it (Clague, 1997). The foundational work on collective action in the economic sense was by Olson (1965). Collective action often leads to creation of peoples organizations, commonly referred to as groups which bring together individuals with common problems and aspirations and who cannot, as individuals, meet certain goals as effectively, if at all. By pooling their capital, labor and other resources, members are able to access certain resources or carry out profitable activities, which if undertaken by individuals alone, would involve greater risk and effort. This implies that group members have a common objective and means to achieve those objectives. In the context of communal livestock breeding programs, a breeding bull from a nucleus herd may be purchased by a group for use within the group on a rotational basis. The breeding bull then becomes a collective good. A collective good

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is non-excludable; therefore if it is provided to one member of the group, it cannot be withheld from any other member. Any attempt to acquire this good is considered collective action. If only a few members of the group pay for the collective good, yet it is provided to the whole group, then the free-rider problem develops[‡]. The free-rider problem can be overcome through peer pressure from the group members and by having smaller group sizes. The classic study by Olson (1965) suggests that collective action is more difficult to organize in larger groups relative to smaller ones.

The concept of social capital is closely related to collective action, and is often taken as an indicator of capacity for collective action. As such, empirical research usually incorporates both concepts when analyzing collective action. Social capital has been described as a combination of networks of individuals and sets of collective norms embedded in those networks (Ostrom et al., 1994). It deals with relations of trust, reciprocity and exchanges, common rules, norms and sanctions, as well as networks and groups, which are important mechanisms for building social capital assets (Meinzen-Dick et al., 2004). Such social ties are commonly viewed as important assets, a form of capital at par with physical, financial, human and political capital, and a potential instrument for building the other forms of capital. Several studies such as Ramos-Pinto (2006) have shown that social capital facilitates collective action. Elements of social capital have potentials to make collective action more or less likely. For instance, the degree to which close interactions or networks that characterizes a group can make cooperation more likely. The collective action and social capital concepts have been applied in a few economic studies such as Fujiie et al. (2005) to analyze the factors influencing successful collective action at individual and group level.

[‡] Free riders are economic agents who benefit from or consume a good but do not contribute to its provision.

An individual decision maker makes a choice decision whether to participate in a collective action initiative or not. Though choices are made under conditions of uncertainty, in this study, the decision maker is assumed to be risk neutral and aims at maximizing expected utility of profits. The decision maker is assumed to weigh up the expected utility of profits from the collective good or service through participation in a collective action initiative, represented as $E[U(\pi^P)]$ and the expected utility of profits from non-participation, represented as $E[U(\pi^N)]$. The decision to participate in a collective action initiative occurs when:

$$E[U(\pi^P)] - E[U(\pi^N)] > 0 \tag{1}$$

Where,

$$\begin{aligned} E[U(\pi^P)] &= U[E(PQ(X^P, Z^P) - W^P X^P)] \\ and\ E[U(\pi^N)] &= U[E(PQ(X^N, Z^N) - W^N X^N)] \end{aligned} \tag{2}$$

E is the expectation operator given the constraints facing the decision maker, P is the output price, Q is the expected output level, X is a column vector of input quantities, W is a column vector of the input prices and costs associated with the collective action such as financial contributions and transport costs to attend group meetings in case of W^P, and Z is a vector of household and other socioeconomic characteristics. The individual's expected utility of profits associated with participation and non-participation in collective action as presented in equation (2) is unobserved and can be represented by the latent variable Y^* which defines the propensity for the decision maker to participate in a collective action initiative:

$$Y^* = E[U(\pi^P)] - E[U(\pi^N)] \tag{3}$$

Y^* is unobservable to the analyst. What is observed is whether a decision maker participates in a collective action initiative or not. This can be presented as Y and is linked to Y^* as follows;

$$Y = 1 \ if \ Y^* > 0,$$
$$and \ Y = 0 \ if \ Y^* \leq 0. \tag{4}$$

When $Y^* > 0$, the decision maker decides to participate in collective action and $Y = 1$ is observed. Otherwise, if $Y^* \leq 0$ the decision maker decides not to participate in collective action and $Y = 0$ is observed. For an individual decision maker i, the latent variable Y^* is assumed to be related to observed characteristics through a structural model as follows (Greene, 2003):

$$Y_i^* = \beta X_i + e_i, \qquad (i = 1, \ldots, N) \tag{5}$$

Where X_i is a vector of household and other socioeconomic characteristics, β is a coefficient vector, and e_i is a random disturbance term. From equations (4) and (5), the probability of a decision maker i, to participate in a collective action initiative is given by the following probability model:

$$
\begin{aligned}
\Pr[Y_i = 1] &= \Pr[Y_i^* > 0] \\
&= \Pr[\beta X_i + e_i > 0] \\
&= 1 - F(-\beta X_i) \\
&= F(\beta X_i)
\end{aligned} \tag{6}
$$

