Implications of an Extension Package Approach for Farmers’ Indigenous Knowledge:  
The Maize Extension Package in South-western Ethiopia

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Abstract  
This article is based on a study of the effects of a “maize extension package” on farmers’ indigenous knowledge (IK) in the Jima area of South-western Ethiopia. Both qualitative and quantitative approaches were employed to collect information from farmers, extension workers, and researchers. Initially, semi-structured interviews and discussions were used extensively to collect information. The structured questionnaires were administered to 80 randomly selected farmers and to 40 purposively selected extension personnel.

The study found that there is a rich wealth of indigenous technical knowledge and practices relating to maize production, though these appeared to be rapidly disappearing and are seriously endangered. Findings revealed that the promotion of modern practices in a package format played a major part in this regard with noticeable effect on local maize varieties and informal seed systems, traditional pest and disease control practices, control over produce and maize utilization. On the other hand, farmers, extension personnel and researchers were somewhat aware of the importance of farmers’ IK and the fact that it is at great risk, though the later two tended to favour modern technologies over IK. Age, gender, farming experience, and resource endowment were found to influence the possession and use of IK practices.

Based on the findings it was recommended that vigorous efforts should be made to identify, strengthen and integrate IK into formal research and development efforts to make them more relevant, effective and sustainable. To this effect, enhancing awareness, knowledge and skills at different levels; designing flexible programmes, strategies and methods combining IK and modern practices, should be given greater attention.

Keywords: Maize, Extension Package, Extension Approach, Indigenous Knowledge, Ethiopia
Introduction

Over the past decades, conventional development approaches have a track record of repeated failure as they excessively focused on technological solutions and “package type” top-down approaches without regard for indigenous knowledge (IK) systems and farmers’ practices. In particular, the drive to achieve agricultural development without taking into account IK systems and sustainable practices has proved socially, economically, and environmentally unsuccessful (Dommen, 1988). Hence, recently, there is an increasing recognition of the richness and value of rural people’s knowledge and the need to give due consideration to it, whilst planning and implementing development programmes. The role of indigenous knowledge has been emphasized in different international action plans and conventions. For instance, Nakashima and de Guchteneire (1999) stated “at the 1992 Earth Summit, clear reference to indigenous and local knowledge was inscribed in the Rio Declaration and Agenda 21” (¶ 3).

The role of IK lies in the fact that it optimally utilizes available resources, is readily available and less expensive, explores and exploits existing diversities, is environmentally appropriate, and provides livelihoods while appreciating the need to sustain the productive resource base (Brouwer, 1998; Warren, 1989). More importantly, the problems of development are too large and too complex for government and outsiders alone. If development is to take place and if it is to be sustainable, it must rest on the enterprise and initiatives of millions of people to generate change based on their own values and experiences (Tick, 1993). Thus, rural peoples’ knowledge can provide effective alternatives to modern scientific know-how. Moreover, a blend of scientifically generated technical knowledge with indigenous practices is flexible in that it can adjust to agro-climatic changes as well as the variable socio-economic conditions of farmers (Momen, 2000). Both are complementary in their strengths and weaknesses (Chambers, 1983) and combined they may achieve what neither would alone. In particular, the fact that farmers’ IK and practices are based on generations of experiences, are constantly tested, evaluated and adapted through a continuous process of experimentation and innovation makes them the best fit under circumstances referred to by Chambers as “complex, diverse and risk prone” (Chambers, Pacey, & Trupp, 1989), which is a typical feature of Ethiopia.

Despite this growing recognition, there is still a high dependence on external technological solutions in development programmes and projects that seek to improve agriculture and food production. This paper examines the interface between technology packages and IK in a rural area of Ethiopia.

