# Indigenous Seeds in Uganda

**Client: CARITAS Uganda**

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## List of Acronyms

| | |
|---|---|
| AEZ | Agro- ecological Zone |
| CABI | Center for Agri- Biosciences International |
| CSOs | Civil Society Organizations |
| DNA | Deoxyribonucleic acid |
| GMOs | Genetically Modified Organisms |
| ITK | Indigenous Technical Knowledge |
| MAAIF | Ministry of Agriculture and Animal Industry and Fisheries |
| NARO | National Agricultural and Research Organization |
| PELUM | Participatory Ecological Land Use Management |
| PGRC | Plant Genetic Resources Centre |
| ZARDI | Zonal Agricultural and Research Development Institute |

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**Executive Summary**

CARITAS Uganda the social services and development department of the Uganda Episcopal Conference, with support from Caritas Denmark, through the Uganda Farmers Common Voice Platform, Caritas Uganda is working towards influencing positively, policies and laws geared towards enhancing the contribution of agriculture to the economy and poverty reduction among the communities in Uganda.

The organization recognizes seed as the most valuable input in farming. Of great concern is the threat of erosion indigenous seed and therefore agro biodiversity especially of traditional crops through modern agricultural trends.

CARITAS therefore commissioned a study to document and profile local/indigenous seed varieties; with the major aim of promoting and protecting such seed from extinction.

The study was undertaken in the 4 regions of Uganda i.e. Central, Western, Northern and Eastern represented by Luwero, Isingiro, Gulu and Katakwi districts respectively.

Findings revealed that there is still a number of Indigenous seeds in use by the farmers. The benefits of such seeds and their crops were enumerated. However, the trend shows a steady decline of cultivation of such varieties. The decline was attributed to such factors as civil strife/insurgency, environmental factors such as drought, biotic factors such as pests and diseases, and lack of interest of the younger generation in indigenous knowledge including seeds. The most prominent cause of declining local seed is the promotion of mainly seed of new varieties by government and many NGOS while neglecting indigenous seeds.

The study reveals that although there are threats of further disappearance of indigenous seeds, yet there are also opportunities for reviving their multiplication and utilization especially when a market is provided by niche consumers and end users.

Lessons of efforts of establishing seed banks for indigenous crops are shared and should provide learning for players in the agricultural sector in Uganda.

The key role of various actors in the seed chain is discussed and their collaboration is a requirement for revival of indigenous seeds protection, preservation and utilization in Uganda.

From the study, various actors share thoughts on how seeds can be revived, preserved and promoted.. These ideas are put together to provide recommendations for various stakeholders in the agricultural system. For example, the informal seeds sector, among other things needs to be strengthened. The most important driving factor should be markets for crops from indigenous seeds, which is the major motivator for use of the better yielding new varieties. The strategy for promotion of local seeds would also include a clearly drafted message of the benefits they provide e.g. indigenous vegetables for health benefits.

# 1.0 Introduction

In Agricultural production, seed is the primary input for a future harvest. It is the unit by which flowering plants reproduce other plants. Seed is therefore a means of production as well as a product. The history of seeds has very ancient roots, dating back to around 10,000 years ago when human beings abandoned hunter-gatherer lifestyles in favor of permanent settlements and started dedicating themselves to agriculture, (Slow Food International, 2014). They then started selecting and saving seeds and also sharing them among themselves in an organized form of agricultural.

One of the major reasons being advanced for low productivity of smallholder African agriculture is lack of or limited of access to seed of both improved and indigenous crop varieties. This problem is especially acute for indigenous crops, which for various factors are not attractive to commercial seed companies. These include open pollinated varieties, vegetatively propagated crops such as bananas, cassava, sweet potato and crops with limited and fluctuating seed demand such as African indigenous vegetables. These crops however, have huge potential to contribute to productivity, food security and incomes for a large number of mainly resource-poor farmers who rely on informal seed systems or own saved seed.

**Defining Indigenous Seeds, Hybrid Seeds and Genetically Modified Seeds (GMOs).**

*Indigenous seeds*

Indigenous seeds are those that have come from plant varieties handed down from generation to generation in a particular region or area, and sometimes called local seeds. In the Ugandan context, these also include seeds of crops that have been introduced before existing generations (about 100 years) and are adapted to the local conditions. They are hand-selected by farmers for special desired traits such as taste or resistance to pests and diseases. Such varieties are open-pollinated, which means they're pollinated by insects or wind without any human intervention. Indigenous seeds often show uniformity in appearance and the plants from these seeds grow true to that variety. When they are grown they will be the same as the parent plant.

