

Local organizations involved in the conservation of crop genetic resources: conditions for their emergence and success in Ethiopia and Kenya

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Abstract

Local organizations comprising of farmers, local formal and informal institutions, and public conservators can potentially be relevant options to confront the challenges of conserving indigenous crop varieties in developing countries. Although property rights and market failure problems experienced in crop genetic resources (CGRs) are different from other natural resources such as forests, wildlife, etc., such local organizations, and contractual arrangements within them, can be very instrumental in enhancing on-farm conservation. However, empirical investigations of such local organizations in order to determine the dimensions of their feasibility have been scarce. Against this background, this paper analyzes interactions of stakeholders in these local organizations and then explores the conditions for their emergence and success. The paper discusses field cases of on-farm conservation of traditional cereals and pulses from Ethiopia and indigenous vegetables from Kenya. It points out that local organizations conserving CGRs can be classified into different categories of contractual arrangements depending on certain driving factors that influence interactions of stakeholders and devolvement of decision-making authority. The paper further argues that these driving factors, which include accessibility to markets, presence of collective action or self-organizational capacity and provision of relevant CGRs conservation policies, form some of the key conditions determining the success of the case study organizations. The paper concludes by outlining policy implications on the structuring of such local organizations and the importance of certain factors in facilitating their emergence and success.

Introduction

The principal managers of crop genetic diversity in developing countries are farmers and particularly those living in marginal areas. Driven by survival motives involving issues far from simple profit maximization, these farmers make decisions on the choice of crop and varieties to plant, and produce

seeds and select them for storage and planting (Bellon 1996; Brush 2000). Further, they are often confronted with a diversity of interests and, with the absence of a single variety that they can fully depend on for their multiple needs, they manage a range of varieties using a diversity of selection criteria (Maxted et al. 2002). Moreover, the seeds produced are usually exchanged with other farm-

ers from within and outside their communities and thereby new varieties are obtained, and lost or degenerated ones are replaced. By producing a diverse set of crop varieties, these farmers practice a form of crop development and maintain crop genetic diversity through on-farm conservation, which is a subset of *in situ* conservation of crop genetic resources (CGRs). Thus, as past studies on on-farm conservation of CGRs¹ acknowledge, farmers are a major stakeholder group involved in maintaining traditional varieties (Bellon 1996; Thies 2000; Maxted et al. 2002).

Despite uncertainties concerning the extent and rate of diversity decline in CGRs (Virchow 2003), their conservation is taking place in a number of developing countries through *ex situ* and *in situ* approaches. Although *ex situ* conservation is still the dominant approach, *in situ* conservation has recently entered the stage for conservation of intra-species diversity. Taking *ex situ* and *in situ* to be complementary conservation strategies (Meng et al. 1998; Maxted et al. 2002), the latter is more preferred due to its dynamic feature to allow the genetic resources to adapt themselves to the natural and socio-economic environment (Evenson et al. 1998). However, the level of crop diversity that farmers produce *in situ* is less than what society wants to have mainly because each farmer makes independent decisions based only on observable characteristics of the varieties. For this reason, there could be landraces of no direct or immediate interest to any farmer, resulting in possible extinction, and also landraces of interest to thousands of farmers, resulting in redundancy.

Although farmers play an important role in the conservation of CGRs through managing diversity and maintaining it in their production systems, governments and other stakeholders such as non-governmental organizations (NGOs) and private companies also make important contributions. Success of CGRs conservation initiatives cannot, therefore, wholly depend on farmers' conservation activities alone (Rajanaidu and Ramanatha Rao 2002). Moreover, due to imperfect markets (Bellon 1996) and transaction costs, the social and private marginal benefits are not identical and therefore the level of conservation is sub-optimal. This calls

for creation of institutions or institutional arrangements that, by creating new incentives or imposing new constraints, would enable stakeholders of CGRs to transcend these limitations. Contracts involving NGOs, research institutions and farmers (other stakeholders may also be involved) in CGRs conservation initiatives could be regarded as a good example of such institutional arrangements. These contracts are notably informally created but, in a few cases, they may also be formal.

Empirical analyses of institutional arrangements for on-farm conservation of CGRs in order to determine their characteristics and dimensions of their feasibility have remarkably been scarce. In designing institutional arrangements of on-farm conservation of CGRs, it is particularly important to consider essential determinants of their effectiveness, for example, capacity for collective action and other important socio-economic characteristics of farmers, driving forces such as accessibility to markets and the capacities of the public institutions. Against this background, this paper examines local organizations² involved in CGRs conservation in Ethiopia and Kenya in order to characterize the institutional or contractual arrangements within them and determine the conditions for their emergence and success, and factors affecting farmers' capacity for better crop diversity outcome. Addressing these issues is hoped to shed light on some of the incentives that local organizations create to improve the non-optimality of conservation through harmonization of farmers' variety choice criteria with national and international CGRs conservation strategies. For the national governments, such knowledge would be important in the setting up of policy and institutional frameworks that have to be applied in close cooperation or partnership with the farmers.

The paper is structured as follows: The next section provides a theoretical exploration of how different contractual arrangements can be designed and classified. The third section describes the study areas and presents the methods used to collect the data. This is followed by the fourth section, which discusses the roles and interests of the participat-

¹ Plant genetic resources include farmers' varieties (cultivated traditional species) and non-cultivated species from other plant species. CGRs in this study refer to farmers' varieties.

² The term 'local organizations' in this paper represents the association of different groups of stakeholders operating at the community level for the purpose of promoting production of indigenous varieties.

ing stakeholders, identifies the different factors influencing emergence of the local organizations and characterizes the different kinds of contractual arrangements that are created. In the fifth section, the outcome or success of the case study local organizations is assessed in terms of efficiency, equity and sustainability criteria, and the conditions or factors determining it are examined. Finally, the sixth section draws some conclusions and policy implications.

