The Modern Methods Of Farming Adopted By Small Scale Farmers And How They Have Impacted Indigenous Knowledge: The Case Of Kagadi District, Uganda

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ABSTRACT

This study undertaken among local farmers in rural Uganda in Kagadi District clearly shows that most farmers still depend a lot on indigenous knowledge to manage their farms and farm produce. Over 35% of the farmers use IK and have tended not to pick up other modern methods of farming like using improved seeds, fertilizers and insecticides. They also report receiving knowledge on modern farming very recently. Modern Agricultural information has been flowing much more slowly than was originally anticipated in this District. There are a few IK methods which when undertaken together with modern methods has potential for increasing agricultural productivity and this includes knowledge on the seasons, identifying the best seeds, taking care of the dry seeds while in storage among others. This strongly recommends the need to identify the good IK methods which can be incorporated into the modern methods and used to improve agricultural production including the whole food production chain.

Key Words: Small Scale Farmers, Modern farming, Indigenous Knowledge in farming.

1. INTRODUCTION

Brieger (2005) has defined Indigenous knowledge (IK) as local knowledge that is unique to every culture or society and the basis for local level decision making in a variety of spheres (Mutekanga D and Tusiime J, 2018). People have indigenous knowledge of nearly all natural resources around them, ranging from water to plants and animals. The Uganda national Council for Science and Technology (UNCST) reported in 2017 that IK manifests itself in a variety of ways including household relations, taboos, and customs, and that it is part and parcel of community social order (Mutekanga and Tusiime 2018).

An ecosystem has been defined (Millennium Ecosystem Assessment, 2005) as a dynamic complex of plant, animal and micro-organism communities and the non-living environment interacting as a functional unit. This complex system provides ecosystem services that benefit people. Ecosystem services include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, diseases, wastes and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient recycling. The human species, while buffered to some extent against environmental changes by culture and technology, are fundamentally dependent on the flow of ecosystem services (Millennium Ecosystem Assessment, 2005). However, changing phases of climate and its possible effects on the ecosystem is becoming a source of concern to development agencies all over the world. This concern seems to be most pronounced in relation to the agro-ecosystem, which is directly affected by climatic factors that can be overcome through application of indigenous knowledge (IK) (Raygorodetsky, 2018).

Organic Agriculture has been described as a systemic operation relating solely on ecological processes as opposed to artificial chemical use (IFOAM 2017). Other authors like the Codex Alimentarius Commission (2014), described organic agriculture as a holistic system promoting agricultural ecosystems production.

The agro-ecosystem being a principal component of the general ecosystem is indeed one sphere of human activity and existence that is particularly vulnerable to human activities, because it is dependent on climatic conditions for generating and sustaining biodiversity, which forms the fundamental link between humans and the environment (Brown *et al*, 2007). As such, any significant alteration in the average state of the weather over a period of time at a location tends to bring about some shift in the naturally established balance in the agro-ecosystem. Consequently, the dependence of humans on this balance for certain vital system services tends to be affected negatively. Sometimes this may result in food insecurity and adverse weather conditions in form of epidemics within the environment. It is hoped that insights from findings of a research conducted on IK, can be applied in the agricultural sector to avert food insecurity, epidemics, climate change and environmental degradation emanating from human activities.

2. LITERATURE REVIEW

Indigenous knowledge has been described as being very significant to local poor communities who depend on natural resources for their livelihoods (Mutekanga and Tusiime 2018). They further reported that IK aspects are illustrated in various activity areas including hunting, farming, gathering, use of food and herbs, honey collection, handcraft and even architecture.

The Uganda National Council for Science and Technology (UNCST 1999) reported that local indigenous farmers' knowledge systems offer an alternative approach to interpreting environment and development change, and that this often helps to instruct or inform and improve development policies and actions at the local and national planning levels.

In Africa since time immemorial, there have been traditional healers, birth attendants and those who treat fractures, even compound fractures (Mutekanga and Tusiime 2018).

Several researchers (Nelms & Gorski 2006; Mahomoodally 2013, and Mwizenge 2016) have confirmed that African Traditional Medicine is holistic and attempts to go beyond the boundaries of the physical body into the spiritual. That this can be categorised as mind-body medicine. These researchers have also reported that some common medical principles have emerged over time in various African regions and they include several scientifically proven techniques and strategies, some of which are culturally specific and of psychological importance.