Where $\Pr[.]$ is a probability function and $F(.)$ is the cumulative distribution function. The exact distribution of F depends on the distribution of the error term e_i. If e_i is distributed as a logistic random variable, then the logit statistical model results. In this study, the binary choice model for participation in a collective action initiative has been estimated using a logit model. The cumulative distribution function in equation (6) can thus be presented as a logistic distribution;

$$F(\beta X_i) = \frac{e^{\beta X_i}}{1 + e^{\beta X_i}} = \Lambda(\beta X_i) \tag{7}$$

Where $\Lambda(.)$ represents the logistic cumulative distribution function. The log-likelihood function for a sample of independent observations is then presented as;

$$
\begin{aligned}
\log(L(\beta)) &= \sum_{i=1}^{n} y_i \log(\Lambda(\beta X_i)) + \sum_{i=1}^{n}(1 - y_i)\log(1 - \Lambda(\beta X_i)) \\
&= \sum_{i=1}^{n} y_i \log\left(\frac{e^{\beta X_i}}{1 + e^{\beta X_i}}\right) + \sum_{i=1}^{n}(1 - y_i)\log\left(1 - \frac{e^{\beta X_i}}{1 + e^{\beta X_i}}\right) \\
&= \sum_{\{i; y_i=1\}} \log\left(\frac{e^{\beta X_i}}{1 + e^{\beta X_i}}\right) + \sum_{\{i; y_i=0\}} \log\left(1 - \frac{e^{\beta X_i}}{1 + e^{\beta X_i}}\right)
\end{aligned}
\tag{8}
$$

The parameters of the logit model are estimated by maximum likelihood methods.

3. Data Description

The data set for the binary logit estimation is from a recent survey of 304 households in Suba and Narok districts of Kenya representing crop-livestock and pastoral systems, respectively. A purposive random sample was employed to select cattle keeping households in the two districts. The survey was administered through questionnaire interviews by local enumerators who were trained prior to the exercise which took place between August and December 2004. The questionnaire was developed in collaboration with partners from the International Livestock Research Institute and Swiss Federal Institute of Technology. It covered varied information including household demographics, membership to groups, group activities and benefits. The dependent variable in the binary logit model is membership to a welfare group. Forty percent of the surveyed households are members of at least one welfare group, some of which are informal, unregistered organizations. Figure 1 presents the proportion of households who are members of various types of welfare groups.
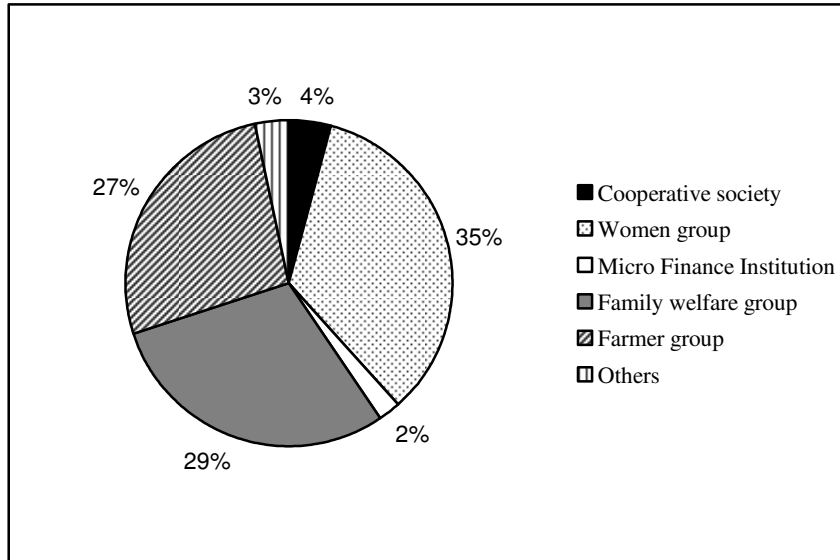
Figure 1: Membership to different types of welfare groups

Thirty five percent of the households are members of women groups while 27% belong to farmer groups. The services obtained from women groups are mainly agricultural extension advice and rotational savings while the farmer groups provide pooled farm labor services such as weeding and harvesting on a rotational basis. In Kenya, women group formation has been encouraged as a means of improving rural livelihoods through income generation and informal credit access. Twenty nine percent of the welfare group member households belong to family welfare groups. The services obtained from such groups include rotational purchases of income-generating equipments such as bee hives and emergency assistance of members to offset hospital and funeral bills.