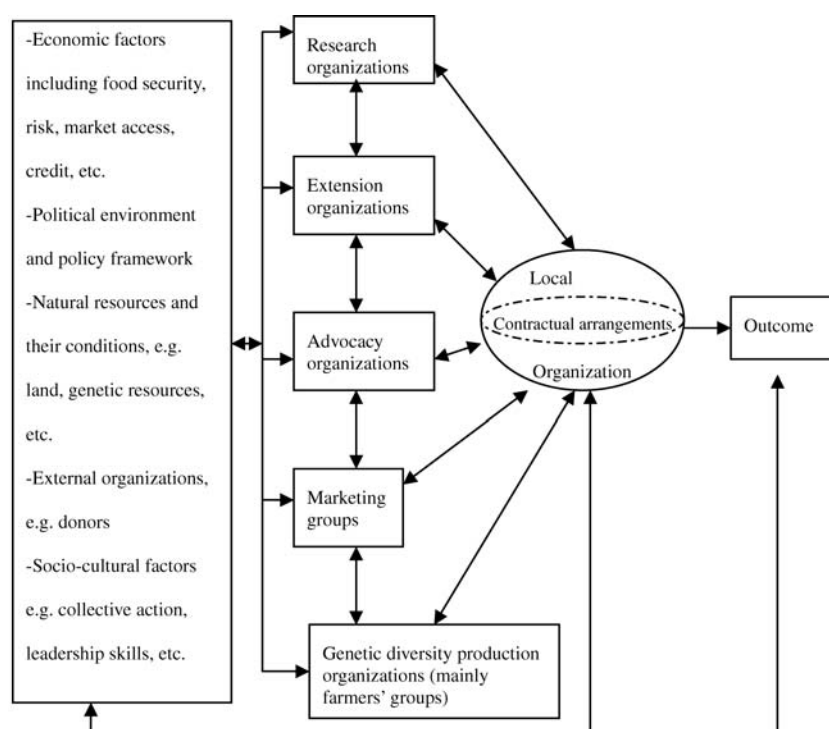
Contractual arrangements for the conservation of CGRs

Design of contractual arrangements

We argue in this paper that farmers, in their efforts to enhance production of indigenous varieties, relate with other stakeholders (Figure 1) in the local area leading to the formation of a local organization. The farmers may be individuals or

organized in groups e.g., women groups, self-help groups and work groups. The stakeholders involved enter into a relational contract or institutional arrangements which structures how they are going to relate with each other in the long-term. These stakeholders can be classified into organizations or groups according to the activities they carry out to promote on-farm conservation of CGRs. Whereas some stakeholders may be specializing in a single activity, e.g., the marketing groups being involved in a marketing activity, others like the NGOs conduct multiple activities such as advocacy, marketing, research and extension.

The creation and maintenance of local organizations, and contractual arrangements within them, is expected to be dependent on a wide range of factors (see Figure 1) including the political environment and policy framework conditions, economic factors, organizational capacity and other socio-cultural aspects of the farmers, and nature of crops being conserved



Source: own schematic presentation

Figure 1. Interactions among different stakeholders in a local organization conserving crop diversity.

(Bellon 1996; Smale and Bellon 1999). It is also expected that these factors will affect the internal organization of individual stakeholder groups and their capacities to participate as members of the local organizations. Environmental factors are particularly important for the farmers in that they can be the sole determinant of the choice of the varieties that can be maintained in their farms. For instance, through their indigenous knowledge farmers have learnt to maintain certain traditional varieties of cereals that do well with low rainfall or short rainfall seasons, and require low level of management and inputs (Bellon 1996). Largely, it can be hypothesized that the factors shown in Figure 1 are key determinants of the incentives created for stakeholders' participation, and the emergence and overall outcome or success of the contractual arrangements. This outcome can be analyzed in terms of efficiency, equity and sustainability (see the section on 'Conditions for success of local organizations').

Types of contractual arrangements

Depending on their objectives, one can identify two categories of contractual arrangements:

- (1) arrangements whose sole objective is to promote utilization of CGRs and hence ensure their conservation (Wale et al. 2003), and
- (2) arrangements whose primary objective or motive is not on-farm conservation through enhanced utilization of crop diversity (Wale et al. 2003; Thies 2000).

The latter arrangements are often adopted in participatory crop improvement breeding approaches, e.g., participatory varietal selection, and are often tailored to involve farmers in the testing of the adaptability of varieties in their localities, conducting seed production activities, and sometimes extending new crop varieties or supplementing agricultural extension services. For example, in India and Nepal the participatory approach has been successfully applied in enabling farmers to identify existing local varieties that they greatly prefer but had never had the opportunity to try them (Witcombe and Lenne 1999).

Drawing on Oakley's (1991) criteria for identifying typologies of participation³, contractual arrangements within local organizations conserving CGRs could further be classified according to the levels of farmers' participation and benefits (mainly in terms of power) drawn from variety testing and crop utilization activities. Thus, we can subsume three broad groups of contractual arrangements, which are likely to be present wherever farmers are involved in the choice and promotion of certain crop varieties. Seen from the perspective of the government agencies (mainly research and extension agencies), these three types of relational contracts can be termed as consultative, interactive and informative arrangements.

Under *consultative* arrangements, the role of the farmers is to answer questions from extractive researchers (e.g., crop breeders, agronomists, etc.) and extension agents. Farmers are told of the usefulness of the genetic materials but they are not able to influence their analysis or use since there are no structures for making common decisions. These contracts are also referred to as 'take or leave contracts' since the farmers do not have the possibility to negotiate (Salanie 1997). The *interactive* contractual arrangements are characterized by researchers and farmers co-operating in making decisions on the analysis of varieties to be grown or conserved on-farm. Thus, farmers have a stake in maintaining their traditional farming practices, e.g., keeping existing landraces, or adopting new ones (Witcombe and Lenne 1999). An extreme case of the interactive arrangements is characterized by farmers mobilizing themselves and adapting certain crop genetic materials in their localities due to their high capacity for self-organization and other driving forces such as market access, risk, resource endowment and change of consumer behavior. We refer to these kinds of arrangements as *informative*. They are however not common in CGRs conservation activities initiated by government agencies.

The consultative, interactive and informative types of contractual arrangements would be expected to have different levels of achievement of

³ Since the broad concept of participation has diverse meanings and interpretations, we wish to redefine participation to reflect its application in this paper. In this case we regard participation as a process where farmers not only take an active role in contributing their own resources (farmland, farm inputs, labor, local know-how, etc.) in CGRs conservation activities but also are actively involved in the decision making process.