Mutekanga and Tusiime (2018) reported that some European and American based pharmaceutical companies often send agents to tap the knowledge of traditional African pharmacologists. Treatment for cancer, obesity,

drug addiction, diabetes, and other ailments have benefited directly or indirectly from traditional African pharmacologists through plants such as the African willow (South Africa), the hoodia plant (Namibia), iboga (Gabon), Nimu tree (Uganda), and many other botanicals (De Smet 1998). In 2002, Carlson reported that Shaman Pharmaceuticals collaborated with several local traditional healers and communities in Guinea, West Africa and as a result of this collaboration, several plants were identified as useful for the treatment of diabetes.

Concerning Agriculture, Mutekanga and Tusiime (2018) reported that most African local communities knew and still know when and where to plant certain types of crops. They further reported that these communities also know why certain crops do not grow in certain areas, when to take their animals for grazing, why at certain periods there is a low milk supply and what to give the animals to increase the milk supply, how to treat animal diseases using indigenous herbs, shrubs and other concoctions.

Mwinzenga (2016) had earlier reported that many people in Africa have fermented foods using indigenous knowledge for storage and preservation purposes. The foods mentioned include cassava, cerals oil seeds and milk.

Indigenous knowledge is important in maintaining soil fertility. For instance in Dejen District, Amhara Region of Ethiopia, Fenta (2010) reported that farmers recognize soil fertility as an important agent for increased crop productivity and use different indicators to know the level of soil fertility. Similarly in Northeast Thailand, Polthane (2010) established that some farmers used crop and weed residues to make composite organic fertilizer to improve the fertility of soil.

In Mukungwe sub-county of Masaka District in Central Uganda, local communities have been reported by Agea *et al* (2008) to be using IK practices in various farming practices. These practices include coffee husks for mulching and placing cassava and potato tubers in soil for preservation and storage.

It has also been reported by several authors (Buthelezi, Hughes and Modi, 2010, Wahyudi *et al*, 2012) that farmers in KwaZulu Natal in South Africa practiced mixed farming and used local plants as pesticides.

Effects of Agriculture Modernization on Indigenous Knowledge, Environment and Wellbeing

In a study about sustainable indigenous agricultural practices, Dlamini (2007) noted that traditional plants were used to treat livestock diseases. However, with the introduction of modern farming, farmers could not recall most of the mixtures that were used because they had not used them in a long time.

Wild food plants (WFPs) have been reported by Tabuti *et al* (2004) that they are being replaced by cultivated crop species and that this is due among other reasons to loss of IK.

In the recent past, agricultural modernization that involves the use of hybrid and genetically modified seeds (GMOs), synthetic fertilizers and chemical sprays application for high output and prevention of a host of pests and diseases respectively has overshadowed IK. Despite the modernization of agriculture, more people still go

hungry. Most people argue that the technologies of the Green Revolution (GR) increased global food supply. The GR spanning the period from 1967-68 to 1977-78 changed India from a starving nation to one of the world's leading agricultural nations. The GR increased food production through expansion of existing farmland, double cropping existing farmland, using seeds with superior genetics or high yielding varieties (HYV) of seeds, mainly wheat and rice but also millet and corn. The most noteworthy HYV seed was the K68 variety for wheat, developed by M.P. Singh who is also regarded as the hero of India's GR.

Haser (1990) further reported that under HYV the area with crops increased from 7% to 22% during the 10 years of the GR. This was despite the fact that where HYV was used it demanded more water, fertilizer and pesticides.

A new "Green Revolution" in Africa (AGRA) promoted by the Gates Foundation and the Rockefeller Foundation was reported in 2006 (The Bill and Melinda Gates Foundation, 2006). The authors of the Gates Foundation bulletin posed a pertinent question whether the new effort will learn from the mistakes of earlier initiatives? The proposal disregarded the interests of smallholder farmers and the environment, especially in Sub Saharan Africa where smallholders comprise the majority and land is their most prized possession. India has failed to extend the concept of HYV seeds to all crops or all regions. In terms of crops, it remains largely confined to food grains only, not to all kinds of agricultural produce. The GR cannot therefore be considered a true success yet. Therefore, AGRA, should learn from the GR and other initiatives.