Technological Packages for Agricultural Development

Like many developing countries, Ethiopia historically has concentrated efforts and resources on the transfer of packages of modern agricultural technologies, with implications for the poor, for indigenous knowledge and for sustainability. According to Sendeu and Mtwara, (1994) hundreds of millions of subsistence farmers in developing countries have not been able to participate in the miracle of the ‘Green Revolution’ as they cannot afford to pay for irrigation, seed, agro-chemicals, fertilizers and farm implements. In general, rural people are paying a high price with the arrival of high input-output technologies in the form of natural degradation, social disturbances, increasing inequalities and unstable production systems (Naseem, 2000). Nevertheless, since 1994-95 Ethiopia has been implementing a new extension intervention that employs a ‘technology package approach’ in an attempt to attain food self-sufficiency through the aggressive promotion of packages of improved technologies to farmers.
Technologies developed by research are formulated into ‘packages’ at national level by the Ministry of Agriculture (MoA) and find their ways to farmers through local extension workers. Of all food crops, maize has received the highest attention due to its widespread cultivation and significance as a food crop (Tesfaye, Bedassa, & Shiferaw, 2001). Evidence from the local MoA in Jima indicates that the maize extension package ranks first both in terms of number of participating farmers and area coverage. The major components of the maize extension package are providing fertilizer, improved seeds (hybrids), pesticides, better cultural practices, credit for inputs, extension advisory services, and conducting demonstrations. The approach tries to channel a predetermined and fixed, complete set of technological requirements to all farmers, through a blanket recommendation across different socio-economic conditions. It does not allow room to incorporate farmers’ own technical knowledge based on experience and local situations.

Owing to the nature and limitations of the current extension package, some critics (e.g., Belay, 2000; Beyene & Abera, 2000) have questioned its effectiveness and sustainability. Shortcomings that have been highlighted include dependence on high cost external inputs; excessive reliance on a narrow genetic base; inadequate availability of inputs in the required quantity and quality for various socio-economic categories of farmers; and the consequences of continuous use of chemicals. Above all, it is argued that the excessive focus on the introduction of external technologies has contributed much to the neglect and erosion of local genetic resources and farmers’ IK systems. This last point was the focus of a study in the Jima area in 2002 (Negussie, 2002).

**Objectives of the Study**

The overall objective of the study was to investigate the diversity and prospects of farmers’ indigenous knowledge and practices with respect to maize production, and to examine the effects the maize extension package had on farmers’ IK systems. Obviously IK systems have many dimensions, including local technologies and local adaptations of technology, in fact, anything that has its origins within a particular area (Sen, Angell, & Miles, 2000). It includes such aspects as information, practices and technologies, beliefs, tools, materials, experimentation, biological resources, human resources, education and communication (IIRR, 1996). However, the specific objectives of this study were to:

1. Identify the major indigenous knowledge and practices pertaining to maize production, their strengths, limitations and prospects;
2. Identify some of the major factors influencing knowledge and use of indigenous technologies and practices by farmers;
3. Examine the attitudes of farmers, extension personnel and researchers toward the role and importance of farmers IK; and
4. Examine the effects of the maize extension package (or components of the package) on farmers’ IK systems.

**Methodology**

The study was conducted in Kersa district, one of the major maize producing districts of Jima zone, South-western Ethiopia. Both qualitative and quantitative approaches were employed in this study.

One representative cereal producing district and three peasant associations (PAs) were purposively selected for the study based on the importance of maize in the farming system, their representativeness, and the intensity of the extension service received. Initially, purposive and accidental sampling techniques were used to select individuals and group informants for the
informal interviews and discussions. In this way, eight female farmers and 35 male farmers were selected. As a second phase, sampling frames were obtained from respective PA offices and farmers were stratified as participants, if they were participating in the programme in 2002 and as non-participants, those who participated in the extension package programme at some stage but who discontinued due to various reasons.

Eighty farmers (54 participants and 26 non-participants) were selected using a simple random sampling technique based on the proportion of the two categories in the sampling frame. In addition, 40 extension personnel—20 field level, 15 district and 5 zonal level extension staff—were selected. The selection technique used for the extension staff was purposive as they were few in number and thus the majority was interviewed. Four relevant researchers were also purposively selected and interviewed.