Table 1 presents descriptive statistics for independent variables used in the empirical analysis. The means and standard deviations are presented separately for households who participated in collective action through welfare group membership and those who did not participate in any collective action initiative.

Table 1: Descriptive statistics based on welfare group membership

Variable	Member of a welfare group (n =123)		Non-member of a welfare group (n =181)	
	Mean	S. D.	Mean	S. D.
Age of household head (years)	56.2	14.8	46.3	15.7
Gender of household head (1 = male, 0 otherwise)	0.8	0.4	0.9	0.3
Years of education of household head	8.1	4.8	4.7	5.3
Number of adult female household members (above 18 years old)	1.8	1.1	1.5	1.2
Human population density (within a 5 Km radius)	93.7	39.5	48.2	43.7
Access to off-farm income (1 = yes, 0 otherwise)	0.1	0.3	0.2	0.3
Tenure system of owned land (1 = with title deed, 0 otherwise)	0.2	0.1	0.4	0.1
Cattle herd size	26.0	46.4	58.4	90.5
Distance to the nearest market (Km)	3.1	3.2	3.1	2.3
Travel time to the nearest large urban centre[*] (Hrs)	2.0	0.1	3.8	0.2
Narok district (1, if household is located in Narok district, 0 otherwise)	0.2	0.4	0.8	0.4

Source: Survey data

[*]The urban areas are defined on the basis of population densities, that is, population densities of more than 250 people km^{-2}

The independent variables used include farm and household characteristics, geographic location and market access variables. Household characteristics include access to off - farm income, age, gender and education of the household head as well as number of adult female household members. The average age of the household head differs significantly between

members and non-members of welfare groups, with an average of 56 and 46 years for the member and non-member households of welfare groups respectively (p<0.01).

The proportion of male heads of households in the sample population is an average of 80% and does not differ significantly between members and non-members of welfare groups. The average number of education years for heads of households differs significantly between member and non-member households of welfare groups at p<0.01. For households who are members of welfare groups, the average number of education years is 8.1 years compared to 4.7 years for non-members of welfare groups. Education enhances the ability of an individual to perceive and conceptualize the effects of collective action, thus permitting a critical evaluation and trade-offs of the costs, which may be in terms of both time and money, and gains from a collective good through collective action. In addition, education influences the depth and richness of social networks and produces skills in relating to others and effective contributions to group developments. If this hypothesis is true, then household heads who have more schooling will have a higher probability of being members of organizations such as community welfare groups. Presence of an adult female in the household is hypothesized to increase the probability of membership to a welfare group. More than a quarter of the sample households who are members of welfare groups actually belong to women groups. Most women in the rural areas of Africa have a tendency to organize themselves into welfare groups to meet their financial and material obligations, especially in the absence of a stable income. Table 1 indicates the average number of adult female members to be 1.8 for households who are members of some welfare group and 1.5 for the non-welfare group members.

Membership to welfare groups may also be influenced by the intensity of social interactions as they reinforce trust, an important aspect of social capital. Trust plays an important part in the formation of relationships and is essential to transactions that are not fully controlled

by either legal constraints of contracts or the economic forces of markets. The human population density variable has been included as an independent variable to proxy the intensity of social interactions. It is expected that social interactions among people tend to be more intense if they are concentrated within a smaller area (Fujiie et al., 2005). The average human population density variable is significantly different between the member and non-member households of welfare groups at p<0.01. The variable is strongly correlated with the type of production system, with a positive correlation for crop-livestock system which is predominant in Suba district and a negative correlation for the pastoral system common in Narok district. The hamlets, where the pastoral communities live are generally sparsely distributed in comparison to the crop-livestock farmers.

Access to off - farm income and other farm characteristic variables such as security of tenure of land owned and cattle herd size are used as wealth indicators. The average values of these variables differ between the member and non-member households of welfare groups as indicated in table 1. Lower mean values are reported for households who are members of welfare groups, implying that households that are members of welfare groups may be resource constrained and therefore have incentives to join welfare groups in order to improve their conditions. On the other hand, wealthy households with access to off-farm income and security of tenure of land may have alternative channels to meet their needs and may not have the incentives to join the communal welfare groups. Land tenure security in the form of individual property rights influences access to formal or informal credit since land is often used as collateral.