Modern agriculture has been glamorized over traditional agriculture with the latter dismissed by modernists as primitive, backward, and of very low productivity. Mono-cropping, chemical fertilizers, high yielding varieties, irrigation, and high mechanization characterize modern agriculture. Modern agriculture short circuited the evolution process of crops, and traditional systems of cultivation to adapt to local conditions. It encouraged farmers to believe that higher yield could be obtained with less effort by applying chemicals as opposed to application of knowledge that was encouraged by the traditional system (Dlamini, 2007).

In India, farmers regretted why they embraced the GR. They returned to practicing organic agriculture where they apply IK. The Organic Farming Association of India provides adequate evidence about the success of organic farming not only in India but other countries such as France, Jamaica, German, to mention a few. India has the strongest organic farming movement worldwide and in all states of the Indian sub-continent, farmers are demanding for a ban on GM seeds if the politicians are to get their votes in turn (OFAI, 2017).

Fenta (2010) reported that in the Dejen District, Amhara Region of Ethoipia, small scale local farmers mainly use IK for maintaining soil fertility and are more knowledgeable in IK compared to large scale modern farmers who mainly use inorganic fertilizers. This is an important aspect of the types of farmers who are more likely to use IK.

Perceptions about the use of pesticides and fertilizers vary between the rich and poor farmers. While rich farmers favour and practice use of pesticides and fertilizers on all the crops, the small farmers do not. This is because they believe that as long as the blessings of the village deity are with them, pests cannot cause any damage. However, the latent reason may be that these farmers do not want to increase the cost of cultivation by application of fertilizers and pesticides for a moderate increase in the yield (Kumar, 2010).

Mann (2006) reported that in the 1950s, research scientists developed various strains of cereal and other crops which was a tremendous boost to the Green Revolution (GR) which dramatically reduced hunger. But these crops needed heavy inputs in terms of fertilizers and irrigation. The impact of this development was among others the loss of local traditional seeds and crops and genetic diversity.

Dlamini (2007) documented the economic and social impact of modern agriculture. The economic impact includes dwindling productivity due to decline in soil fertility, the high cost of production leading to low profits, high risk of failure due to monoculture and the outflow of capital from villages where food is produced to the cities. The social impact of modern agriculture included the farmer overdependence on outside markets and exploitation by outside market forces, farmer dependency on seed companies for seeds, and farmer dependency on agro-chemicals leading to increased indebtedness and suicide by farmers. Another example of social impact was the high health risk created by low nutritious status of families resulting from the production of one type of crop and the lack of integration of plant and animal farming.

Conventional agricultural practices often degrade the environment through soil erosion, excessive water extraction, and biodiversity loss. Handley (2003) argued that growing food using inorganic fertilizers and pesticides, reduces biodiversity among other things that are significant in food production.

Lappe *et al* (1998) reported that a national survey by United States Environmental Protection Agency (EPA) found that 10.4 per cent of community water wells are contaminated with at least one of 127 different pesticides. The most harmful chemicals end up in the developing world as a result of exports of such pesticides by U.S. based corporations. Most end up in fields where workers are not provided protective clothing and where safety precautions are the last concern of the farms' owners. In a survey conducted in Central America, it was found out that when pesticides are being applied, 64 per cent of farmers and farm workers use no gloves, 62 per cent use no boots, 72 per cent no overalls, 60 per cent no hat, 55 per cent no respirator, and 64 per cent not even a long-sleeved shirt. Increasingly, transnational chemical companies have moved the manufacture of the most hazardous pesticides to the third world, where plant safety regulations are less stringent. The lethal combination of deadly ingredients and deficient safety precautions was dramatically demonstrated by the 1984 leak at the Union Carbide pesticide plant in Bhopal, India, that killed more than 2,000 people and injured 200,000.

While pesticides most endanger exposed factory workers and farm workers, today everyone is at risk. The weight of evidence is very clear and exposure to pesticides is a cause of cancer. Beyond causing cancer, new

evidence suggests that pesticides may have many other dangerous effects. For example, many pesticides fall into a category of chemicals called endocrine disrupters, some of which directly affect the reproductive system. The most frightening part is that this occurs in dosages much smaller than those at which we used to think pesticides residues were dangerous. Lappe *et al* (1998) further argues that pesticides have played a significant role in the high rates of increase in various cancers, as well as in apparently declining human sperm counts.