The data were collected using a variety of tools, methods and techniques. These, among others, included: key informant and group interviews, focus group discussions, transect walk, direct observation, and structured questionnaire. During the first phase, checklists and semi-structured interviews were extensively used. As a second phase, structured questionnaires were developed based on the information obtained in order to crosscheck and validate, and quantify some of the information.

The questionnaires were pre-tested on eight farmers and five extension personnel and administered by five junior researchers selected from Jima Research Centre, who could speak the local language. Semi-structured interviews were used for researchers. Existing documents were also used as secondary sources of data to supplement the primary data. Efforts were made to triangulate and crosscheck in order to ensure reliability of the information collected. Descriptive statistics such as measures of central tendency and dispersion; chi-square, t-test, and correlation coefficients were used in analysing the quantitative data.

Findings

Local Maize Varieties and Seed Systems

In terms of indigenous knowledge and practices, the use of local maize varieties and informal seed systems were the most important. The study revealed that respondent farmers in the study area cultivated different varieties of maize. The local varieties found in the area include: *Kenya, Oromee, Affillo and Araba*. All varieties have their own attributes and qualities and are needed by farmers for different purposes. Some of the features and attributes of these varieties are given in Table 1.
Table 1

**Local Varieties: Some Characteristics and Qualities**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Characteristics</th>
<th>Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>White kernel;</td>
<td>Has got multiple use/advantage;</td>
</tr>
<tr>
<td></td>
<td>Shorter plant height than other local varieties;</td>
<td>Good taste; high flour to grain ratio;</td>
</tr>
<tr>
<td></td>
<td>Matures in four months.</td>
<td>Relatively fast maturing;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Responds to fertiliser;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relatively tolerant to weevil.</td>
</tr>
<tr>
<td>Oromee</td>
<td>Red or mixtures of red and yellow/white kernels;</td>
<td>Fast maturing - supply food during hungry months;</td>
</tr>
<tr>
<td></td>
<td>Small cob and grains, hence low yielder;</td>
<td>Good taste – highly preferred for consumption;</td>
</tr>
<tr>
<td></td>
<td>Matures in three months;</td>
<td>Tolerant to storage pests.</td>
</tr>
<tr>
<td></td>
<td>Hard grains – difficulty of grinding.</td>
<td></td>
</tr>
<tr>
<td>Araba</td>
<td>White kernel; large cob and grain size;</td>
<td>Gives relatively better yield – high kernel to cob ratio;</td>
</tr>
<tr>
<td></td>
<td>Softer grains/kernel;</td>
<td>Easy to grind with local flourmill or stone.</td>
</tr>
<tr>
<td></td>
<td>Susceptible to disease and storage pest;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leafy - high vegetative growth;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not tasty for consumption.</td>
<td></td>
</tr>
<tr>
<td>Affillo</td>
<td>Red or mixtures of red and yellow seeds;</td>
<td>Highly resistant to storage pests.</td>
</tr>
<tr>
<td></td>
<td>Longer maturity period – five months;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hard grains – known as mill breaker;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor taste and palatability.</td>
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</tr>
</tbody>
</table>

The study found that the effect of the ‘maize package’ in the area was to radically reduce the number of varieties that farmers grow. As can be seen in Table 2, before the introduction of the ‘maize package’, 14% of the respondents used to cultivate only one maize variety, whereas at present 46% cultivate only one variety. Similarly, 58% of the respondents cultivated two or fewer varieties before the introduction of the maize package, while at the time of the study, 97% reported that they relied on two or less varieties. This indicates that rapid loss of maize genetic diversity has been taking place in the area.

