

# *Mapping and Auditing of Agricultural Indigenous Knowledge in Uasin Gishu and Keiyo Districts in Rift Valley Province, Kenya.*

*Joseph N. Kiplang'at<sup>1</sup> and Daniel Chebutuk Rotich<sup>1</sup>*

1 Moi University, Kenya, jkngetich@yahoo.co.uk

## ***Abstract***

The purpose of this study was to map and audit AIK among farmers in Uasin Gishu and Keiyo districts in Kenya. It examines the extent of applications of AIK by farmers in their agricultural activities. A survey research method, comprising face-to-face interview was utilized to gather data. This was complemented by focus group discussions with the farmers.

The study suggests and recommends measures to be taken in improving the capturing, preserving and disseminating AIK to agricultural researchers, extension workers and farmers. It envisages an improved flow of agricultural indigenous knowledge among the stakeholders as a result of improved methods for capturing, preserving and disseminating AIK. This is expected to increase agricultural productivity, sustainable food security, generation of foreign exchange, and creation of income earning opportunities by farmers, patenting of indigenous knowledge, creation of national indigenous knowledge systems, and development of local agricultural content.

## ***Introduction***

Kenya's economy is heavily dependent on the agricultural sector that also provides the basis for the development of the other sectors (Kenya, Republic of, National Development Plan 2002:23). Its direct contribution to Gross Domestic Product (GDP) is 25% and indirectly contributes a further 27% through linkages with agro-based and associated industries (KARI 2002:1). The sector employs about 75% of the total labour force, generates 60% of export earnings, and provides 75% of industrial raw materials and 45% of Government revenue (KARI 2002:1). About 80% of Kenya's population live in the rural areas and are engaged in agricultural activities. The majority of the population are smallholder farmers who account for 75% of the total agricultural output in the country (KARI 2002:1). In addition to its role in the national economy, the agricultural sector is also key to the livelihood of many Kenyans in food security and nutritional balance (KARI 2000:6). It suffices to say, therefore, that agriculture remains the engine of the national economy and its performance in any one year impacts heavily on nearly all other sectors.

The overwhelming majority of the population in Kenya lives in the rural areas and are small-scale farmers, each working on less than five acres of land. In most instances, the knowledge systems of these farmers have never been recorded systematically in written form, hence they are not easily accessible to agricultural researchers, extension workers, and development practitioners. While they remain invisible to the development community, many indigenous organizations are operating in rural communities to search for and identify solutions to community problems.

Agricultural Indigenous Knowledge (AIK) is a valuable national resource. AIK helps to ensure that the end users of specific agricultural development projects are involved in

developing technologies appropriate to their needs. By working with and through existing systems, change agents can facilitate the transfer of technology generated through the research network in order to improve local systems. AIK is cost-effective since it builds on local development efforts, enhancing sustainability and capacity-building.

Warren (1991) defines indigenous knowledge (IK) as local knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities.

Flavier et al (1995) observes that indigenous knowledge is the information base for a society, which facilitates communication and decision making. Indigenous information systems are therefore dynamic, and are continually influenced by internal creativity and experimentation as well as contact with external systems.

### ***Indigenous knowledge in global knowledge economy***

The basic component of any country knowledge system is its indigenous knowledge. It encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood. Indigenous knowledge is developed and adapted continuously to gradually changing environments and passed down from generation to generation and closely interwoven with people's cultural values. Indigenous knowledge is also the social capital of the poor, their main asset to invest in the struggle for survival, to produce food, to provide shelter or achieve control of their own lives (World Bank 1997).

In many countries, indigenous knowledge systems are at risk of becoming extinct because of rapidly changing natural environments and fast pacing economic, political, and cultural changes on a global scale. In agriculture, for example, new technologies adopted by farmers are easier and convenient to use hence making indigenous knowledge to disappear. There is need therefore to capture, preserve and disseminate this knowledge widely and avoid the risk of getting extinct.