In developed countries such as United States of America, United Kingdom and Australia indigenous varieties are referred to as Heirloom varieties. How experts define heirlooms can vary, but typically they are at least 50 years old in their localities, still maintained by gardeners and farmers particularly in isolated or ethnic communities. In addition, they tend to remain stable in their characteristics from one year to the next.

*Hybrid Seeds*

Hybrid seeds are created when plant breeders intentionally cross-pollinate two different varieties of a plant, aiming to produce an offspring, or hybrid, that contains the best traits of each of the parents. In hybridization, pollination is carefully controlled to ensure that the right plants are

crossed to achieve the desired combination of characteristics, such as bigger size, higher yields or better disease resistance. Hybrid plants typically yield a crop that is uniform in appearance. The seeds from hybrids are either sterile or revert back to one of the original varieties. They won't be the same as the parent plant. The process of developing a hybrid typically requires many years

.

*GMO seeds*

Genetically Modified Organisms (GMOs) – seeds are created through a process of genetic engineering. This is a process during which the plant's DNA is altered using complex laboratory procedures, in a way that cannot occur naturally. It involves removal of genes from a plant or insertion of genes from other species into the plant.

***Types of seeds grown in Uganda***

In Uganda, the seeds grown are Indigenous seeds, are more increasing conventionally bred seeds released from research institutes and hybrids being promoted by seed companies. There are no GMO seeds grown commercially in Uganda since there is no law permitting use of such seeds. However, there have been experiments involving GMO crops such as cassava, banana and sweet potato in confined field trials based in some research institutes of the National Agricultural Research Organization (NARO).

## 1.2. Rationale, Purpose and Objectives of the Study

There are concerns, among various sections of society about the rate at which indigenous crops and their seeds are disappearing in communities. CARITAS Uganda is one such organization. Caritas Uganda is the social services and development department of the Uganda Episcopal Conference. With support from Caritas Denmark, through the Uganda Farmers Common Voice Platform, Caritas Uganda is working towards influencing positively, policies and laws geared towards enhancing the contribution of agriculture to the economy and poverty reduction among the communities in Uganda.

The organization recognizes seed as the most valuable input in farming. Moreover, it is a plant genetic resource, which is passed on from generation to generation. Of great concern is the threat of erosion of agro biodiversity especially of traditional crops through modern agricultural trends.

CARITAS Uganda therefore commissioned this study to identify and document traditional/ indigenous seeds in various regions of Uganda and their role to the contribution of food security in their respective communities and Uganda at large.

The Purpose of the study is to contribute to knowledge on indigenous seeds in Uganda so as to preserve, protect and promote their use as a contribution to sustainable livelihoods of the people.

The specific study objectives were to:

- To profile local/traditional seed varieties and the potential for nutrition and resilience to climate change, pests and diseases.
- To generate information that will facilitate and enhance the reframing of the debate on food and agriculture policies, laws for the protection of indigenous seeds.
- To issue policy recommendations on the protection and strengthening of traditional dynamic agriculture, livelihoods and their related knowledge systems;
- To establish the common traditional and indigenous seeds in the different communities in the 4 selected agro-ecological zones from the 4 regions of Uganda; the threats and sustainability/management of seed varieties in the different communities
- To ascertain the different players and their roles in the promotion and protection of the indigenous seed.
- Provide appropriate recommendations for the promotion and protection of indigenous seeds in Uganda.

# Chapter 2: Methodology

## Selection of the study area

In order to take into account the diversity of traditional/indigenous seed and crop knowledge in the country, 4 Agro Ecological Zones (AEZ) were selected from the four regions of Uganda (North, East, west and Central). The research was conducted in 1 district in each AEZ and in each district 2 sub counties were selected making a total of 8 sub counties. The initial consideration of districts is Gulu, Katakwi, Isingiro and Luwero for Northern, Eastern, Western and Central Uganda. Specifically in Luwero the team collectd data from Kikyusa and Kamira subcounties; Paico and Unyama sub counties were visited in Gulu District, for Isingiro district data was collected from Kamuli and Kikagate sub-counties and for Katakwi the sub counties of Usuk and Magoro were considered for the study. All these were selected for being representative of the district different cultures and socio-economic characteristics. The criteria for selection of the districts were based on socio-cultural distinctiveness within the region and wide representation of the country.