Table 2

**Number of Varieties Grown by Farmers before the Maize Package and in 2002 (N=80)**

<table>
<thead>
<tr>
<th>Varieties Grown</th>
<th>Before the Maize Package</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>44</td>
<td>51</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

In terms of types of variety grown, 27% of respondents grew only hybrid seed, while 29% grew both *Kenya* and hybrid seeds during the study season (Table 3). About 10% and 2% grew only *Kenya* or *Affillo*, respectively. None of the respondents were found to grow only *Oromee* or *Araba*. On average, about 6% grew *Oromee*, *Affillo* or *Araba* along with
other varieties. Thus *Oromee*, *Affillo* and *Araba* seem to be highly endangered as their seeds have become scarce. In addition to the hybrid, farmers were more inclined to grow *Kenya* because of its relatively high yielding ability and response to fertilizer.

Table 3

<table>
<thead>
<tr>
<th>Maize Varieties Grown by Respondents during the Study Year (N=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety Types</td>
</tr>
<tr>
<td>Hybrid</td>
</tr>
<tr>
<td>Kenya</td>
</tr>
<tr>
<td>Affillo</td>
</tr>
<tr>
<td>Oromee</td>
</tr>
<tr>
<td>Araba</td>
</tr>
<tr>
<td>Hybrid + local varieties (mainly Kenya)</td>
</tr>
<tr>
<td>Kenya + other local varieties</td>
</tr>
<tr>
<td>Oromee + other varieties</td>
</tr>
<tr>
<td>Affillo + other varieties</td>
</tr>
<tr>
<td>Araba + other varieties</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

It was expected that those farmers who had abandoned the ‘maize package’ would be more inclined to use local varieties, and indeed the majority (70%) cultivated only local varieties (but mainly *Kenya*). Less than 4% mentioned growing *Affillo*, *Araba* or *Oromee* either alone or along with other varieties. However, about 22% cultivated second generation hybrid seeds in spite of the stringent warnings given by researchers and extension agents, implying a critical need for seeds that can be re-used for next planting. The remaining 8% shifted to other crops or contracted out their land to those who could afford modern inputs.

None of the respondents who abandoned the package grew more than two varieties in 2002, though close to a third reported that they used to maintain three or more varieties before the introduction of the package. Respondents pointed out that because of the huge advantages some elite farmers enjoyed during the initial years of the programme, most farmers abandoned the low yielding local varieties and shifted to hybrid maize. It was also noted that extension workers were advising them not to plant local seeds close to their package fields because of the cross-pollinating nature of the crop. This again led to the loss of the local varieties. Some wise farmers stated that they maintained their local seeds in distant highland areas where the maize package had not yet expanded. But those who dropped out of the package programme often found that they had nothing to fall back on.

When participation in the package programme and area of land allocated to local seed was examined, a significant association (*t*-value = -2.556; *p* = 0.013) was found between the two variables. Those who had left the ‘package’ allocated, on average, more than half a hectare to local seed compared with only a third of a hectare for package participants. This was not surprising as package participants are expected to devote most of their resources to package maize. In general, the study found that the maintenance of local varieties was mostly by skeptical farmers, who tended to fear risk, as well as by wise and older farmers. It was also interesting to note that resource-rich farmers maintain local varieties as their resources allowed them to cultivate both local and hybrid seeds. For instance, a significant association (*r* = 0.364; *p* = 0.003) was found between farm size and area allocated to local maize. Those with large farm size tended to allocate larger plots to local maize. However, farm size was not significantly associated with number of varieties grown.

In the study area, there used to be a wide range of practices and sources for local seeds though the primary source was the farmers’ own stock. In addition to household storage, the principal local seed acquisition mechanisms were gifts, market/purchase and exchange with other seeds. Traditionally it was common for seed to be given as a gift between relatives, friends or neighbours as
there were strong social obligations in this regard. However, informants explained that, in recent years, seed gifts had become less common because the maize extension package promotes expensive hybrid seeds, whose sole source is the highly centralized formal seed sector. For instance, with hybrid maize it was not possible for farmers to locally select, preserve or exchange seeds for several reasons.