Market access may also influence the household's decision to undertake collective action. Distance to the nearest market and time taken to reach the nearest large urban centre have been used as measures of market access. The average distance to the nearest market is about 3 Km and does not differ significantly between members of welfare groups and non-members. Conversely,

average time taken to reach the nearest large urban centre differs significantly between member households of welfare groups and non-members at p<0.01. This may be attributed to the poor road infrastructure common in most rural areas of Africa. The effect of market access on participation in collective action initiatives has been widely debated. On the one hand a negative relationship between market distance and participation may be expected since areas closer to the market may have lower costs for interaction with the government for purposes of registering a society and for making their demands heard (Meinzen-Dick et al., 2004). However, Fujiie et al. (2005), note that in rural communities with little exposure to urban market activities, members expect to continue their interaction indefinitely, and hence have incentives to cooperate. Access to markets often decreases this interdependence, and therefore might reduce the likelihood of collective action.

4. Empirical Results

Table 2 presents the maximum likelihood parameter estimates and marginal effects of the binary logit model for membership to welfare groups. The model was estimated using LIMDEP Econometric software version 8.0 statistical package. The McFadden's R^2 value of 0.366 shows a moderately good fit[§]. The estimated coefficients have the expected signs though the market access variables, gender of the household head and cattle herd size are not statistically significant. The coefficient on human population density has the expected positive sign and is statistically significant at the 5% level. This result is consistent with the hypothesis that a high human population density strengthens social interactions as a basis for organizing collective action. This finding is similar to that found by Fujiie et al. (2005) in their study on collective action in the Philippines.

[§] The independent variables included in the model may not be exhaustive. Other variables such as group characteristics and policy factors (government regulations for groups) could also have significant influences but were not captured during the surveys.

Table 2: Binary logit model results for welfare group membership

Variable	Coefficient	Standard Error	Marginal Effects
Constant	-1.2881	1.0474	-
Human population density	0.0132[**]	0.0055	0.0030
Access to off-farm income	-0.6351[*]	0.3544	-0.1474
Age of household head	0.0251[***]	0.0100	0.0056
Years of formal education of household head	0.0804[**]	0.0357	0.0181
Number of adult female household members	0.2721[*]	0.1470	0.0611
Distance to the nearest market (Km)	-0.0003	0.0015	-0.0001
Travel time taken to the nearest large urban centre	0.0473	0.1454	0.0106
Tenure system of owned land (1 = with title deed, 0 otherwise)	-0.0014[***]	0.0004	-0.0003
Gender of household head (1=male, 0 otherwise)	-0.6543	0.4279	-0.1559
Cattle herd size	-0.0003	0.0033	-0.0001
Narok (1= Narok district, 0 otherwise)	-0.0205[*]	0.0156	-0.0105
Narok*Human population density	-0.0163[***]	0.0056	-0.0037
McFadden R^2 = 1- L_Ω/L_ω	.366		
Log likelihood function	-154.991		
Correct predictions	77.2%		
N	304		

Note: [***], [**], [*] indicate that coefficients are statistically significant at the 1, 5 and 10 % levels, respectively, using P-values in maximum likelihood estimation.

The coefficients on education level and age of the household head are also positive and statistically significant as expected, indicating that more educated and older heads of households are more likely to be members of welfare groups. The positive effect of age on likelihood of collective action participation may result from experience and repeated transactions between partners in a group which in turn reinforces trust and social capital. Sakurai (2002) also finds a

positive relationship between education level and membership to welfare groups. Older heads of households may have no alternative access to monetary resources especially as they may have retired from formal employment and may not have access to social welfare benefits. Consequently, the welfare groups may be important avenues for meeting their needs and cushioning against shocks. Similarly, the coefficient on number of female adult household members is positive and significant at the 10% level, indicating a higher probability of membership to welfare groups for households with female adult members.

The coefficients on access to off - farm income and tenure system of owned land, have the expected negative sign and are statistically significant at the 10% and 1% levels, respectively. This indicates that the probability of being a member of a welfare group is lower for households with access to off-farm income relative to households without off-farm income. The marginal effect of off-farm income indicates that access to off farm income reduces the likelihood of being a member of a welfare group by a substantial 15%. Similarly, the probability of being a welfare group member is lower for households with security of land tenure in the form of title deeds relative to those without tenure security. These results imply that households who are wealthy are less likely to be members of welfare groups compared to their wealth constrained counterparts.