Indigenous knowledge is part of the lives of the rural poor because their livelihood depends almost entirely on specific skills and knowledge for their survival. Mainstreaming this knowledge and integrating it with modern knowledge would be most promising to farmers in Kenya. It will facilitate the adoption of technologies leading to increase in agricultural production. It is therefore important for development agents such as NGOs, CBOs, governments, donor agencies, private sector and local leaders to recognize IK, value it and integrate with modern technologies. Indigenous knowledge can be preserved, transferred, or adopted and adapted elsewhere.

### ***Agricultural Indigenous Knowledge Systems***

Despite the increased influence of modernization and economic changes, a few traditional agricultural management and knowledge systems are predominant in many African countries (Akullo et al, 2007). These systems exhibit important elements of sustainability. In Ethiopia, for example, high yielding sorghum varieties were introduced to increase food security and income for farmers and rural communities. This variety only proved a success when weather and other conditions were favorable. However, the local varieties with higher variance of traits were less susceptible to the frequent droughts.

Many small- scale farmers in Kenya utilize indigenous knowledge system because it is cheaper compared to modern techniques. They are also available locally and are easy to adapt and use. AIK is stored in people's memories and there is likelihood of being distorted or forgotten. A lot of AIK has been lost through deaths of elderly people since there is no formal documentation of such knowledge. In many communities in Kenya, it is difficult to share AIK because of household belief it is their preserve and hence have no business in sharing. It is guarded jealously by those who have it.

The increased uses of modern farming methods have limited the use of AIK. The population increase and pressure in rural areas of Kenya have led to intensification of agriculture in and use of modern methods. It is therefore necessary to establish the extent to which AIK is applied by farmers and in Kenya. The findings of this study were therefore expected to shed light on the application of AIK and how it can be captured, preserved and shared by farming community.

### ***Objectives of the Study***

The study was guided by the following objectives:

- To map and audit Agricultural Indigenous Knowledge (AIK) among farmers in Uasin Gishu and Keiyo Districts in Kenya.
- To find out the extent to which farmers apply AIK in improving agricultural productivity for sustainable food security.
- To establish how farmers preserve, share and integrate indigenous knowledge in their farming activities.
- To examine the national policies and strategies currently existing in capturing, preservation, and utilization of indigenous knowledge in Kenya.
- To suggest and recommend measures to be taken to improve the use of AIK by farmers in Kenya.

### ***Justification of the study***

The overwhelming majority of the population in Kenya lives in the rural areas and are small-scale farmers, each working less than five acres of land. In most instances, the knowledge systems of these farmers have never been recorded systematically in written form, hence they are not easily accessible to agricultural researchers, extension workers, and development practitioners. While they remain invisible to the development community, many indigenous organizations are operating in rural communities to search for and identify solutions to community problems.

Policy makers and agricultural development planners are beginning to recognize the need to understand existing knowledge systems and decision-making processes. Agricultural innovations based on indigenous knowledge have been tested through time. Indigenous knowledge is a science that is user derived and scientist-derived, and its utilization in development efforts provides long-term advantages that complement the contributions of conventional top-down agricultural technologies. The promising indigenous farmer practices and knowledge, however, need to be tested, validated and where necessary improved.

This study therefore sought to map and audit AIK among farmers in Uasin Gishu and Keiyo Districts in order to understand its application and use for sustainable food security. The

findings will therefore contribute documented knowledge of AIK and is expected to be helpful to agricultural researchers, extension workers and policy makers in Kenya.

### ***Methodology***

A survey research method, comprising of face-to-face interview was utilized to gather data, as a means of mapping and auditing AIK among farmers in Uasin Gishu and Keiyo Districts. As a procedure, a research permit was obtained from the Ministry of Higher Education, Science and Technology. It was also necessary to get an introductory letter from Moi University introducing the researchers to the respondents. The respondents were contacted in advance and requested for their participation and cooperation in the study.