The World Health Organization (WHO, 2014), in a recent report warned Uganda on cancer-causing chemicals. According to the report, some chemicals widely used by farmers in Uganda are blacklisted for causing cancer. In Uganda, the herbicide brands with Glyphosate chemical include Weed Master, Weed End, Weed Sate, Supa Sate, Pin Up, Haosate and Herbisate. The chemicals, especially Tetrachlorvinphos and Parathion were banned in the EU and US over a decade ago as stipulated in the report. However, the five chemicals are still on the list of 200 chemicals approved by the Ugandan Ministry of Agriclutre Animal Industry and Fisheries (MAAIF) for use by the farmers. People are exposed primarly through residence near sprayed areas, home use and diet. The Uganda National Drug Authority (UNDA, 2015) has reported that the Uganda Cancer Insitute indicates a steadily rising cancer patients from less than 2,000 in 2005 to 35,000 in 2014; and of these, about 12-15% were new cases.

In a related development, Uganda's National Drug Authority (NDA) deregistered and recalled four types of poultry drugs found to cause cancer in humans, and warned the public against their use. NDA obtained the information from researchers to the effect that human beings who eat meat or eggs from birds treated with the said drugs have higher chances of contracting cancer. The blacklisted drugs, which have been on the market since the 60s, include Neocryl, Cospro F and Fuzol, which are both in powder and liquid form. The UNDA representative reported that it had been discovered that when farmers treat poultry with the said drugs, they remain in the birds, in their original form and those who eat poultry products are liable to suffer cancer-related diseases with time. The UNDA is responsible for regulation of veterinary and human drugs for their quality, safety and efficacy (UNDA 2011).

In Yemen, like in Uganda, Mohammed Al Qadhi (2008) has reported increasing cancer casesbut in this case linked to the national habit of chewing khat, and to the use of pesticides used to spray the plant. As a result about 30 per cent of Yemeni cancer patients have mouth and gum cancers.

Several authors (Evans, 2012, Grossman 2015 and Zimmer 2018) have reported that after reviewing the many already well documented negative impacts of Roundup on the environment and living creatures, Monsanto's best-selling herbicide Roundup is linked to infertility. Glyphosate is classified by the EPA as a Class III toxic substance, and can kill an adult in as a little as 30 grams. Glyphosate has also been linked to conditions such as: (i) Hormonal disorders, (ii) Lymphoma, (iii) DNA damage, (iv) Endocrine disease, (v) Skin cancer, (vi) Kidney damage and (vii) Liver damage (Evans, 2012, Grossman 2015 and Zimmer 2018).

Most small scale farmers in Kagadi in 2016 had tended to use newly introduced fertilizers, herbicides, insecticides, pesticides and other related chemicals to manage weeds and pests on their farms and also in storage and to increase yields per acre. However it is not very well known neither is it documented what impacts these approaches have had on the indigenous knowledge used by these same farmers (Kagadi District Annual Report 2016).

3. OBJECTIVES

The major objectives of this study was to establish the impact of the use of modern small scale farming practices in particular to the Indigenous Knowledge (IK) practices used on their farms.

Specifically the study:

- Identified the modern methods of farming adopted by smallholder farmers in Kagadi District.
- Established how the above modern methods have affected application of Indigenous Knowledge on smallholder farms
- Compared the benefits of using modern farming methods to using IK methods.
- Identified the methods suggested to be promoted by the farmers.

4. METHODS

The research collected quantitative data using a questionnaire to the local farmers and qualitative data using a questionnaire to the key informants:

- The questionnaire which collected quantitative data targeted bio data of the farmers and had a series of questions on the various modern methods being used, the IK methods being used and how they affect each other. This tool was also used to gather the comparative data of the two methods including benefits of each method.
- On top of the demographic data, the questionnaire also focused on the following issues: identifying the origin of Agricultural Modernization (AM); the modern farming practices farmers carry out; SFM, pests, diseases and weeds control in AM; inputs used by farmers in AM; how modern agriculture practices have affected IK; benefits of AM as compared with IK; any support to farmers from development agencies; the names of the specific agencies and type of support; the tangible benefits farmers have realized from the support; support to farmers at family level; farmers' average monthly income from agricultural produce; other main income sources and how the income is spent; small scale farmers' suggestions on the type of modern agricultural methods that should be promoted.
- Direct observations of the current methods being used by farmers on their farms.