## Description of the Study Area

### Isingiro district

Isingiro district is located in the southeastern part of the Western Region of Uganda. It is bordered by the republic of Tanzania in the south, Mbarara district in North West, Ntungamo district in the West, Rakai district in the east, and Kiruhura district in the north. It comprises of two counties with ten sub counties as well as two town councils. Isingiro is mainly occupied by migrants from Kabale, Bushenyi and other areas. It used to be a game park reserve until the 1970,s when government degazetted the area. The people migrated into Isingiro as there was land scarcity in their home districts, and seeking for employment. Currently Isingiro has a population of 396,700 with banana production as a main source of livelihood. Bananas does well due to the well drained loamy soils The other food crops grown in Isingiro district include sweet potatoes, irish potatoes, beans, maize and cassava. In isingiro district the team visited Kikagate subcounty and Kamuli Town Council.

### Katakwi district

Katakwi is located in the eastern agro-ecological semi-arid zone lying between longitudes 33° 48’ E - 34° 18’ E and latitudes 1° 38’ N – 2° 20’ N. It is bordered by the districts of Napak in the north, Nakapiripirit in the east, Amuria in the west and northwest, Soroti in the southwest, and Kumi and Ngora in the south. The major crops grown in Katakwi include millet, cassava, sweet potatoes, groundnuts and sorghum. Traditionally many of the people of Katakwi District use draught animal traction for opening land for production for subsistence level. The team visited Omagoro and Usuk sub counties. Katakwi is one of the districts in Teso where that the habitants still practice the indigenous Iteso cultures

**Gulu District**

Gulu is located in Northern Uganda and the people therein speak Acholi. It has historically been seen as the most influential of the northern districts. It shares borders with other districts of Kitgum, Lira, Amuru , Lamwo, Pader, Oyam , Nwoya as well as Sudan. Total land of the district is 3,449.08 sq km with 96.9sq kmwith open water. Current population is at 479,496 inhabitants. Gulu district has 12 sub counties and 4 divisions, and has had insurgencies for over 20 years that forced people to live in and out of camps. This contributed to retarded development in the district. The main economic activity in the district is subsistence agriculture, growing majorly simsim, sorghum, millet, groundnuts and pigeon peas in which over 90% of the population is engaged. Culturally, the Acholi are headed by Chief Rwot David Onen Achan 11 supported by prime minister and clan heads.

**Luwero**

The District is located in central Uganda and it is bordered by Mpigi District in the South, Kiboga and Nakasongola Districts in the North and Mukono District in the East. The total area of Luwero District is approximately, 5773.53 sq.kms of which 5625sq. kms is dry land. Soils are generally red, sandy looms whereas the Southern part is relatively fertile and can support all kinds of crops. In the northern areas, some parts developed from alluvial materials which are deep and are strongly acidic with low organic matter content. The soils are however suited for cotton growing, cattle rearing and cereal production. The District is presently composed of two counties, namely; Bamunanika, and Katikamu. Each County is further divided into 5-6 Sub counties making a total of 17 Sub counties and 134 parishes.

## Data collection and Analysis

Data was collected using key informant interviews, focus group discussions, participant observations through a transect walk. To this effect a key informant guide (appendix 1, Focus group discussion guide (appendix 2) are herein included. The Key informant interviews were used to document key issues to do with seed production, preservation and promotion from Ngos, extension staff, village leaders, elderly and researchers.

*Figure1 &2: Focus group discussions in Paico, Gulu district. And Key informant interviews in, Kikagate, Isingiro district*

Focus group meetings were useful to understand the profiles of indigenous seeds, socio-economic and cultural importance/ benefits from the farmer foras, women groups, youth and elders and other community members. The researchers met and agreed to interview the following individuals and groups of people in order to document the information required to address the research outputs.

The seed companies were included to get their opinion of indigenous seeds focusing on the potential for commercializing their production. The team too undertook literature review to document background and indigenous seeds and their cultural and social-economic benefits. There are 22 seed companies in Uganda, however out of the 22 seed companies in Uganda, none of them is processing and selling traditional seeds for profit. The researchers conducted key informant interviews with Victoria seed in Gulu and Achila Enterprises (Dealers in seed distribution) in Eastern Region. The team visited the Plant genetic Resources Centre (PGRC) to document available traditional seeds as it is responsible for gene preservation in Uganda.