CGRs conservation; and their application depends mainly on the local conditions and the set objectives. Though they may exist in the form of simple formal or informal agreements involving research institutions, extension departments and farmers, complex arrangements that as well involve universities, seed producing companies and NGOs could occur. It can be hypothesized that the level of on-farm conservation of CGRs and chances of success will be the lowest with consultative contracts and the highest with the informative contracts since the major determinant is the level of farmers' involvement in the decision-making process. On the other hand, participation of farmers in decision-making processes would largely depend on the capacity for self-organization or collective action (as a result of farmers being in small groups, being homogenous, possessing social capital, having able leadership that aid self-organization, etc.) within the farming communities (Meinzen-Dick and Knox 2001).

Description of study areas and data collection procedures

Description of study areas

In Ethiopia, data used in this study was collected from the districts where the Global Environment

Facility (GEF)-sponsored 'a dynamic farmer-based approach to the conservation of Ethiopian plant genetic resources' project operated. Through this project, the Institute of Biodiversity Conservation and Research (IBCR) has established 12 community seed/gene banks in 6 different regions (Table 1). Agro-ecologically, the regions with these community seed banks are characterized by highland, mid highland (midlands) and lowland zones. The area covered by each of these agro-ecological zones varies considerably from one region to the other. For instance, the Bale region has 17% of its area classified as highland, 31% midland and 15% lowland, while the corresponding areas in Keffa Sheka region are 70, 10, and 20% respectively. The altitude of the regions ranges from 700 to 4300 m above the sea level (Demissie and Arega 2000). Rainfall is bimodal in most regions and the annual amount increases with altitude. In the highlands, crops such as barley, wheat and oats are better adapted, but one can also find tef (*Eragrostis tef*), highland maize, highland sorghum and linseed. Crops which are better adapted to the mid highlands are maize, sorghum, tef and millets, while most of the legumes perform better in the lowlands. Beef cattle and goats are mainly found in the lowlands, while most of the dairy cattle and sheep are kept in the highlands and midlands.

Table 1. Community seed banks: distribution, membership, crop varieties and their seed outputs.

Region	District	Targeted farm families ^a in a district	Membership (no. of farmers in CCAs)			No. of crop varieties	Quantity of seed (MT)	
			Male	Female	Total % of targeted farm families			
East Shewa	Lume		800	200 (0.20)	1000			
	Ghimbichu		240	60 (0.20)	300	4	3.63	
Bale	Agarfa	31,178	86	12 (0.13)	98	0.31	3	3.17
	Goro	19,469	82	19 (0.19)	101	0.52	5	1.95
Keffa Sheka	Decha		170	56 (0.25)	226		5	1.30
	Chena		268	29 (0.10)	297		6	1.47
North Shewa	Ankober		70	18 (0.20)	88		2	2.36
	Insaronawayu		60	6 (0.09)	66		5	1.32
South Wollo	Kallu	168,831	206	17 (0.08)	223	0.13	3	8.67
	Woreilu	34,998	311	51 (0.14)	362	0.82	8	9.82
East Tigray	Hawzen		270	30 (0.10)	300		11	7.00
	Genta Afeshum		270	30 (0.10)	300		9	2.44
Total			2833	528 (0.16)	3361		68 (22) ^c	46.76

Source: Data derived from the project reports of the IBCR and documented by Tanto and Arega (2000), Demissie and Arega (2000), Tanto and Demissie (2001), and Tsegaye (2003).

^aData on total number of farm families targeted by the project was lacking from reports of eight of the seed bulking sites.

^bMen and women entered in the table are from different farm families/households. Figures enclosed in parantheses represent the proportion of women members out of total membership of CCAs.

^cThere were a total of 22 different crop varieties handled by the seed banks.

The objective of establishing the community seed/gene banks was to arrest the rate of loss of crop genetic resources in farmers' fields. Prior to the establishment of these seed banks, serious genetic erosion had been occurring due to market forces, and policy and human-related factors (Tsegaye 2003). The most threatened crop was the durum wheat (*Triticum durum Desf.*), which had been completely replaced by improved bread wheat varieties in some localities. Besides aiming at containing this loss of crop diversity, the project was to develop a sustained capacity for CGRs conservation in the country, and strengthen extension and market services that would promote utilization of local varieties. In addition to the establishment of community seed banks, the project had different specific objectives or tasks in each of the regions. These tasks were all geared towards enhancement of farmers' on-farm conservation efforts. The project was to analyze agromorphological characteristics of local and improved wheat varieties of wheat and barley in Bale; analyze ethno-botanical features and market outlets of durum wheat and barley in North Shewa; and study the impact of market incentives on farmers' on-farm conservation efforts in East Shewa. In Tigray, the project was to evaluate yield potential of farmers' varieties of different crops (tef, maize, barley, wheat, pea, faba bean and lentils); while in South Wello and Keffa Sheka, it was to analyze the diversity of Enset (*Enset ventricosum* [Welw.] Cheesman), sorghum, wheat and barley varieties and the associated indigenous knowledge of the local farmers (Tanto and Arega 2000). The number of farmers participating as members of these community seed banks and those targeted to benefit out of this initiative are shown in Table 1, and are further discussed in the section on 'Groups organized by research organizations.'

In Kenya, data on indigenous leafy vegetables (also called African leafy vegetables, ALVs) was gathered from the western part of the country, which, administratively, comprises of Western and Nyanza provinces, and some parts of the Rift Valley province. Districts known for ALVs production in this region include Nakuru, Transmara, Kericho, Kisii, Siaya, Busia, Butere-Mumias and Bungoma. The region, covering almost an eighth of the country, is agro-ecologically consistent owing to the influence of Lake Victoria. It was

chosen as the study area because it has a high diversity of ALVs and exhibits a closed and a common culture of leafy vegetable usage, quite distinct from other parts of the country (Maundu et al. 1999). It has an altitude range of 500–3100 m above the sea level and is characterized by humid, sub-humid and semi-humid agro-climatic zones. The amount of annual rainfall ranges from 900 to 2000 mm (Maundu et al. 1999). Due to the diversity of climatic, topographic and soils conditions, the region has diverse crop and livestock types and species. Cash crops grown in the region include cotton, rice, sugar cane, pyrethrum, coffee and tea, while the major food crops include maize, beans, ALVs, exotic vegetables, cassava, peas and different kinds of fruits. The production of maize as a food crop in the region is closely associated with the utilization of ALVs as the flour meal of the former has to be served with vegetables.