Firstly, it was not possible to obtain hybrid seeds through locally available networks. Secondly, because of its hybrid nature, farmers could not preserve it for next season’s planting and they had to purchase it every year. Thirdly, given its high price and close supervision by extension agents, it was not possible to freely share package seed with others. Fourthly, owing to its high susceptibility to storage pests, it was not possible to protect it with local practices. Fifthly, the knowledge and expectation that package seed will be available from the MoA, has made some farmers reluctant to select and maintain their own seed. In general, since the introduction of the maize package, seed purchase has become the dominant seed securing mechanism, and in view of this reality, informants stressed that the package has caused dependence on external sources (such as the formal seed sector).

Impact on Planting Time and Methods

In the study area, land preparation is mainly done with local ox drawn ploughs and takes place between December and March. Time of land preparation and frequency of ploughing are determined by several factors including type of previous crop, rainfall, availability of labour and oxen, variety to be planted, type of soil, weed situation, and the purpose of the crop. Normally, planting of local maize takes place between March and April, though recently farmers have been influenced to change their planting time because of the extension package recommendation, change in weather conditions and the late delivery of fertilizer and seed. Farmers are expected to stick to research recommendations, which are to plant package maize in late April and May. This later planting had consequences for disease infestation, yield reduction and food supply. Farmers in the area practise both broadcasting and row planting for local maize.

Traditionally in Kersa, intercropping was common, yet the introduction of the ‘maize package’ did not incorporate this important practice. Local maize was intercropped with fast maturing crops such as haricot bean and local cabbage, but pulse crops have been almost abandoned due to diseases/pests and change in weather conditions, thus limiting farmers’ options.

Crop Management Practices

In the area, soil fertility has been declining over recent years due to monocropping, continuous cultivation and the use of inorganic fertilizers. Indigenous practices relating to organic fertilizers and different fertility maintenance techniques have become less common as farmers dependence on commercial fertilizers has increased. For instance, the vast majority (90%) of the respondents never used compost. A common traditional soil fertility improvement practice in the area was known as ‘balloo geederu’. It involves constructing temporary enclosures on different parts of the field and keeping cattle there for at least a week and then rotating until the whole field had received the same treatment. This practice is now abandoned mainly because of the decline in the livestock population. Nowadays, the use of animal manure is limited to plots around the homestead due to shortage of manure and labour, and because of its absence in package recommendations. It was noted that resource rich farmers were the ones most likely to use manure on local varieties used for green cobs.

Traditional crop rotation in the area involved planting maize for two or three years, followed by tef for one year and sorghum for another year, then leaving...
fallow for at least two years. Crop rotation has been increasingly abandoned because of the expansion of maize growing. Moreover, farmers have abandoned tef because of disease problems, leaving no compatible crop for rotation with maize. This underscores the critical need to identify and promote alternative crops for rotation. It was found that crop rotation was significantly associated with farm size rather than with involvement in the package. Larger holdings allow cultivation of various crops which can be rotated with maize. It was also noted that farm land scarcity and the introduction of fertilizer and improved seeds have led to a reduction in fallowing because of farmers escalating desire to cultivate large areas by using commercial fertilisers. Again, there was a significant association ($\chi^2 = 3.933; p = 0.047$) between farm size and fallowing practices as farmers with larger holdings were more likely to practice fallowing.

Interestingly, one area that has shown the successful ‘integration’ of local knowledge/practice with the modern maize package practice has been in weed management. The traditional maize weeding operation, known as babbaqaa, uses oxen for inter-row cultivation and takes place three times for local maize. According to farmers, the main purposes of babbaqaa include weed control, loosening the soil, maintaining the desired plant population, initiating brace roots, slowing down plant vegetative growth as well as covering the roots with soil to protect against lodging. After the last babbaqaa, farmers heap soil around the plants with a hoe. Finally, “quncoo” (slashing of weeds and weak/dead plants) is carried out at the flowering stage before silking. Though babbaqaa was not initially part of the package recommendations, farmers continued to practise it with package maize. Researchers have become convinced of the importance of the practice and now stress the need to recommend it with the package. Researchers stated that the practice also helps to prevent soil erosion and to retain soil moisture.