Data collected was analyzed using content of the transcribed interviews by searching for underlying themes from the data that contain information about profile of major crops grown, seed conservation and management and strategies for revamping indigenous seed production,. The steps

involved in content analysis include: open coding, focused coding to generate categories, axial coding to link to each other and concept development, analysis and interpretation as suggested by (Charmaz 2006). Major quotations were selected to further explain key research findings that are included in the report.

# Chapter 3: Study Findings

## 3.1 Socio-economic characteristics of the respondents

A total of 60 respondents were interviewed through focus group discussions and individual interviews. Elderly women were the majority of the respondents because they were the most knowledgeable in traditional seed conservation and management. In Luwero, the respondents interviewed comprised of 10 female and 4 male. Out of which three were youth and 11 were elderly. For Isingiro, 18 respondents were interviewed in total out of which 6 were men and 12 women. Of which 2 were less than 30 years, 4 were 40 years and above, 6 were 50 years and above and 6 were 60 years and above While for Katakwi a total of 14 respondents were interviewed of which 4 were male and 11 female. Out of which one was 20 years, two were 30 and above years, two were 70 years plus and 2 were 80 years and above. In Gulu the team held focused group discussions with mainly elderly women of 70 years and above. In addition 5 youth were interviewed as well. The women were more due to the fact that it is the women who participate in seed management and conservation. The elderly women are known to be more knowledgeable about the indigenous and traditional seed variety.

## 3.2 Profile of Local/ traditional seed varieties

## Profile of Indigenous crops for which seeds are available

**Table 1 :Central Region**

| Perennial Crop | English Name | Botanical name | Local name | Varieties | Description |
|---|---|---|---|---|---|
| | Banana | *Musa spp* | Matooke | Nakabululu | Short stature, soft food, high yielding, drought resistant and resistant to BBW. Helps during famine. Mainly cooked with beans (Katogo) |
| | | | | Nyamwezi | Short maturing, has big bunch size, and soft food |
| | | | | Nakitembe | Used for after birth storage of placenta, soft food, very susceptible to BBW and Kiwotoka |
| | | | | Musakala | Has long figures, scattered bunch and it is soft and yellow when cooked. Has medicinal properties |
| | | | | Mbwanzirume | Purplish midrib on leaves, very compact bunch and heavy with short figures, very soft when cooked, tolerant to BBW and other diseases |
| | | | | Mbidde | Has a lot of sap, When cooked the banana turns purple, for mwenge and juice, drought tolerant, mainly eaten as katogo (mixture of beans and bananas) and has cultural values attached. |
| | | | | Gonja | Sweet type, mainly for roasting. Only a few stools are grown |

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|---|---|---|---|---|---|
| | | | | Murubo | Has the largest fingers, clusters scatter while cutting, deep yellow banana, bulky for transporting, clusters are very few on the bunch |
| **Root and tuber crops** | **Yams** | *Dioscorea alata* | | Kyetumula | Big in size, food security crop, long lasting in the gardens |
| | | *Elephant ear or Tania* | | Obukupa/ | Small and oval shape, mealy, purplish inside with heart shape leaves. Upland yams, eaten only at home, never sold. Grows throughout the year but harvested during dry season |
| | Cocoyam or Taro | *Colocosia esculenta* | | Bwayise | Cultivated where there is enough water, for example swampy places.<br>Available throughout the year since it grows in moist areas |
| | | | | Ebisebe | Climbing stems with tendrils. Very soft, with fibrous surface, light maroon when cooked. |
| | | *Dioscorea alata* | | Ndagu | Very hard when cooked, lasts for a whole week without getting rotten |
| | | | | Ekobe | Arial root, purple flesh, climbing type and average yield |
| | | *Dioscorea odoratissima* | | Kaama | Wild yam that grows mainly in the forest, Very small roots |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Baluggu | Climbing type, white inside, small size |
| | | | | Kyetutumula | Climbing type , Grows big up to 50 kgs per plant. yellow inside, |
| | **Sweet potatoes** | *Ipomoea batatas* | Lumonde | Kiwoko | Tan and white skin |
| | | | | Kyabandula | Red skinned, pure white splits when well cooked, susceptible to pests and diseases |
| | | | | Kawogo | Long lasting in the garden, cream skin, cream flesh but susceptible to pests and diseases |
| | | | | Dimbuka | Short term maturing, resistant to pests and diseases, white cream, large tubers, quick maturing, not so mealy, large leaves simple leaf shape. |
| | **Cassava** | *Mahihot esculenta* | Mwogo | Kakuyege | Red skin |
| | | | | Mbwa | Not bitter, does not rot and drought tolerant |
| | | | | Njule | White, pale stem , short stature, tubers are white skin, quick maturing 8-12 month, very good, not very high yielding, resistant to major diseases such as mosaic |
| **Pulses and Legumes** | **Beans** | *Phaseolus vulgaris* | Ebijanjaalo (Muttikke) | Nambale | Long reddish and maroon. When cooked dark soup, |
| | | | | Obote | Nick named, by farmers, black and big seeded, due to its colour of soup, mainly eaten in Katogo of Cassava and bananas. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Kanyebwa | Variegated with pink/ reddish color |
| | | | | Kayinja | Maroon and short |
| | | ***Phaseolus species*** | | Obuyindiyindi | Perennial beans, small pods and can last for years. Usually cooked mixed with ntula. |
| **Cereals** | **Maize** | | **Kasoli** | Masibisimbe | Short mature-ng within 3 months, with white and purple seeds, sweet taste |
| | | | | Nailon | Can be pure white and yellow in color, popcorn, and drought resistance |
| | | | | Munandi | Big cob, long and sweet, long lasting in the garden, good for roasting and flour. Common in the cattle corridors/ drought tolerant areas |
| **Vegetables** | | | | | |
| | **Local name** | **English name** | **Botanical name** | | |
| | Ebbugga | Amaranth Spinach | *Amaranthus lividus* | | |
| | Ddodo | Amaranth spinach | *Amaranthus dubius* | | |
| | Eggobe | Cowpeas | *Vigna uniguiculata* | | |