It is estimated that about 1000 ALV species are utilized in Africa and about 200 of these are used as leafy vegetables in Kenya. Only 4 species out of the 200 have been fully domesticated, while about 15 species are semi-domesticated and the rest are wild. Most of the domesticated and wild species are found in the study area (Maundu 1995). Kemei et al. (1995) document that both the domesticated and wild vegetable species in the study area have been grievously neglected and are threatened by severe genetic erosion. This is mainly because CGRs conservation policy in Kenya has to a large extent focused on genetic species of the exotic vegetables and it is not until quite recently that the importance of the ALVs in enhancing calorie intake of average Kenyan and alleviating poverty was highlighted (Maundu et al. 1999). To overcome this threat of genetic erosion through *in situ* conservation initiatives, several organizations and government institutions have been promoting ALVs production through activities such as marketing of vegetables, seed collection, seed processing and storage, seed multiplication, and regeneration and characterization of species. These organizations and institutions include the Kenya Agricultural Research Institute (KARI), Department of Extension Services in the Ministry of Agriculture, NGOs and bilateral donors. Several farmers' groups have also organized themselves and, with donors' support, are actively participating in the promotion of ALVs on-farm conservation. These groups target few farmers, often

within the range of 10–500 in an administrative location. Unlike the farmers' groups, the government institutions and NGOs lack clear targets and outreach objectives. They also operate in vast areas, often combining promotions of ALVs together with those of other traditional and exotic crops, and medicinal plants, and encompassing activities of the farmers' groups. This made it difficult to assess the targeted farmers that specifically fall under programs promoted by these stakeholder organizations or even those participating without having affiliations to other mobilization agents.

Survey methods and data

The evaluation of the stakeholders' interactions and dimensions of feasibility of different local organizations conducted in this paper is based mostly on qualitative data. However, some quantitative data was also collected from the study areas in the two countries.

In Ethiopia, both qualitative and quantitative data on on-farm conservation of traditional cereals and legumes, and the organizations involved was collected through two surveys in 2001 and 2003. The surveys focused on gathering data on on-farm conservation activities of sorghum, wheat, tef, barley, maize and pulses. During the surveys, the community seed bank sites were visited and informal discussions and interviews were conducted with farmers within the districts covered by the project. In addition, technical staff of the local NGOs, the IBCR, and the Ethiopian Agricultural Research Organization (EARO), and multilateral and bilateral donors involved directly or indirectly in the seed banking activities were interviewed. Data collected during the surveys included participation of farmers in the project, interaction of farmers with other stakeholders, crops cultivated and genetic resources conserved, marketing problems, farmers' perceptions of the project and constraints faced by the stakeholders. Moreover, data on the costs and achievements were gathered from secondary materials in the IBCR offices.

In Kenya, a survey targeting individual farmers, groups (mainly women groups), local NGOs, local research and extension departments involved in on-farm conservation of ALVs was conducted in

2003. Methods used for data collection included district rapid rural appraisals which were followed by informal stakeholders' interviews (guided by a checklist), joint field visits with the members of different stakeholder groups and participant observation in pocket areas known for ALVs production. Market surveys were also conducted in the regional cities and big towns in order to interview the marketing agents and middlemen involved in the vegetables' business. Data collected included marketing information (market availability, prices, agents, etc.) and utilization of ALVs, problems associated with production of ALVs, types of membership, history and capacities of the local organizations, benefits achieved and constraints faced when participating in the local organizations. In addition, information on the types of ALVs grown in the study area was gathered. These vegetables⁴ include theamaranths (*Amaranthus dubius*, *A. hybridus*, *A. cruentus*, and *A. graecizans*), Ethiopian kale (*Brassica carinata*), cowpeas (*Vigna unguiculata*), spiderplant (*Cleome gynandra*), jute mallow (*Corchorus olitorius*), the sunnhemp (*Crotalaria ochroleuca* and *C. breviflora*), pumpkin leaves (*Cucurbita maxima/moschata*), and the African nightshades (*Solanum americanum*, *S. scabrum*, *S. villosum*, and *S. eldoretii*) (Maundu et al. 1999).

Different stakeholders and their local organizations

Stakeholders' roles and interactions

In both Ethiopia and Kenya, local organizations involved in the conservation of CGRs can be classified depending on the type of the organizations mobilizing the farmers and the factors or driving forces leading to their emergence (see Table 2). Whereas in Ethiopia all the farmers' groups were mobilized by the IBCR, in Kenya this was accomplished by different kinds of stakeholders. Hence only one type of local organization, the community seed banks, was found in Ethiopia.

⁴ Vegetables in western Kenya are produced mainly in four zones: (1) Molo/Elburgon/Kabarak (mainly serving Nakuru town), (2) Ainamoi (mainly serving Kericho town), (3) Kilgoris/Magena/Nyangusu (mainly serving Nairobi and Kisii towns), and (4) Vihiga, Butere and Luanda (mainly serving Kakamega and Kisumu towns).

Table 2. Types of contractual arrangements within local organizations involved in on-farm conservation in Ethiopia and Kenya.

Organization mobilizing farmers	Key driving forces	Examples of local organizations	Type of contractual arrangements from governments' perspective
IBCR	Conservation and research objectives (related to policy)	Community seed banks' groups	Interactive
KARI	Research objectives (related to policy)	Farmers–researchers' groups	Consultative
Traders (marketing groups)	Market access Collective action (due to homogeneity)	Farmers–traders' groups	Informative
Farmers (self-mobilization)	Market access Collective action	Farmers' groups	Informative
NGOs	Donor funds Market access	Farmers–NGOs' groups	Informative

Source: own table.

Another major divergence in the on-farm conservation strategies being applied in these two countries arises from the structure of the local organizations: all the community seed banks in Ethiopia have a similar structure whereas in Kenya the local organizations are designed in different forms and have different structures. The latter have been formed mainly to establish networks⁵ for the exchange of seed and knowledge on important ALVs, how they can be marketed and how production can be enhanced through seed multiplication. In the following section, we look at how stakeholders interact with one another and the kinds of incentives they create for one another's involvement in on-farm conservation of CGRs. We also identify various driving factors that led to the emergence of the local organizations and classify the stakeholders interactions according to the types of contractual arrangements discussed earlier in the second section.