– Key Informants were identified and separately interviewed on the above objectives using the questionnaire tool. This qualitative data was used in comparison with what the quantitative data collected using the data above from the local farmers.

The SPSS statistical package was used to analyze the data so collected.

5. RESULTS AND DISCUSSION

5.1 DEMOGRAPHIC CHARACTERISTICS OF THE TARGET FARMERS

The information that was collected included location, age, gender, marital status, level of formal education, number of family members, number of years living in the village, position of respondent in the group/association.

Location of the farmers

The highest number of respondents were from Burora Sub-county (37.9%) followed by Muhorro: (33.9%) and Kyanaisoke: (28.2%).

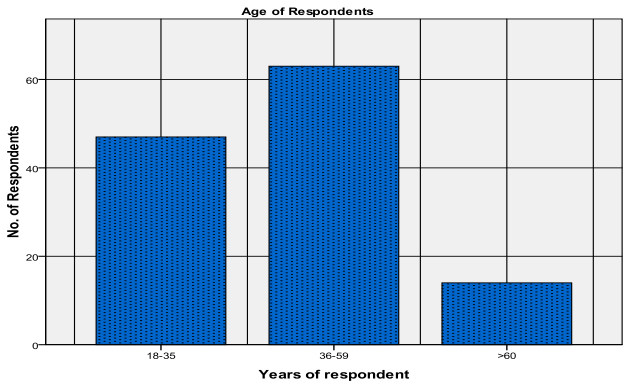
Gender

The number of female respondents were more (67%) than the males..

Age

All respondents were above 18 years and those between 18 and 35 were 37.9% while those between 35 and 59 were the majority (50.8%), while only 11.3% were 60 years and above (Figure 1).

Figure 1: Age of Respondents



Marital Status

85.5% of the respondents were married. This is an important demographic data since most rural communities believe in getting, married as a sign of responsibility but also as indicator of having more farm labour (Rankoana Sejabaledi A. 2017).

A comparison between the age of most farmers correlates very well with the percentage of those married. Most farmers (85.5%) in the target area were married and aged between 18 and 59 years (88.7%).

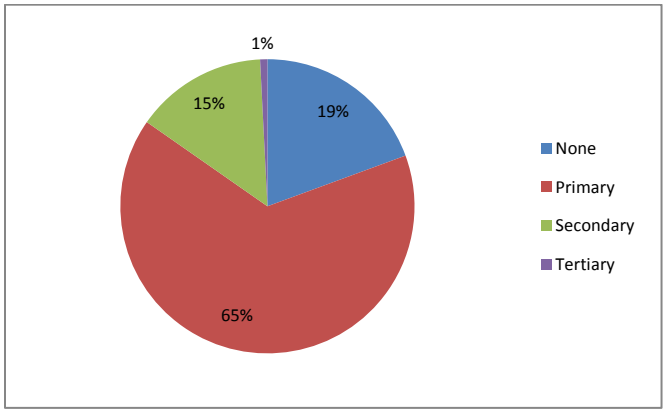
Level of Formal Education

There is relatively low level of education among these farmers. 19.4% reported that they had never gone to school and 65.3% stopped in primary school. Very few 14.5% had achieved secondary school education (Figure 2 below).

Number of Family Members

There is a correlation between levels of education and family sizes. While educated people tend to have smaller manageable families, the reverse is true for the uneducated. The findings indicated that 37.1% had family sizes of 2-5 members, while 53.2% had family sizes of 6-9, and only 8.9% had families of 10-13 members.