The steps taken to accomplish the study included the use of qualitative approach. The research design employed involved interviewing farmers who were randomly sampled across the two districts. They included the elderly and those above 60 years who were purposively selected because they were thought to possess sufficient information about utilization of IK in agricultural production as they had lived long enough to witness the changes in utilization. The majority were illiterate and interview method was therefore most appropriate. In total, 41 farmers were consulted by the study.

Furthermore, key informants who comprised of the District Agricultural Officers and Agricultural Extension Officers, employees of NGOs and CBOs and the local leaders were purposively identified and interviewed basing on their practice and knowledge of the AIK. A total of eight divisions in the two districts were selected. Generic review of literature was also carried out to follow up on the changing context of agricultural research in Kenya.

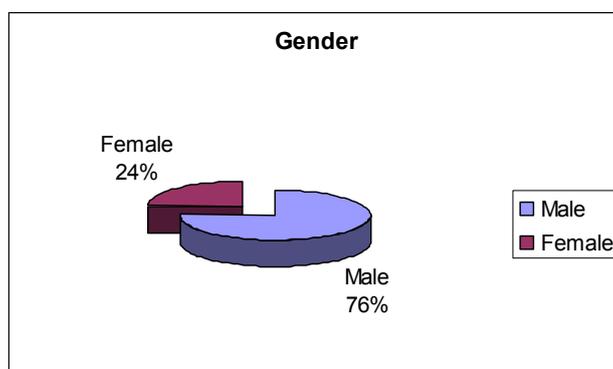
During the field visit, it was possible to observe some of the practices mentioned by respondents. This was captured using a digital camera depicting AIK practices applied both in animal husbandry and crop production as demonstrated by the farmers consulted.

## ***FINDINGS AND DISCUSSIONS***

### ***Characteristics of respondents***

#### ***Gender***

Of the respondents consulted, 76% were male, while 24% were female. This is presented in the following pie-chart.



The male farmers constituted the highest number of respondents this could be attributed to the social and cultural set-up where men are supposed to be out in the farms as women undertake household activities. The men usually plough the farms using oxen and women are only invited during the weeding and harvesting season. The farming pattern affected

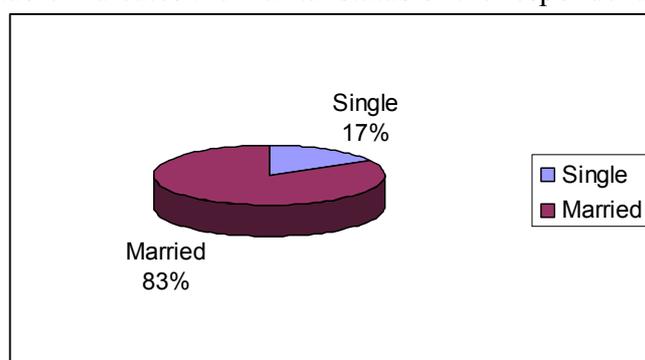
communication of indigenous knowledge from generation to generation which obviously favored the men.

### ***Marital Status***

It was necessary to know the marital status of the respondents in order to establish the ownership of land. In many instances men own the land and make all the farm decisions including crops to be planted and animals to be reared. Women could only inherit the land after the death of their husbands. In recent past, many parents have considered giving land to their unmarried daughters.

Culturally, women were expected to keep indigenous chicken and a small garden at the homestead.

The following table indicates the marital status of the respondents.



Most of the respondents (83%) were married and the men being the head of households were required to make all the farm decisions. This meant that indigenous knowledge was mostly with men.

### ***Level of education of respondents***

The respondents' level of education was established. It was found out however, that there is no correlation between respondents' level of education and their indigenous knowledge. In most cases those who possessed good AIK were illiterate. The level of education may determine success of integrating AIK with modern farming technologies. This will require farmers to have some basic knowledge of education.