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|---|---|---|---|---|---|
| | Enkolimbo | Pigeon peas | *Cajanus cajan* | | |
| | Ensugga | | *Solanum nigrum* | | |
| | Ejjobyo | African spider herb | *Cleome/gynandropsis gynandra* | | |
| | Nakati | | *Solanum aethiopicum* | | |
| | Essunsa | Pumpkin leaves | *Curcubita maxima* | | |
| | Empande | Bambara nuts | *Voandzela subterranean* | | |
| | Ettimpa leaves | Cocoyam leaves | *Colocasia ensculeanta* | | |
| | Ekigaaga | Lima beans | *Phaseolus lunatus* | | |
| | Katunkuma | Bitter berries | *Solanum indicum sbsp. Distichii* | | |

| | | | | | |
|---|---|---|---|---|---|
| | Ebisusuuti | Cho-cho | *Sechium edule* | | |
| | Sere | Black jack | *Bidens pilosa* | | |
| | Entula enganda | Bitter berries | *Solanum gilo* | | |
| **Fruits** | Amatungulu | Ginger lily | *Aframomum sanguine* | | |
| | Amatugunda | | *Vangueria apiculata* | | |
| | Amapeera | Guava | *Psidiun guajava* | | |
| | Ensaali | | *Garcania buchananaii* | | |
| | Empafu | Incense tree | *Canarium schweinfurthii* | | |
| | Enyonza | | *Carissa edulis* | | |
| | Enkenene | Mulberry | *Morus sp.* | | |
| | Obukwansokwanso | | *Rhus vulgaris* | | |

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|---|---|---|---|---|---|
| | Entuntunu | Cape goose berry | *Physalis peruviana* | | |
| | Enkomamawanga | Pomegranate | *Punica granatum* | | |
| | Ekifennesi | Jackfruit | *Artocarpus heterophyllus* | | |
| | Ekisitafeeli | Custard apple | *Annona reticulata* | | |
| | Mikooge | Tamarind | *Tamarindus indica* | | |
| | Muzinda | | *Trecuria africana* | | |
| | | | | | |
| | | | | | |