Figure 2: Respondents levels of formal education (% rounded off to nearest figure)



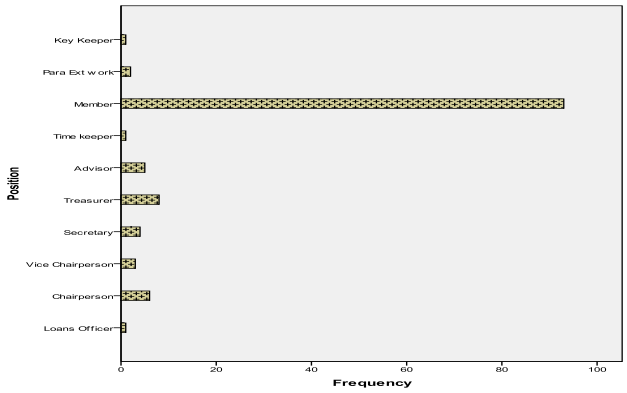
Number of years living in the village

Most farmers (71%9) have lived in their respective villages for over 15 years while the rest have lived there for less than 10 years.

Membership in Farmers' Groups

All the respondents belonged to a farmer's group with very creative names that depicted teamwork and cooperation, development, wisdom and uplifting. Farmers belonged to 20 different groups in their respective sub-counties. Most farmers (75%) were ordinary members in their groups (Figure 3). Although majority of the farmers were not on the executive committees of their respective farmers' groups, they were well versed with information regarding what goes on in their groups.

Figure 3: Positions of the Respondents in their Groups



Bio Data of the Key Informants

The majority of the key informants (56.3%) were in the 31- 40 year bracket and the majority (68.8%) held at least a degree in various fields (Table 1). All these key informants were male from the district local government and the Civil Society Organizations.

Table 1: Age and Level of education of Key Informants

Age Range	No.	%		Level of Education	No.	%
20-30	1	6.3		Certificate	2	12.5
31-40	9	56.3		Diploma	3	18.8
41-50	1	6.3		Degree	7	43.8
51-60	5	31.3		Masters	4	25.0
Total	16	100		Total	16	100

5.2 ORIGIN OF AGRICULTURE MODERNIZATION IN KIBAALE AREA

Most farmers (75%) reported that agricultural modernization was introduced by three major players – The National Agricultural Advisory Services (NAADS), Uganda Rural Development Training Program (URDT) and Muhorro Area Cooperative Union (MACU) as indicated in Table 2 below.

Table 2: Origin of Agricultural modernization in Kibaale Area

Origin	No.	%
NAADS	36	29
URDT	30	24.2
Muhorro Area Cooperative Union	27	21.8
Kagadi Kibaale Community Radio (KKCR)	6	4.8
Kagadi District Farmers Association (KDFA)	2	1.6
National Political campaigns of 2010 / 2011	9	7.2
Others(Various)	14	10.2
Total	124	100

According to the key informants, agricultural modernization in this area began in 1996 with the NAADS program but was enhanced by the work of organizations like International Fund for Agricultural Development (IFAD), Irish International Aid, URDT and EMESCO. The interventions included the use of herbicides, fertilizers, pesticides and High Yielding seed Varieties. They, however, mentioned that in the 1960s a few

tractors had been introduced and some famers were given fertilizers and chemicals especially those who were growing traditional cash crops like tea and tobacco.

5.3 MODERN FARMING PRACTICES APPLIED BY FARMERS

The majority of farmers (35.5%) reported using improved seeds and animals on their farms and these included as quality protein maize (QPM) (Locally referred to as Nnalongo), rice, banana suckers, Irish potatoes, beans, cassava, pigs and heifers. Others (33.1%) used fertilizers and pesticides as shown in Table 3 below).

Table 3: Modern farming methods used on farmers' fields

Modern farming practice	No.	%
No response	9	7.3
Fertilizers	31	25.0
Pesticides	10	8.1
Improved seeds and animals	44	35.5
Decomposed manure	6	4.8
Herbicides	8	6.5
Improved plant varieties	8	6.5
Herbicides + improved planting materials	4	3.2
Herbicides + fungicides + pesticides + improved seeds	4	3.2
Total	124	100

5.4 SOIL FERTILITY IMPROVEMENT IN MODERN AGRICULTURE

The majority of farmers (82.3%) still used IK in soil fertility improvement. They used it concurrently as they practice agricultural modernization. The IK methods mentioned included bush fallowing, leaving grass scattered to naturally rot and mulching (Table 4).