Groups organized by research organizations

In areas with community seed banks in Ethiopia, key stakeholders participating in on-farm conservation of traditional crop varieties include the

⁵ In Kenya, knowledge on important types of indigenous vegetables, their cultivation and cooking techniques is still with the local farmers and especially those who are above 50 years old. The NGOs, researchers and extension agencies have been going for this knowledge and the indigenous seeds from the farmers. On the other hand, farmers gain knowledge of improved techniques of cultivation after on-station and on-farm trials have been conducted by the researchers.

farmers and the IBCR, and a national NGO, the Organic Seed Action (OSA). During the time of this study's survey, all the targeted 12 community seed banks in Ethiopia had already been established. The initial major task of IBCR was to conduct demonstrations of the local varieties to be conserved on-farm, and collect and buy the seed from the farmers in order to reduce farmers' vulnerability to seed shortage during the beginning of the crop season. Simultaneously, the IBCR was organizing the farmers into Crop Conservators' Associations (CCAs)⁶, which were to take up the ownership and management of the seed banks after the expiry of the project period.

The seed banking organizations function as community-based seed supply networks for locally adapted crops and enhanced farmers' varieties. They have two major components; a seed store or a germplasm repository for local crop improvement and a marketing element through which farmers' varieties are bought and sold. Willing farmers are provided with free seeds of their choice for planting but are expected to contribute to the seed bank an agreed upon amount of seeds⁷ (i.e., repay in kind) during the harvesting period. This borrowing of seeds is particularly important to farmers during

⁶ Farmers are regarded as members of the community seed banks if there are members of the CCAs.

⁷ It is the general assembly, the main decision making organ of the community seed banks, that fixes the amount of seed to be repaid. In most cases this was set at 115–125% of the seed borrowed from the seed banks during time of planting.

droughts and periods of seed scarcity. In addition, farmers are allowed to sell the rest of the seed to the seed banks at the local farm gate prices. The IBCR is the community organizer and the monitoring agency of the community seed banks. It provides one technical staff per site who helps in organizing the farmers. The key constraint for the long-term survival of the community seed bank organizations is the lack of markets for the produce from traditional crops.

Discussions held with farmers during the survey revealed that farmers' attitudes towards the projects were favorable as their seed demand had been satisfied. In addition, the flexibility of seed banks' operations in line with farmers' concerns and demands was an incentive that enhanced participation in seed bulking activities. However, many farmers did not enroll themselves as members of the CCAs as they had difficulties paying the membership fee (set by the main committee) and contributing the agreed amount of seed as 'membership shares' (in most bulking sites one share = 25 kg of seed). Thus, although all farmers in the bulking sites could easily access seeds, participation as members of the seed banking organizations was quite low. During the survey period, it was found that as few as 20 farmers were participating as members in some of the seed banking organizations. It is also evident from the four bulking sites which had data on targeted populations that membership in the CCAs was still low as the project period came to an end (Table 1). Notably, there was a gender imbalance in participation as in most seed banking organizations women membership in CCAs was less than 25% of total membership. This trend may be attributed to the fact that men are the sole decision-makers in the families or households of most rural areas in Ethiopia.

Both farmers in the CCAs and the IBCR staff are organized in four types of committees that coordinate bulking activities: the 'general assembly', which is the main decision making body and three other sub-committees under it. However, none of the 12 farmers' associations or the CCAs within these community seed banks are registered as societies or voluntary community based organizations and therefore the government does not legally recognize their existence. Although the OSA promotes marketing of the traditional varieties by linking farmers with marketing agents, it has not been formally accepted as a member of the

seed bulking organizations. This is because of the mistrust that exists between the NGO itself and the IBCR⁸. The latter fears that the OSA can eventually take over the bulking activities and start using them to solicit for funds. Another key stakeholder, which also operates in the bulking areas, is the Ethiopian Agricultural Research Organization (EARO). The EARO is, however, not a member of the seed banking organizations since it tends to promote use of improved varieties and application of modern inorganic fertilizers and chemicals. Similarly, the Ministry of Agriculture (MOA) tends to promote the use of improved varieties at the expense of local ones. As such, the activities of these two institutions are not in harmony with those of the IBCR and the OSA.

Kenya does not have an organization like the IBCR whose sole responsibility is biodiversity conservation. Thus, conservation of indigenous vegetables is handled by the KARI, which is also mandated by the government to promote production of the exotic varieties, e.g., the cabbage. The organization lacks incentives to promote production of ALVs since the Kenyan agricultural policy emphasizes on enhanced production of exotic varieties in efforts to alleviate food shortage and poverty. As such there are very few local organizations where farmers have been organized by the KARI to grow indigenous vegetables. Such groups are normally contracted by the KARI and, without establishing structures for making common decisions, are required to conduct farm trials and exchange information on the evolving and unidentified varieties, e.g., the *Solanum* species.

Groups organized by marketing agents

In these kinds of local organizations, farmers are organized in farmers' groups or working groups which relate with certain traders' groups or middlemen. No other stakeholders belong to these organizations. The farmers are organized in small groups of 10–15 persons. In an administrative location with a population of 300–500 farming households, for example, we found out that there are as many as five such local organizations. Likewise, traders belonging to each local organization are organized in a group of 3–5 persons. Members of both the farmers' and traders' groups

⁸ The key technical persons of the OSA are actually former IBCR scientists who initiated the seed bulking activities.

are women, though men, whose wives are members, also participate in the cultivation of vegetables. There are no men in the traders' groups.

The key driving force or incentive for the establishment of these organizations is the opening up of market in Nairobi for the indigenous vegetables and particularly the African nightshades, cowpeas and amaranths. It is the traders who mobilize the farmers to organize themselves into groups in order to grow vegetables to sell to them in bulk. These vegetables are then taken to Nairobi, which is about 400 km away. By organizing the farmers, the traders are able to get agreed upon times of harvesting the vegetables. Their interest is to get enough produce to transport to Nairobi in order to reduce operational costs of their business.

Normally, the traders set the farm gate prices but the farmers' groups have the option to negotiate and reach an agreeable price. However, the traders have a stronger bargaining position since they can threaten farmers of abandoning their produce and fetching other growers. Farmers who do not belong to any of the farmers-traders' groups are forced to sell their vegetables at lower prices since there are no prior marketing arrangements. The traders' groups have the role to keep the farmers' groups informed of the prevailing consumer prices in Nairobi, consumer preferences and any other information necessary for the maintenance of the contractual arrangements. In Transmara District where these local organizations are common, all the participating farmers and traders belong to one ethnic group – the Kisii. Thus, homogeneity in terms of culture and social background plays a vital role in the emergence and maintenance of these local organizations.