**Table 2. Northern Region**

| Crop | English name | Botanical name | Local name | Varieties | Description |
|---|---|---|---|---|---|
| **Cereals** | | | | | |
| | Millet | *Eleusine coracana* | | Dyara | Turns yellow when ready for harvest, short maturing (two and half months) |
| | | | | Adoke | Appears white in colour, with no specific use depends on how it is prepared |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Locha | Has compact head, used mainly for brewing , ready in 3 and half months |
| | | | | "Ajok onyinge" meaning I have scooped the seed | Matures within three months, has scattered head when wet and compact head when dry, red seeded, high yielding |
| | | | | Geya | Tall with scattered head, often planted after simsim, long maturing- 5 months |
| | | | | | |
| | **Simsim** | *Sesamum indicum* | | Londong | White plant, white seeded, and big seeded , takes 3 months to mature |
| | | | | Renge | Green plant and smaller seed, bitter taste and takes 3 months to mature. Drought resistant as well |
| | | | | Rajimo | Completely white seeded, short susceptible to disease and matures in only 2 months |
| | | | | "Otoro tata" | Literally meaning tata was used for transporting it from the garden due to high yields. Fast maturing as well |
| | **Sorghum** | *Sorghum bicolor* | | Kabi | Originated from Kitgum, used for both food and brewing. Tall in size, resistant to disease |
| | | | | Kabi white | Tall in size and high yielding |
| | | | | Kabi red | Tall in size and high yielding |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | **Maize** | *Zea mays* | Ayongi | Lankadyang | Long seeded, big cob and very sweet, single white colour |
| **Roots and tubers** | **Sweet potatoes** | *Ipomoea batatas* | Layata | Adimagu | No heaping, just plough and plant, white skin and flesh |
| | | | | Lakampala | Broad leaves, orange fleshed potatoes |
| | | | | Linkwadong | Originated from where someone was married "Nwoya". White skinned, white fleshed, big size, 3 months maturity period, high yielding, soft and sweet taste |
| | | | | Labeja red/ white | Produces high sap when cooked remains on the saucepan, white mealy and high yielding, |
| | **Cassava** | | Bwana | Lugoli | Grows tall branches that can touch the ground and produce tubers, very big tubers, dark brown tubers, green stem and leaves, not bitter, high yielding, and tubers take long in garden up to 3 years |
| | | | | Amich | Very tall and produces long tubers, red skin and stem, takes 5 months |
| | | | | Okonyoladak | Fast maturing, not bitter and soft, not fibrous and easily attacked by pests and diseases |
| | | | | Acona | Green/ pink leaves and stem, bitter , usually dried and mixed with sorghum or millet for atapa |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Apoko | Short type, after growing enlarges to prevent weeds from growing, high yielding , white and clear |
| **Pulses & legumes** | **Groundnuts** | | Ful | Amaido | Red and long seeded, too much oil, good taste, drought resistant and disease and pest resistant. It is uprooted during harvesting |
| | | | | Atunju Otara (Acholi white | Tall and uprooted during harvesting, white seeded, thick like simsim, sweet taste |
| | **Pigeon pea** | | **Lapana** | Lapana apiri | Short plant. Short maturing from langa |
| | | | | Lapana tall | Grows very tall, long lasting during storage, tastes better than lapana apiri, takes a short time to cook due to soft cover |
| | | | | Adyang | Introduced from Mbale , it is big seeded and forieign |
| | **Cow peas** | | **Ngoo** | Ngoo | Small seeded grain, originated from langa |
| | **Beans** | | | Oyee dokaren | White round seeded |
| | | | | Minopindi | Small yellowish seed |
| | | | | Welo owot aka | White |
| | | | | | |
| **Table 3. Western region** | | | | | |
| **Crop** | **English name** | **Botanical name** | **Local name** | **Varieties** | **Description** |

| | | | | | |
|---|---|---|---|---|---|
| **Perennial Crops** | **Bananas** | *Musa spp* | **Matooke** | Kibirizi | Tall variety with good performance and good taste and aroma |
| | | | | Mbwazirume | Quick maturing- within nine months starts flowering and by one year ready for harvest, tall variety |
| | | | | Mbiruru | Short fingers and compact , high yielding |
| | | | | Musaagala | Long and scattered fingers,<br>Big branches |
| | | | | | |
| **Pulses and Legumes** | **Beans** | *Phaseolus vulgaris* | | Kashoga soga | Lemon in colour, and high yielding |
| | | | | Kanyebwa | Quick maturing |
| | | | | Kashureje | White in colour, Can grow in marginal soils- infertile |
| | | | | Rushare | Drought resistant and resistant to pests and diseases |
| **Cereals** | **Maize** | | | Nyakenga | Multicolored- purple, yellow and white |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | Drought resistant<br>Pest resistant, very sweet |
| | | | | Nylon | Very sweet and good for roasting and popcorn |
| | Millet- At least 1-2 varieties found in each household | *Eleusine coracana* | | Makara | Black in colour hence birds do not like it, it swells during cooking |
| | | | | Rushekurwa empangare | **Red** |
| | | | | Kinshansha | **Red**; Birds do not like it, it swells during cooking |
| | | | | Kikoba | Closed head, Difficult in threshing |
| | | | | Kahendarwiko | Breaks the mingling stick, Hard to mingle, used for Obushera |