Therefore, this could be one of the local innovations that prove the rationality of farmers thinking and the validity of their practices.

**Maize Pests and Disease Control**

The study found that farmers have a wealth of traditional practices for the control of maize pests and diseases. These focus mainly on protection against storage pests which cause serious losses and are the major threat to food security. They include the use of various botanical pesticides such as plant extracts or pastes as well as mechanical processes. However, these practices have come under threat as commercial pesticides have gained wider popularity. Farmers also reported that ‘package’ maize is highly susceptible to pests and that traditional methods are ineffective for it. This as well as the provision of commercial insecticides along with the maize package threatens the use of traditional pest control practices. During individual and group interviews it was pointed out that, younger farmers were more inclined to favour commercial pesticides, while older farmers were said to have rich experience and knowledge in traditional control practices. Poor farmers who cannot afford commercial pesticides also stick to these traditional practices. Women were also said to be knowledgeable in this area because of their dominant role in the grain storage process. It can be concluded from the observations and discussions made with farmers that traditional pest control practices were seriously endangered.

**Maize Harvesting, Storage, and Utilization**

Maize is the most important food and cash source for Kersa farmers and it is consumed both at the green and dry stages. The early maturing local varieties can be harvested for green cobs in July, while the main harvest of dry cobs is from October to December depending on the variety and time of planting. Most of the local varieties were early maturing as compared to the hybrid.
(BH-660). There are two common harvesting methods, one involves cutting the stalks before dehusking and the other involves removing cobs from the erect maize stalk. In the area, maize is commonly stored in a local store known as gonbisaa, which is made of interwoven sticks, raised a few centimetres above the ground. In the area, a variety of traditional dishes are prepared from green and dry maize including: Qixxaa, daabboo, biddeena, kijoo, harkiso, marqaa, danfisaa, and waaddii. Local varieties are used for most of the traditional foods prepared from green maize. Maize varieties differ greatly in their suitability for particular dishes and it was noted that a single variety could not fulfill all the requirements, thereby necessitating the maintenance of different varieties.

During discussions it was pointed out that women are not allowed to feed the family with package maize at the green cob stage. Women informants underlined the high value they assign to green maize as a relief during the hunger months; whereas men stressed that package maize should not be consumed until they had sold the quantity required for input loan repayment and other financial needs. Men also cautioned that, if they were to allow maize to be consumed green, it would be all consumed before reaching the dry stage. This would have serious consequences for household food security in the area. Moreover, some of the informants felt that the package programme has transferred more control over production and income to men as they are increasingly involved in marketing the output in the name of loan repayment as they are the registered head of household.

Differences between Farmers, Extension Personnel and Researchers

The attitudes of key actors—farmers, extension personnel and researchers—play a critical role in influencing the attention given to IK and efforts to make use of it. In this regard, it was observed that farmers accord different degrees of value and importance to various types of IK practices. Virtually, all farmer respondents (96%) felt that their local practices and varieties were displaced after the introduction of the package. The majority (94%) also indicated that they were worried about this displacement, which implies that they had positive attitudes, towards local varieties. In general, it was observed that farmers appreciate most of their traditional practices such as traditional pest control methods; local seed systems and some soil fertility management practices. Some of the advantages of local varieties that were stated included heavier grains, lower demands in terms of management and inputs, early maturity and resistance to storage pests. Moreover, farmers were also aware of the limitations of their practices, especially, some of the traditional agronomic practices such as land preparation, planting and fertilizer application.