Farmers' self-organized groups

In these organizations, farmers who have already organized themselves into formal groups come to realize the gains of cultivating indigenous vegetable all by themselves. Thus, the key driving force for the emergence of these groups is not profits from vegetables, but rather other socio-economic problems, which they had been established to handle. However, involvement of these groups in vegetable production activities was cultivated by the demand for leaves in Nairobi and other nearby big towns, and for seed by the local farmers. The

members of such groups are close neighboring families who are homogeneous (in terms of culture and economic endowment) and characterized by high levels of social capital. The groups have the capacity to invite the research and extension agencies to train or advise them on any technology they desire. The training organizations are, however, not allowed to participate in the decision making process. The groups do not have any contractual arrangements with marketing agents or traders since they sell their farm produce direct to consumers in big cities (including Nairobi). Such groups are quite few and one is likely to find only a single one in an administrative district. One such organization is the Technology Adoption Through Research Organization (TATRO) women group in Siaya District, which has 20 members and is involved in the cultivation of *Crotalaria* species and spider plant leaves and seeds.

Groups organized by advocacy organizations

These kinds of local organizations have two key members: the NGOs and the farmers. The latter are normally organized as women and self-help groups. These farmers' groups are mobilized by the NGOs whose key interest is the promotion of vegetable cultivation. The key driving force for the emergence of the NGOs-farmers' organizations is the availability of donor funds from bilateral donors and international research organizations (e.g., IPGRI). In addition, participation of farmers' groups in these organizations is enhanced by the accessibility to ready markets for their farm produce, and particularly the seed that is bought by the NGOs and re-supplied to the farmers. As such, the NGOs relate also to the farmers as the marketing agents for the seed (NGOs buy and sell the seed). The research and extension agencies do not have any relational contracts with these farmers' groups since the NGOs have the capacity to train the farmers and share any technical information with them. Normally, the NGOs set the buying and selling prices of the seeds without negotiating with the farmers. However, these prices are highly subsidized and thus serve as a key incentive for farmers' participation in on-farm conservation activities. Examples of such NGOs include the Rural Outreach Programme (ROP) in Butere-Mumias District and Sustainable Agriculture Centre for Research, Extension and Develop-

ment in Africa (SACRED Africa) in Bungoma District.

Following the discussion in this section and in the theoretical framework, the various types of contractual arrangements found in the empirical cases in Ethiopia and Kenya can be summarized as shown in Table 2. These contractual arrangements are assigned to the empirical cases of local organizations from the perspective of the government agencies. The criteria considered are mainly interactions of stakeholders and devolvement of the decision making authority, which are driven by certain factors or conditions that also lead to the emergence of the different local organizations. Our evaluation in Table 2 shows that most of the contractual arrangements in Kenya are of the informative type since the government agencies are not directly involved. The major hindrance in this case is the policy, which fails to clearly spell out the roles of research and extension agencies with regard to conservation of CGRs. In addition, these agencies lack the capacity to mobilize farmers and establish structures for common decision making due to budget limitations. Thus, the KARI is able to establish consultative contracts only. In Ethiopia, the IBCR has policy incentives and, being the key decision maker in conservation initiatives, its contractual arrangements are mainly of the interactive type.

It can also be noted from Table 2 that the extension departments are not members of the local organizations. This may be because of the difficulties they face while attempting to pass conflicting messages to the farmers: one for on-farm conservation and the other for increased food production by growing high yielding exotic varieties. Notably, the extension departments enjoy close relationships with the EARO and the KARI in Ethiopia and Kenya, respectively, whose priority is promotion of the exotic varieties. Overall, Table 2 indicates that emergence of the Kenyan local organizations is mostly being propelled by the availability of markets for indigenous crop products. This may mainly be attributed to consumers' realization that the indigenous vegetables are more nutritious than the exotic ones (Maundu et al. 1999). Table 2 also shows that the informative type of contractual arrangements emerges mostly in conditions where farmers have a capacity for self-organization or collective action and accessibility to markets.

Conditions for success of local organizations

To assess the conditions for success, one is first of all confronted with the problem of quantifying whether the local organizations have been successful or not as CGRs conservation organizations. Thus, we develop first in this section the criteria for assessing the success of these local organizations. This is followed by an assessment as to how successful the case study local organizations were and an analysis of the factors influencing this success.

Criteria for evaluating success of local organizations

Within the context of sustainable development (WCED, 1987⁹) and the Convention on Biological Diversity (CBD), three broad criteria i.e., economic, ecological, and social (socio-cultural) can be used to evaluate success of local organizations involved in the conservation of biodiversity and natural resources. However, considerations of success in a short-term perspective will entail further elaboration of the above criteria. According to Hanna (1995), the most common evaluative criteria that can be applied practically are: efficiency, equity and sustainability. Most of these criteria have been applied in assessing success of the local organizations or co-management organizations involved in the conservation of fisheries, forests and wildlife.

Efficiency of CGRs organizations can generally be considered in terms of cost-effectiveness, where the lowest costs to achieve a particular or stated level of benefits are determined. However, there are also situations where flows of both costs and benefits have to be considered (Mburu and Birner 2002) in order to identify the level of conservation benefits that is efficient (allocative efficiency). The third aspect of efficiency is organizational efficiency. This latter aspect involves comparison of benefits and costs in order to identify which organizational structure would make it possible to achieve certain objectives, for example, maximum net benefits from on-farm conservation initiatives.

⁹ WCED Report (1987) (also called Brundtland Report) defines sustainable development as development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

It is therefore closely related to allocative efficiency. An important question in this case is as to what kinds of characteristics or conditions make some contractual arrangements more efficient than others both in terms of allocative and organizational efficiency. Moreover, it would be important to consider whether transaction costs (costs of participation) play any important role in influencing efficiency of the local organizations.