**Table 4: Eastern Region**

| Crop | English name | Botanical name | Local name | Varieties | Description |
|---|---|---|---|---|---|
| | **Cassava** | *Mahihot esculenta* | Emwogo | Elilio | Small leaves, grows to average height, cream to white leaves , tubers are small , very good for consumption, good taste |
| | | | | Ochole | Grows tall, one and half years to mature, long and brown tubers cream stems |
| | | | | Ebwanaatereka | Quick maturing, in less than a year, |
| | | | | Aditu | Remains Short at maturity , does not tall, broad leaves, cream stems, Grows more stems |
| | | | | Ejaribu ( fumba chai) | Short maturing, easy to cook, Very sweet, medium sized leaves, straight stems that are whitish in colour. |
| | | | | Emulai | Short maturing, small leaves, tiny stems, stems are cream in colour |
| | | | | Elogologo | Yellow stems, produces thick stems that interlog when growing, matures in two years |
| | **Sweet potatoes** | *Ipomoea batatas* | Acok | Emadirait | (red skinned and white flesh |
| | | | | Epura Amojong | Long and straight, white inside |
| | | | | Ebusiemeza | Red skinned and yellow inside |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Adope elap | Red skinned and white inside |
| | | | | Ojamu Okwena | White and purple |
| | | | | Asira | Purple inside |
| | | | | Osukot | Yellow inside and cream skin, tasty |
| | | | | Arakaraka | Quick maturing within 2 and half months White inside and reddish colour out |
| **Legumes and Pulses** | Bambara nuts | *Voandzela subterranean* | Isuk | Isuk brown , white and black | Brown and white and black |
| | Groundnuts | *Arachis hypogeal* | Emaido | Etirait | Tan colored, spreading in type, drought resistant |
| | | | | Egoromoit | Three seededLong lasting seed does not rot |
| | | | | Ogwara | White and red strips, bitter, spreading type in growth habits and high yielding |
| | | | | Atesot | Two seeded ,High yielding, |
| | | | | Erudurudu | Uprooted during harvesting |
| | | | | "Emusugut" | Meaning white man, red seeded, erect in growth habit, sweet taste, |
| | Cowpeas | | | Ichirukukwa | Small seeded, harvesting difficult due to the tiny seed, and leaves which are tasty) |
| | | | | Ibelat | Big seeded |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Ebumula | Large seeded, mixed white and brown |
| | | | | Ejumula | White seeded, three seeded and matures within 90- 94 days, uprooted during harvest. |
| **Cereals** | **Millet** | *Eleusine coracana* | Akima | Ebiera | Black during harvest turns red (changes colour) |
| | | | | Ekapa | Scattered head at maturity , cream in colour, three –four months to mature<br><br>Mainly used for ajon preparation |
| | | | | Emorumoru | Yellowish when mature, round head, |
| | | | | Epus | Mixed color at maturity (cream and white) round head at maturity and based for beer |
| | | | | Etigo | High yielding |
| | | | | Eitiyo | (white round and more popular because it is early maturing, good for beer and porridge, tolent to weeds) |
| | **Sorghum** | *Sorghum bicolor* | Imumwa | Ededeye | Red sorghum |
| | | | | Ekoli | White seeded, |
| | | | | Atibai | Produces a big head and it is short .red seeded, long .maturing and drought resistant. Matures within 3-4 months. |
| | | | | Lodir | Soft to grind |
| | | | I | Ijonga | Big seeded heads, drought resistant, resistant to pests and diseases, , stems eaten as sugarcane |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Eiterema (<br>Elemunyang) | Tall and scattered head |
| | | | | | |
| | **Simsim** | *Sesame indicum* | Ikanyum | Ebalo | grows in swampy places |
| | | | | Ekilimite | Brownish stems and leaves, high yielding, long maturing -4 months to mature |
| | | | | | |
| | **Maize** | *Zea mays* | Ekiriddidi | Loodos (yellow) | Smal combs, yellow in colour and very sweet for roasting and boiling |
| | | | | Ebado | Grows tall with big combs and big seeds, takes 4 months to mature. White in color |
| | | | | Itutunu | Small combs, does not grow very tall, small stems white and yellow mixed<br>Short maturing- 3 months |
| **Vegetables** | **Local name** | **English name** | **Botanical name** | | |
| | Ecadoi | African Spider herb | *Cleome gynandra* | | |
| | Eboga | Amaranthus | *Amaranthus dubius* | | |