Table 4: Soil Fertility Improvement in Modern Agriculture / AM

Methods of Soil Improvement in Modern Agriculture	No.	%
Use of synthetic fertilizers	19	15.4
Bush fallowing (IK)	39	31.5
Mulching (IK)	30	24.2
Leave grass to naturally rot and not burning grass (IK)	31	25.0
Land still fertile, no fertilizer needed	1	0.8
Composting (IK)	2	1.6
Total	124	100

5.5 PESTS, DISEASES AND WEED CONTROL IN AGRICULTURE MODERNIZATION (AM)

In the control and management of pests, diseases and weeds, most farmers (70%) used methods introduced in agricultural modernization. These included use of introduced herbicides and pesticides. Only 30% used IK methods which included planting specially selected seeds and scaring birds away (Table 5).

Table 5: Pests, Diseases and Weed Control

a. Herbicide, reported by 28 respondents (22.6%);
b. Pesticides – 51 respondents (41.1%);
c. Planting improved seeds - 30 respondents (24.2%); (IK)
d. Scaring birds – 1 respondent (0.8%); (IK)

e. No response – 14 respondents (11.3%);

Types of fertilizers, pesticides, fungicides and herbicides applied by farmers in crop gardens in Modern Agriculture.

The inputs reported by the farmers include fertilizers, pesticides, fungicides and herbicides (Table 6). The commonest pesticide used by farmers was (Ambush {Pymetherine} 33.1%) and fertilizers used were NPK (22.6%). Farmers were required to mention the specific types of inputs they use, the specific crops for which the inputs are used, the purpose of using those inputs, how much per acre and how often these inputs are applied by the smallholder farmers.

Table 6: Types of fertilizers, pesticides, fungicides and herbicides applied by farmers in crop gardens in Modern Agriculture

Chemical Used On Crops	Number Of Respondents	Percentage Of Respondents
1.Fertilizers (Super Grow, Nitrite, Phosphorous & Potassium - NPK)	28	22.6
2. Pesticides (Ambush – Pymetherine)	41	33,1
3. Fungicides	30	24.2
4. Herbicides (Weed All, Weed End, Mamba, West Master, 24D, Round Up)	9	7.3
5. Others	2	1.6
6. No response	13	10.5
TOTALS	124	100

The Key informants reported that the biggest challenge is lack of correct information by farmers while applying the pesticides and fungicides on their farms.

5.6 HOW MODERN METHODS HAVE AFFECTED APPLICATION OF INDIGENOUS KNOWLEDGE ON SMALLHOLDER FARMS

According to a key informant, 80% of the crops grown in this area is based on IK and only 20% involves the use of synthetic fertilizers. Other key informants (20%) reported that modern methods are commonly used by the large land farmers and those who are wealthy.

Most farmers (33%) indicated that they had no idea regarding the effect of agricultural modernization on IK. However, 23.4% indicated that they had adopted AM and IK is dying out, but a significant percentage (16.8%) reported that modern agriculture had spoilt indigenous thinking and contributed to disappearance of indigenous plants variety (Table 7).

Table 7: Effect of Modern Agricultural practices on IK

Effect of AM (Agriculture Modernization) on IK (Indigenous Knowledge)	No.	%
Spoilt our indigenous thinking	5	4.0
Disappearance of indigenous plant varieties(NAADS cassava caused disease transmission to local varieties and they became extinct, Poor yields in indigenous crop varieties when mixed with improved)	16	12.8
Modern agriculture supplements IK	8	6.5
People have adopted AM, IK is dying out	29	23.4
No effect	11	8.8
No idea	41	33.0

No response	14	11.3
Total	124	100

5.7 A COMPARISON OF THE BENEFITS OF USING MODERN FARMING METHODS TO USING IK METHODS

A simple comparative analysis by farmers indicated that 35.5% of them reported that modern farming led to high outputs, maximum utilization of land and saved time. A very small percentage (2.4%) indicated no benefits accrued from modern farming.

Examples of modern farming sighted included using high yielding cassava variety, high quality protein maize (QPM) provided the NAADS program. Other farmers reported that their work is easier using the modern methods of herbicides and planting in lines (Table 8).