Equity refers to fairness to the stakeholders involved in the local organizations or how the outcomes of the contractual arrangements affect the local communities in terms of race, ethnicity, class and gender (Hanna 1995). It has four main components: representation, process clarity, compatible expectations and distributive effects. These are, however, not addressed in detail in this paper. Sustainability has also three components: stewardship, resilience and governance. Stewardship is defined as the tendency for resource users to maintain productivity and ecological characteristics of the resource (Nielsen et al. 1998). In evaluating the management process in fisheries, Hanna (1995) identifies three components of stewardship: time horizons, monitoring and enforcement. If resource stewardship is to be enhanced, the local organizations should contain incentives to lengthen the time horizon beyond the short-term, have adequate and practical systems devised to monitor ecological conditions and human behavior, and lead to regulations that promote compliance and permit cost-effective enforcement. Resilience is the ability of the local organizations to absorb and deal with changes and shocks (Nielsen et al. 1998). The local organizations are expected to have rules that are flexible enough to respond quickly to changing conditions and at the same time be able to adapt to both changes in the structure of the industry and changes in the market. Governance is mainly measured in terms of the level of rule compliance. Other measures may include overall reduction in conflict, existence of an effective conflict mechanism, and existence of practical and implementable enforcement procedures.

Determining success of local organizations and its influencing factors

The various types of local organizations in Table 2 are evaluated in terms of the criteria discussed in

the preceding section (see Table 3). For efficiency, it was not possible to analyze the benefit/costs ratios or compare costs of different local organizations since data on all costs and benefits were not available. The major variables that would affect these costs and benefits can, however, be assessed from the qualitative data. For example, within a span of 3 years, the local organization comprising of IBCR and farmers in Ethiopia had achieved high benefits in terms of CGRs conservation as seeds from 22 different crop varieties had been banked, although the actual participation of local communities was low (Table 1). However, since the IBCR was involved in mobilizing unorganized farmers and did not target a specific category, it is expected that its transaction costs were considerably high. Further, the IBCR had to construct permanent seed bulking structures, pay field workers, conduct capacity building programs and provide transport for supervisors and monitors. Therefore, its production costs would also be considerably high. Project reports from the IBCR showed that about US\$ 2.5 million had been spent for all the project activities carried out in 1999–2001 (Tanto and Demissie 2001). Thus, comparing this local organization with a case where farmers are capable of organizing themselves, one is most likely to find that farmers' mobilization by research organizations is not cost-effective. Moreover, without markets for the traditional crops produced in areas with community seed banks in Ethiopia, the financial benefit/cost ratio of IBCR-farmers organization is likely to be considerably low and even below one. With the absence of donor funds after the project period is over, the activities of the IBCR may not be sustainable. Similarly, sustainability, and particularly stewardship, would be low with on-farm conservation activities supported by donor funds through the NGOs and the KARI in Kenya.

Overall, it can be argued that farmers' self-mobilized groups are the most successful as the level of crop diversity produced is relatively high and their production costs are likely to be considerably low. In addition, fairness to individual farmers is greatly enhanced and the levels of crop diversity, stewardship, resilience and compliance with rules are comparatively high. For instance, the TATRO group in Kenya has been cultivating all the eight types of indigenous vegetables mentioned in the survey methods and data section for

more than 6 years and has all along maintained a constant number of households as members. However, activities of such local organizations are often successful due to management capacity of a few local elites and sometimes farmers' ex post transaction costs may be considerably high. Nevertheless, both financial and social benefits reaped (including crop diversity) from these local organizations would be expectedly higher than the costs.

The farmers-traders' groups can be evaluated as the least successful among the Kenyan organizations due to the expected low conservation benefits (low level of diversity). For example, the farmers-traders' groups in Transmara District concentrate on two major varieties of indigenous vegetables (*Cleome gynandra* and *Solanum* species) out of the eight varieties mentioned in the survey methods and data section. Additionally, these groups are prone to market forces, and farmers are faced with lack of incentives to extend production of vegetables to the long-term.

In our analysis in Table 3, we identify factors that would both favor and hinder success of each of the empirical cases of local organizations. It can be seen from this table that most of the factors favoring success of the case study local organizations are similar or closely related to the driving factors for the emergence of the same. One important factor contributing to the success of local organizations seems to arise from the prevailing economic conditions, as farmers have to have markets for their crop produce as an incentive for cultivating the traditional crops. There has to be a consumer demand for products from traditional crops and farmers have to access market outlets and get favorable prices for these products. Thus, as has also been documented by Meng et al. (1998), access to markets can induce farmers to undertake poly-variety cultivation. However, a common problem associated with this factor, and which was found within the farmers-traders' groups, is that farmers are likely to specialize in the few varieties demanded by the market leading to low level of diversity or uniformity of crop varieties conserved on-farm (Smale and Bellon 1999). Moreover, when farmers have access to markets, many of the goods and services provided by certain traditional varieties can be substituted by alternatives that can be purchased in the market and as a result the production of crop diversity would shrink (Bellon 1996).

We contend that other important factors favoring success of local organizations arise mainly from farmers' characteristics or the socio-cultural factors indicated in Figure 1. The farmers have to possess the capacity for collective action, and have clear and achievable objectives. Thus, drawing on our studied cases, one can deduce that for local organizations conserving crop genetic resources to emerge and be successful, the capacity for collective action within the farmers' groups is a prerequisite. The presence of collective action enables farmers to organize themselves, freely share information with each other, reduce incidences of opportunistic behavior, enhance collective decision-making and hence reduce the costs of participation (transaction costs).

When farmers are involved in local organizations conserving CGRs on-farm, it makes it easier for conservation activities to benefit from farmers' know-how and social recognition of indigenous knowledge is enhanced. This also enhances equity (in terms of increased representation and distributive effects) and increases stewardship of conservation projects, thereby permitting cost-effectiveness. Such benefits would however be more apparent as decision-making authority is devolved to the local farmers and as the interaction of stakeholders moves towards the interactive and informative types of contractual arrangements. Thus, involving local organizations with such institutional arrangements in conservation initiatives would often lead to a fair and equitable sharing of benefits of CGRs utilization, hence fulfilling the third objective of the Convention on Biological Diversity (CBD). Moreover, on-farm conservation initiatives would be made more long lasting and costs of implementing on-farm conservation projects would be reduced.

The success of some of the case study local organizations is hindered by lack of a supportive policy. In Kenya, for example, the on-farm conservation activities of the KARI would need a policy framework that is not predisposed to favor certain genetic resources in order to be successful. It is expected that such a policy would allow farmers to freely make choices of the crop varieties they would like to promote and maintain in their farms. For brevity, we just mention other factors that would hinder success of local organizations as evaluated from our case studies. These would include reliance on donor funds, mistrust and short-term interests

Table 3. Evaluating local organizations and key conditions influencing their success.