The following table indicates the respondent level of education.

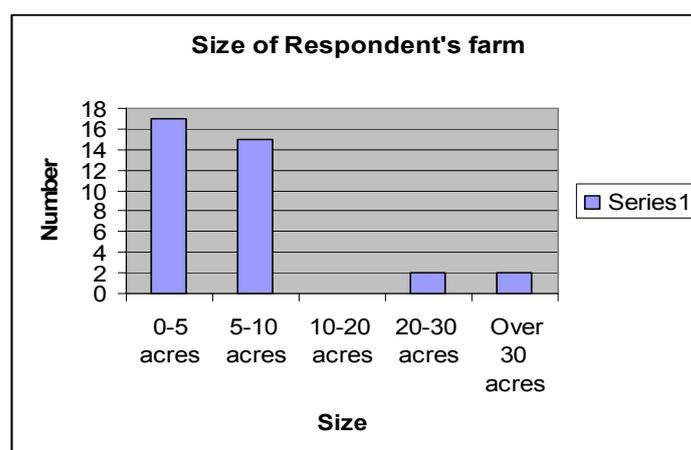
<b>Respondent's level of education</b>		
<b>Level</b>	<b>Number</b>	<b>Percentage</b>
None	5	12
Primary	8	20
Secondary	21	51
Bachelor's degree	6	15
Master's degree	1	2
<b>Total</b>	<b>41</b>	<b>100</b>

The majority of respondents had secondary education with no formal employment, therefore resorting to small-scale farming as a source of livelihood.

### *Size of farm*

It was necessary to establish the size of farm in order to determine whether the respondents were small or medium scale farmers. The study targeted areas where the majority of farmers were small-scale. It was assumed that the large scale farmers practiced mechanized farming and very little indigenous knowledge was applied.

The majority (89%) of the farmers interviewed had between 5 and 10 acres of land and practiced subsistence farming. They were poor and lacked capital to practice modern farming. The majority could not afford farm input such as fertilizer and seeds. They used manure from goat drops, cattle and chicken. They also prepare compost manure from kitchen waste/refuse as well as farm by-products. This was applied in fallow plots to enhance nutrient status.



### *Agricultural knowledge practices*

It was necessary to establish the information needs of farmers and ascertain how these needs were fulfilled. The following table summarizes the responses obtained from farmers.

### *Information needs of farmers*

Information Requirements	Number	Percentage
Agricultural inputs	21	58
Pest control	23	64
Planting season	14	39
Marketing of farm products	18	50
Growing vegetables	16	44
Seed variety	19	53
Animal husbandry	11	31
Poultry	14	39
Home Economics	9	25
High yield	17	47
farm mechanization	13	36
Others – crop rotation etc.	5	14

The information collected revealed that the highest percentage of farmers sought for pest control information on a day to day basis. Farmers also had other requirements not listed in the research tool including crop rotation, farm machinery and new crop varieties. However, farmers decried the lack of knowledge on improved farming methods and attributed this to inadequate extension services. They also lacked knowledge on alternative sources of information on improved seed varieties, relatively cheaper farm inputs and also where to market their farm produce. Due to the vacuum in information provision, unscrupulous middle men took advantage of the farmers.

### ***Awareness of indigenous knowledge***

The majority of the farmers interviewed learnt about AIK through parents and grandparents. Others learnt through secondary and college education. It was established that the Kenya Agricultural Research Institute (KARI) and the Ministry of Agriculture have established a Farmers Training Centre for Indigenous knowledge near Turbo Township in Uasin Gishu District. Farmers usually converge and are taught how to apply AIK in their farming activities. Farmers learn various uses of this indigenous technology including use of animal and compost manure, sprinkling of hot pepper on vegetables to control pests, drying of selected seeds for planting, alternating of livestock and crops on a field portion to restore fertility and soaking of seeds before planting in water to hasten germination among other practices.