The dummy variable coefficient for Narok district is negative and statistically significant at the 10% level. This finding indicates a lower probability of households in Narok district relative to Suba district to be members of a welfare group. This is probably because the district is dominated by pastoralist households making it difficult to participate in collective action due to frequent mobility.

5. Conclusions and Implications

Given the important role of communal based livestock breeding programs for livestock keepers to access improved livestock in developing countries, this study contributes to an understanding of factors that determine collective action behavior among livestock keeping households in Kenya. The binary logit results reveal a number of points of interest for policy makers and livestock development agents. The analysis indicates a strong relationship between some socio-economic variables and participation in collective action initiatives. Of interest is the finding that households that are wealth or resource constrained are more likely to participate in collective action initiatives relative to those that are resource endowed. This suggests that policies that encourage group formation may be effective in targeting improvement in livelihoods of poor populations through access to improved livestock. Resource poor livestock keepers may form breeding groups that act as multipliers which receive bulls of proven genetic merit from a nucleus herd for rotational mating among herds of group members. The proven bulls could be obtained through purchases from monetary contributions of group members or through alternative payments in the form of offsprings from the proven bulls. As argued by Wollny (2003), the success of such groups depend on support of other integral sound management practices such as health care, feeding, reproduction and housing in order to minimize mortality and reproduction losses.

Human population densities also appear to be positive and significant in influencing collective action. This implies that communal livestock breeding programs may be easy to organize for sedentary livestock keepers such as those in mixed crop-livestock systems where human population densities are high and social interactions strong. However, it may be difficult to organize for pastoral systems due to the high level of mobility of pastoralists as they search for

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water and pasture with changing seasons. Van der Waaij (2001) suggests that for such systems, cattle keepers ought to individually purchase the improved cattle for upgrading their own. Since artificial insemination may not be feasible in such areas, purchases may be in the form of pregnant heifers or proven bulls.

References

Clague, C. (1997). *Institutions and Economic Development: Growth and Governance in Less-Developed and Post-Socialist Countries*. The Johns Hopkins University Press, Baltimore and London.

Fujiie, M., Y. Hayami, and M. Kikuchi (2005). "The Conditions of Collective Action for Local Commons Management: The Case of Irrigation in the Philippines". *Agricultural Economics*, 33(2):179-189.

Greene, W. (2003). *Econometric Analysis*. 5th ed. Prentice hall, New Jersey.

Mancini, F., Van Bruggen, A.H. and Jiggins, J.L.S. (2007). "Evaluating Cotton Integrated Pest Management (IPM) Farmer Field School Outcomes using the Sustainable Livelihoods Approach in India". Experimental Agriculture, 43: 97-112.

Meinzen-Dick, R., M. DiGregorio, and N. McCarthy (2004). "Methods for Studying Collective Action in Rural Development". *Agricultural Systems*, 82 (3): 197-214.

Olson, M. (1965, 1971). *The Logic of Collective Action: Public Goods and the Theory of Groups*. Revised Edition, Harvard University Press.

Ostrom, E., R. Gardner, and J. Walker (1994). *Rules, Games and Common-Pool Resources*. University of Michigan Press, Ann Arbor, MI.

Otte, J. and P. Chilonda (2002). "Cattle and Small Ruminant Production Systems in Sub-Saharan Africa: A Systematic Review", FAO, Rome. pp 13.

Putnam R. 1995. Bowling Alone: America's Declining Social Capital Journal of Democracy 6 (1) 65-78.

Ramos-Pinto, P. (2006). "Social Capital as a Capacity for Collective Action", in R. Edwards, J. Franklin and J. Holland (Eds) *Assessing Social Capital: Concept, Policy, Practice*, Cambridge Scholars Press.

Sakurai, T. (2002). "Quantitative Analysis of Collective Action: Methodology and Challenges". Paper Presented at a CAPRi Workshop on Collective Action, on 25-28th February 2002 in Nairobi, Kenya.

Van der Waaij, L. (2001). *Breeding for Trypanotolerance in African Cattle*. Ph.D. Thesis, Wageningen Agricultural University, The Netherlands.

Wollny, C. B. A. (2003). "The Need to Conserve Farm Animal Genetic Resources in Africa: Should Policy Makers be Concerned?" *Ecological Economics*, 45(3):341-351.