Organization mobilizing farmers	Valuation of success of local organizations in terms of efficiency (E), fairness (F), and sustainability (S)	Conditions favoring success	Conditions hindering success
IBCR	<p>Ex ante transaction costs could be high (E)</p> <p>Lack of markets for the traditional crops' products (E)</p> <p>Though direct conservation benefits are high, investment and operation costs (both production and transaction costs) for IBCR could be considerably higher (E)</p> <p>Farmers cannot market their products (E); their expectations are not met (F)</p> <p>Strict membership conditions. The very poor may not participate (F)</p> <p>Farmers not organized in formal or legal groups, no experiences in organization, rules compliance, etc. (S). OSA is not fully involved (F and S)</p> <p>Conservation benefits are low due to the experimental nature (E)</p> <p>Farmers are not sure of their roles and responsibilities (F)</p> <p>Farmers not involved in the choice of the varieties they are to grow (S)</p>	<p>Supportive policy framework</p> <p>Integration of indigenous knowledge (IIK)</p>	<p>Markets are not available</p> <p>Donor funds not always available</p> <p>Most farmers are not fully integrated in the genebanks</p> <p>No rules to govern farmers' activities</p> <p>Mistrust</p>
KARI	<p>Conservation benefits are low due to the experimental nature (E)</p> <p>Farmers are not sure of their roles and responsibilities (F)</p> <p>Farmers not involved in the choice of the varieties they are to grow (S)</p>	IIK	<p>Farmers not integrated fully in the decision-making process</p> <p>No policy support</p> <p>Unavailability of donor funds</p>
Marketing agents	<p>Conservation benefits are low due to concentration on few varieties according to consumers' preferences and demand (E)</p> <p>Traders exploit farmers since the latter are not represented in the marketing process (F)</p> <p>No objectives for long-term conservation. Many aspects of the organization determined by market forces (S)</p> <p>High ex post transaction costs for the farmers (E)</p> <p>Management process mainly in the hands of the local elites (F)</p>	<p>Market access</p> <p>Homogeneity (collective action capacity)</p> <p>IIK</p> <p>Collective action capacity</p> <p>IIK</p> <p>-Market access</p>	<p>Farmers are not integrated in both production and marketing processes</p> <p>Short-term interests</p>
Farmers (self-mobilization)	<p>High ex post transaction costs for the farmers (E)</p> <p>Management process mainly in the hands of the local elites (F)</p>	<p>Collective action capacity</p> <p>IIK</p> <p>-Market access</p>	
NGOs	<p>Initial capital investment and ex ante transaction costs for the NGOs could be considerably high (E)</p> <p>Women groups lack financial, human and self-mobilization resources; need outside support (S)</p>	<p>-Market access</p> <p>IIK</p>	<p>Donor funds are not always available</p> <p>Weak groups</p>

Source: own table.

among stakeholders, weak groups without organizational skills, and involvement of farmers who are not fully integrated in the decision making process and other activities of on-farm conservation.

We emphasize that in rating the factors discussed in this paper in terms of importance one has to take care of the local conditions. It would be expected that a particular factor could be very important for a certain case and less important for another. Nevertheless, generalization at the country level could be allowed as we find that these factors are very similar to conditions that have been documented as key factors favoring success of local organizations involved in the management and conservation of other natural resources such as forests, wildlife, water and fisheries (Meinzen-Dick and Knox 2001).

Conclusions and policy implications

The analysis of farmers and other stakeholders involved in on-farm conservation activities of cereals and pulses, and indigenous vegetables in Ethiopia and Kenya, respectively, has provided some useful insights as to how local organizations can be structured to maximize their outputs or benefits. It has been shown that interactive and informative types of contractual arrangements play an essential role in a number of ways: first, they facilitate integration of farmers' indigenous knowledge in conservation initiatives, second, they enable devolvement of decision making power on the choice of varieties to farmers, and third, they are a means of transferring the responsibility of maintaining crop diversity to the local populations. Thus, incentive designs for on-farm conservation in developing countries could target local organizations with such contractual arrangements so as to enhance supply of crop diversity.

The empirical cases presented in this paper provide many different types of driving factors that can lead to the emergence of local organizations for on-farm conservation. These include efforts to attain conservation and research goals, access to markets for indigenous crop products, presence of capacity for collective action and availability of donor funds for farmers' mobilization. Market access has emerged as an important driving factor and particularly in cases where the net demanders of crop diversity (mainly conser-

vation and research organizations) are not involved. Accordingly, availability of markets would not only have a positive effect on the mobilization of the farmers but also on the overall success of the local organizations and contractual arrangements within them. This has an important policy implication: on-farm conservation of CGRs could easily be enhanced and be made successful through provision of markets for traditional crops' products. Thus, the governments need to remove any adverse subsidies that are disincentives to marketing of traditional crops and invest in infrastructural developments, e.g., roads, and consumer awareness programs. Nevertheless, policies based on market access have to be recommended cautiously as there is a possibility of maintaining only those varieties demanded by the consumers. Eventually this would lead to a lower level of crop diversity as only few varieties would be conserved on-farm and probably fewer than what would be recommended by policy.

The paper has shown that other important conditions, other than market access, which favor success of local organizations for CGRs conservation, arise mainly from farmers' characteristics and particularly the capacity for self-organization or collective action. In particular, it has been demonstrated that collective action plays an important role in facilitating emergence and success of local organizations involved in the conservation of CGRs. An important policy implication related to this factor is that if self-organizing farmers are targeted in conservation initiatives, the magnitude of initial investment costs for governments could be relatively low and hence they could make savings from their tight budgets. However, it has to be noted that self-organizing farmers could incur considerably high ex post transaction costs and hence the need for compensation could arise. Such farmers could also end up choosing only those varieties whose costs of conservation are lower than their financial benefits and especially under conditions where self-organization is driven by access to markets.

Finally, to enhance participation of government agencies in on-farm conservation strategies, policies on conservation, food production and poverty alleviation in Ethiopia and Kenya need to be harmonized to allow easier and cheaper mobilization of farmers. This would also eliminate the difficulties faced by extension agents

trying to pass mixed messages to the farmers and hence enhance their participation in conservation initiatives, which is evidently lacking in these two countries.

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