The majority (64%), of the extension personnel interviewed believed that farmers’ knowledge and practices have something to contribute to the effectiveness of research and extension. However, being influenced by the higher yielding ability of the hybrids, the vast majority of extension personnel (82%) believed that the maize extension package is more important to farmers than their indigenous practices and varieties. They were, however, concerned that farmers’ practices and local varieties were being displaced or eroded by the introduction of the package. Thus though being influenced by the perceived advantages of the package, the majority of the extension personnel, to some extent, recognized the value of farmers’ technologies and practices and that these were ignored in the package approach.

On the other hand, researchers had mixed views regarding the value and importance of farmers’ IK and practices. Most of them were of the opinion that modern agricultural technologies are far better and that farmers need to adopt them if they are to cope with the changing
environment. They tended to believe that local practices are backward and not productive, and thus have to be replaced. But surprisingly one of the researchers stressed that some of the farmers’ practices such as inter-row cultivation, seed selection and preservation practices are effective. He was also aware of some of the attributes of local varieties such as resistance to storage pests and better adaptation to local conditions and suggested that they should not be abandoned; but should be improved by research. He even felt that hybrid seeds alone could not address the diverse needs of farmers and thus there is a need for expanding alternative choices for farmers.

**Conclusion and Implications**

The study revealed that Kersa farmers have a wide range of IK relating to maize production and utilization, though much of this is being eroded. It became evident that no one has a monopoly on IK as it is not found in the form of a fully-fledged package. The most significant IK areas include local varieties and informal seed systems, pest control and storage practices, and to some extent, weed control, soil fertility management, and maize utilization. In general, the expansion of the maize package technologies such as hybrid seeds and other practices, coupled with low productivity of the local varieties, had contributed to the neglect and disappearance of farmers’ indigenous technologies and practices. Although farmers want to grow different varieties to fulfill their heterogeneous needs, they have become increasingly obliged to rely on a few varieties.

Of the local varieties, *Oromee, Araba, and Affillo* were at great risk, while *Kenya* seems to have a relatively promising future. With the introduction of the hybrid maize, the local seed systems and networks have also been weakened because of increasing reliance on external sources. The demand for local seeds and other open pollinated varieties has been escalating in the area. This calls for efforts to collect, preserve (mainly on farm in-situ) and improve these local varieties before they are completely lost. Above all, there is a critical need to devote substantial resources and efforts for research and extension of open-pollinated varieties. Moreover, as local seed channels are more accessible to the community, efforts should be made to integrate the formal and informal seed systems in order to enhance their effectiveness.

Traditional pest and disease control practices were also found to be endangered. The introduction of the maize package and commercial pesticides seriously threatens these practices. Thus, there is an urgent need to record, document and conduct studies to determine their efficacy and to further strengthen and disseminate best practices to users. The status and use of alternative soil fertility management practices were not encouraging and farmers have become overwhelmingly dependent on commercial fertilizers. Lack of compatible crops for intercropping and crop rotation, absence of other fertility management practices in the maize package, falling livestock population, expansion of maize area and commercial fertilizers were the major bottlenecks to these practices. In particular, the declining fallowing practice and rocketing price of commercial fertilizers necessitate the search for and promotion of other fertility management practices. The influence of the maize package was also evident on maize utilization and control. In general, efforts have to be made to make the extension package flexible in order to incorporate local knowledge and practices.

On the other hand, both farmers and extension personnel were somewhat aware of the importance of farmers’ IK and the fact that it has been undergoing rapid displacement, implying that there is some concern about its disappearance. However, the extension personnel and researchers were inclined to view modern technologies as the primary remedy for farming
problems. Thus, efforts should be made to raise awareness, understanding, and appreciation of the value and potential of IK in research and development by organizing various fora and by incorporating aspects of IK into the curricula of agricultural learning institutions. Parallel to these actions, efforts need to be made to enhance the development of skills in the use of methods and techniques for identifying, recording, preserving and utilizing IK in research and extension programmes; which of course requires a supportive policy environment.

References