### ***Application of Agricultural Indigenous Knowledge Seed selection and storage***

The farmers select seeds which were of good health and size. The seeds were then placed in baskets and hanged in kitchen ceilings so that smoke and heat would dry and preserve them. A significant number of farmers sprinkle ash on the grains to prevent weevils from attacking. The grain crops after harvest were stored in ventilated granaries and placed on top of twigs and leaves of plants such as Lantana Camara plant to prevent attacks by weevils.

### ***Farm implements used in plough/tilling***

Varied responses were obtained from farmers on the use of farm implements they use in land preparation. Some farmers used hoes and ox-drawn plough to prepare their farms. It was observed that most of the farmers preferred tractor to plough their farms. It was only during weeding that majority used hoe, pangas and sharp sticks.

### ***Application of fertilizer***

Farm yard manure such as cow dung, goat droppings and chicken waste are used by most farmers to improve fertility of fallow land. The use of compost manure, rotten leaves from bushes was also reported. A significant number of respondents have adopted the use of modern fertilizers such as DAP and CAN.

Farmers burnt maize stock after harvest and believe that ash was a source of nutrients and burning killed crop pests in the soil. Few farmers reported cutting of maize stock after harvest and keeping on the sides of the farm. After the farm has been ploughed the maize stock which by now had decomposed is spread across the farm.

### ***AIK practices in Pest Management control***

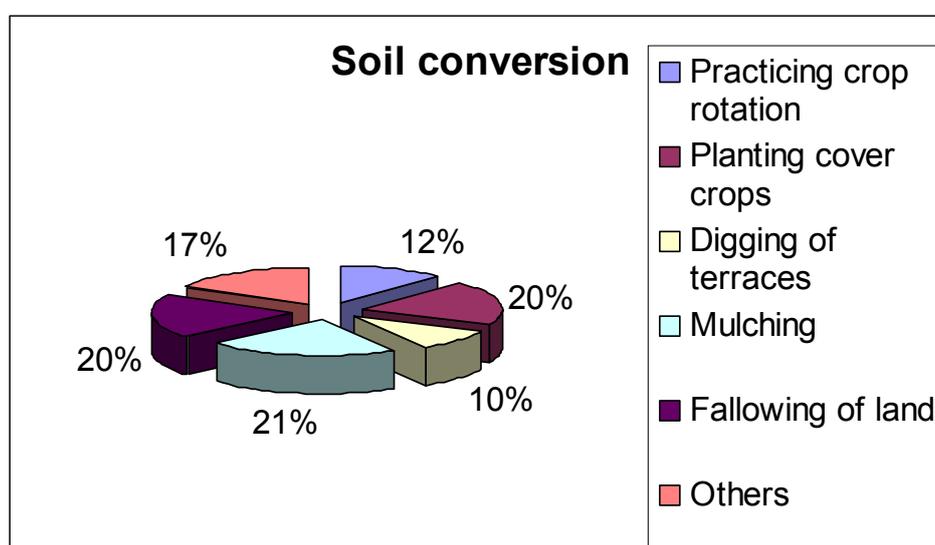
A significant majority of farmers contacted confirmed the use of ashes on crops to control diseases and pests especially for vegetable crops. In granaries farmers stated that dusting of cereals with ashes helps prevent weevils. A large number of respondents cited the use of hot pepper and ashes to control maize stock borer. The farmers preferred timely planting to enable crops such as maize not to be attacked by pests and diseases during their growth period in farms.

Storing of harvest in well ventilated granaries assist in aeration as dumping was cited as a cause of rotting in storage of cereals. Traditionally, the use of pets such as cats to control rats and the use of scare-crows to scare away field pests such as porcupine and birds was cited by some farmers. Use of basket granaries for storage of grains was also said to preserve cereals and secure them from pests.