Table 8: Comparative Analysis between modern agricultural methods and IK

	Advantageous Characteristics	No. Of Respondents	Percentage
1	High output, maximum land utilization, time saving	44	35.5
2	Makes work easier	19	15.3
3	Time saving	18	14.5
4	Organized garden& line planting eases weeding	18	14.5
5	No benefit	3	2.4
6	No response	22	17.7

Respondents further reported that the high production was in milk due to improved animal breeds and in crops for example maize, rice and sugarcane.

5.8 CHALLENGES MET BY FARMERS IN AGRICULTURAL MODERNIZATION

The major challenge (37.9%) faced by farmers in agricultural modernization was heavy investment, poor quality output and soil exhaustion. 21% of the farmers mentioned the unfavorable conditions for some new crop varieties (Table 9).

Table 9: Challenges of modernization in Comparison with IK

CHALLENGES	NO.	%
Heavy investment, soil exhaustion and worsens poverty, poor quality foods	47	37.9
No response	35	28.2
Condition not favorable	26	21.0
Crops attacked by diseases fast	2	1.6
No reserving seed for next planting season	1	0.8
Farmers don't follow instructions	1	0.8
Possess danger to environment, soil quality and life because no protective gears are used	5	4.0
NAADS Cassava rots easily, is sour	2	1.6
I have never used it	1	.8
Banana plantation of AM don't last long as compared to indigenous varieties	1	.8
Duplication of herbicides	1	.8
Lack of equipment, inputs & knowledge	1	.8
Poisonous foods due to chemical use e.g. spraying rice and on consumption, we scratch skin	1	.8
Total	124	100

The key informants reported that IK should be given priority among farmers because it is cheap, affordable, easy to sustain and is an integral part of their cultural heritage. They also further reported that using modern methods has diverted farmers from using IK.

5.9 METHODS SUGGESTED TO BE PROMOTED BY THE FARMERS

Type of agricultural practices that should be promoted

Most farmers (52.4%) reported that IK and in particular organic farming should be promoted. Only 25% supported modern agriculture. The respondents also gave reasons why they chose organic farming type of IK and the most important was that it fetched a lot of income (31.5%) and also that it uses locally available resources (22.6%) (Table 10 below).

Table 10: Farmers' reasons on type of agriculture to be promoted

Reasons for choice of Agriculture	No.	%
Organic farming (OF) not expensive and locally available resources used	28	22.6
With OF products fetch a lot of money	39	31.5
Large output gotten from AM	34	27.4
Without IK, you cannot survive	8	6.5
Large portion of land can be cultivated (AM)	6	4.8
OF maintains soil fertility but needs to be improved	2	1.6
AM makes work easier	3	2.4
I have never faced any challenge with IK and its cheap	1	0.8
OF and AM supplement each other	2	1.6
Quick maturity in AM	1	.8
Total	124	100

Ways in which agriculture should be promoted

The farmers reported that the best way to promote agriculture is by sensitizing farmers in workshops, media and publishing books (24.2), while 19.4% suggested offering training, advisory and extension services (Table 11).

Table 11: How modern agricultural and IK methods should be promoted

HOW METHODS SHOULD BE PROMOTED	NO.	%
Sensitization in workshops, radio, TV, publishing books	30	24.2
Training and advisory through exposure visits and extension services	24	19.4
Farm Visits	10	8.1
More farmer groups formation	20	16.1
Working hard	5	4.0
Information sharing in Churches and meetings	15	12.1
Identify IK specialists to work with AM specialists	10	8.1
Prices of herbicides should be subsidized	5	4.0
Scientifically developing IK through research	5	4.0
Total	124	100

6. CONCLUSION AND RECOMMENDATIONS

The above results show a mixture of both modern methods and indigenous knowledge methods among local community farmers in Kagadi District. They also show that some IK methods are cheaper hence attractive to farmers and some modern methods are not only expensive but they do not have the correct knowledge of how to effectively use them.

The farmers' recommendation to improve the education and awareness of the various methods clearly proves that they still need both these methods and the challenge is knowledge gap and guidance on what to use where.

The most critical recommendation is to identify those methods which are better in the two approaches (IK and Modern) and prepare the farmers accordingly. It is also very important for the scientific information on the types of soils and the capacity of these farmers to be well known so that a y advice given is very practical and applicable.

This holistic approach based on what the farmers really and truly want for themselves is very cardinal for the success of not only agriculture but also food security especially for developing countries.

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