Farmers cited uprooting and destroying affected crops as a way of preventing transfer of pests and diseases from infected to healthy crops. Sorting of harvest before storing, was cited as a good practice to prevent pest multiplication and disease infestation in stores. Use of lantana camara leaves against weevils was cited, where the leaves are laid underneath the cereal produce in the stores. The leaves produce a smell that prevents weevils from attacking. Some farmers sprinkled tobacco juice on vegetable and this kills the pests. Planting of tobacco plants around crop farms also prevent pests. An average number of farmers used modern technology of Integrated Pest Management (IPM) and spraying insecticides

### ***AIK practices in Soil and water conservation***

In conserving soil fertility, the respondents used mulching, fallowing and crop rotation techniques to improve fertility. The details are presented in the following chart.



Other techniques cited include, piling of stones across steep areas, planting grass strips and use of raised beds to prevent surface run-off. The most common method used in preventing soil erosion was digging of terraces. This was practiced in Elgeyo district where most farms were located along the hills. Some farmers planted leguminous crops to alternate with deep and shallow rooted crops as a way of crop rotation.

Varied responses were given on the techniques used to conserve and harvest water. The majority of farmers harvested rain water and stored in pots and water tanks. Construction of pans (sunken ground to harvest water) was also mentioned. Use of boreholes, shallow wells and building tanks and dams were used in harvesting water from roof-tops.

### ***AIK practices in harvesting and storage***

Harvesting and storage of crops especially cereals is still a communal activity. Some AIK practices involved in harvesting and storage include the use of traditional basket granaries, dusting with ash for storage preservation against weevils, winnowing of millet to remove thrash, packing cereals in sacks after threshing, sun drying of legumes to dry them fully before storage and mixing with chemicals for storage.

### ***Application of AIK in Livestock Management***

#### ***AIK practices in rearing animals***

The research revealed that a significant traditional method of hatching eggs and rearing a day old chicks is in use and is a very effective technique with tangible results. The technology involves the use of a traditional hatchery (chepkube) which makes use of fireplace heat to brood and hatch chicks and subsequently rear the chicks using the same fireplace until they are of age to be transferred to a different location.

Traditionally free range grazing was used for livestock especially goats. They are left to graze on shrubs and herbs as these are medicinal. Some salty stones were given to livestock to lick as it is rich in minerals. Cows are de-wormed using traditional brew. Free range system is used for poultry keeping. Sheep are docked to distribute fat and facilitate uniform growth. Poultry are fed using millet, sorghum and maize. Juice extracted from the aloe-Vera plant is used to control coccidiosis in poultry.

The AIK practice used in animal breeding involved the choice of a healthy animal determined by its physical features of the bull to be used in siring. The farmers prefer bulls from a highly productive mother. To avoid in-breeding, bulls may be brought from other villages. A cow without disabilities was used then used for breeding.

#### ***Preservation of milk, meat and vegetables***

Milk is preserved using gourds kept in cool places to avoid becoming sour. Fresh milk is converted into sour milk by putting into a gourd which has been smeared with special medicinal ash obtained from wattle tree. On the other hand, meat products are cut into small pieces dried and smoked for preservation purposes. Fresh vegetables are kept in water overnight so that they are fresh at the dawn of the following morning. Boiled meat is kept inside honey containers to preserve it for a longer time.

#### ***AIK practices in animal husbandry***

Respondents cited the practice of grazing cattle in open fields and de-worming them using traditional brew (sukutek) and certain plant herbs. Blood is also extracted from the neck region of an animal heavily infested with ticks in order to make the animal skin hard and discourage ticks from invading. A small number of farmers cited other practices such as dehorning and choosing the best bull in breeding cattle.

### ***Traditional crops grown and their benefits***

Among the traditional crops grown in the agro-ecological zones under study included: sorghum, millet, black night shade, pumpkins and yams. The farmers also grow cassava, sweet potatoes and maize.

According to the farmers, the traditional crops have many benefits which include: short span of maturity; they are resilient to harsh weather conditions; and resistant to pests and disease. They also observed that traditional crops especially vegetables have medicinal content enabling families to be healthy and live longer. The respondents also gain some income through farming of traditional crops.

### ***Use of AIK in Farm Management***

Several traditional methodologies are used by farmers in managing soil fertility, most prevalently the use of farm yard manure and compost manure. Land fallowing practice was also cited where land is given rest or animals are reared on land portion that has lost fertility in order for it to regain fertility. Others cited planting of leguminous crops and alternating deep and shallow rooted crops (a form of crop rotation).

Water is a vital factor in farming practices and its conservation is crucial at certain times of the year. Some of the techniques farmers cited in conserving water include; mulching, planting cover crops, spreading uprooted weeds of maize and millet stalks on the farm, digging channels to distribute water, use of drip, furrow and bucket irrigation and the use of watering cans

### ***Methods of sharing AIK***

The respondents gave the following ways of sharing of AIK in the community:

- Training communities through extension officers
- Teaching on preservation measures
- Through the use of adult education forums
- Introducing AIK in schools; primary and secondary schools
- Through barazas and workshop forums
- Through establishing demonstration plots
- Through field days
- Use of farmer's field schools
- Use of local media that use vernacular languages
- Availing AIK materials in public libraries

### ***Storage and preservation of AIK***

Agricultural Indigenous knowledge can be stored and preserved for the coming generations as it is a sustainable method used by local farmers. Among suggested responses for preservation and storage of AIK were; preserving AIK artifacts and tools in museums; encouraging research; documentation and publishing of books on AIK; introducing research farms where AIK is practiced; use of extension officers to encourage use of AIK among farmers; establishing a policy framework to manage AIK.

### ***Creation, dissemination and preservation of AIK***

Among the suggestions given on improving the creation, dissemination and preservation of AIK include:

- Training and offering incentives to farmers who practice AIK
- Use of Agricultural Shows as forums for sharing AIK knowledge
- Dissemination through Barazas and workshops
- Use of village elders and opinion leaders
- Carrying out awareness seminars
- Use of incentives to motivate farmers to use the techniques
- Government budgetary allocation should consider AIK
- Integrating AIK with modern techniques to facilitate adoption
- Encouraging use of AIK for self-reliance
- Encouraging authors to publish books on AIK
- Setting up demonstration plots practicing AIK
- Encouraging further research and documentation of AIK
- Use of field days
- Starting farmers field schools
- Incorporating AIK into the educational curriculum
- Retaining some old tools in museums
- Ensuring AIK is upheld by doing follow ups on trained farmers
- Establishing national IK resource centers
- Validating farmers' experiments creates an environment of respect for local people and village-level extension workers thus leading to their increased participation and empowerment.

### ***CONCLUSION***

The study recognizes the active roles of rural people in problem definition and in the search for their solution through local-level experimentation and innovation. By working with and through existing systems, change agents can facilitate the use of AIK technology in order to improve local systems. IK is cost-effective since it builds on local development efforts, enhancing sustainability and capacity-building. AIK includes practical concepts that can be used to facilitate communication among people coming from different backgrounds such as agricultural researchers and extension workers.

This study has revealed that AIK systems can play an important role in facilitating dialogue between rural populations and agricultural stakeholders. Through encouragement of further research and implementation of AIK such vital techniques can be preserved and adequately disseminated for the common benefit of citizens in Kenya and the rest of the developing Africa.

Development agents (Community Based Organizations, Non-Governmental Organizations, governments, donors, local leaders, and private sector initiatives) need to recognize it, value it and appreciate it in their interaction with the local communities.

Information and communication technologies are likely to play a crucial role in the integration of agricultural indigenous knowledge in mainstream knowledge management. This

calls for concerted efforts among all the stakeholders who comprise of farmers, researchers, extension workers, information professionals amongst others. Government support should be intensified in areas of policy and legislation, management, funding, capacity building, and research in IK.

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