| | | | | | |
|---|---|---|---|---|---|
| | Akwaco | Thorny amaranth | *Amaranthus graecizens* | | |
| | Adalarac | | *Oxygonum sinuatum* | | |
| | Emalakany | | *Hibiscus sabdariffa* | | |
| | Ecototo | | *Asystasia schimperi* | | |
| | Ecadokoko | | *Ipomoea eriocarpa* | | |
| | Emoros | | *Cyphostemma denocaole* | | |
| | Atigo | | *Corchorus trilocularis* | | |
| | Einapwor | African Spider herb | *Cleome gynandra* | | |
| | Ainyinyi | | | | |
| | Ecomai (special for dry season) | Desert date leaves | *Balanites aeygptica* | | |
| | Asuswa/Emonyon | Pumpkin leaves | *Curcubita maxima* | | |

| | | | | | |
|---|---|---|---|---|---|
| | Esuujo | Pumpkin | *Curcubita maxima* | | |
| | Akobokob/Ako lil | Local cucumber | *Cucumis melo* | | |
| **Fruits** | Aimuria | | *Carissa edulis* | | |
| | Apedur | Tamarind | *Tamarindus indica* | | |
| | Akunguru | Sheanut | *Vitellaria paradox* | | |
| | Elamai (yellow fruit) | | *Ximenia americana* | | |
| | Ecomai | Desert Date | *Balanites aeygptica* | | |
| | Ebwolo (yellow fruit size of sheanut | Sheanut | *Vitellaria paradox* | | |
| | Acawoi (maroon red fruit coming from ground) | Ginger lily | *Afromamum species* | | |
| | Ekarukei | | *Vitex doniana* | | |
| | Ekum | | *Diospyros mespiliforms* | | |

| | | | | | |
|---|---|---|---|---|---|
| | Edukudukut | | *Borassus aethiopicum* | | |
| | Ekajijai | | *Sclerocarya birrea* | | |

## 3.3 Social Cultural Importance of Traditional seeds

There are several reasons advanced by Ugandan farmers for their continuous use of indigenous seeds in spite of the promotion of improved crop varieties. Many of the reasons have been mentioned in the tables describing the varieties. For emphasis, these will be described in a little more detail.

**Seeds for Food**

The primary reason for farmers saving seed is to be assured of a next crop for food. All the farmers interviewed did not have a specific seed production plan which did not have food as the main output. For most farmers, seed production meant growing a crop of which part is saved as seed for own use. Traditionally, farmers save part of the best grains, roots and tubers from consumption and store them for future planting. This is what is usually referred to as "farmer seed system" or "local seed system" (Musa, 1996).

**Seeds for Incomes**

Many farmers interviewed in all the areas in Uganda said they don't usually grow crops of indigenous varieties with an objective of selling seed. However, they were aware that when they sold the extra harvest of whatever indigenous crop, some other farmers bought it with a purpose of using it for seed. At the same time, all the farmers admitted that they had ever bought seed of indigenous crops at some point of their life. This was common with grains and legumes such as millet, sorghum, maize, beans, groundnuts and cow peas. This therefore means that seed of such crops is a source of incomes to the farmers.

Seed of indigenous vegetables have of recent been produced at commercial level. Scientists at Mukono Zonal Agricultural Research and Development Institute (ZARDI) reported to having supporting farmer groups in Buikwe, Wakiso, to produce seeds of Nakatti, Ntula, Jjobyo commercially since 2012 and they have earned good money from their projects. The farmers have signed a contract with Simlaw Seed Company to supply the seeds which are in turn sold to commercial farmers of the crops. The demand for the seeds is reported to have grown steadily over the last 3 years.

**Perpetuation of desirable traits or attributes of the indigenous crops**

Throughout the years, farmers have been selecting, saving, multiplying and developing their own seeds for the attributes that they value. Among the attributes named include good tastes, good cooking properties, tolerance to drought, quick maturity, good yields and other nutritional values. These seeds which have not been modified in any way by humans have therefore been passed on from generation to generation with their desirable attributes.

Farmers in the all the communities visited during the study were very happy with the fact that they are able to plant their own home saved seeds without buying them. They were also sure that they would be able to germinate and produce food and more seed for them.

This knowledge mobilizes sophisticated and complex observations and understandings of, and experience with, the properties of living organisms and their interactions with all elements of local ecosystems. Indigenous peoples, local communities and peasant farmers practice and retain traditional knowledge through dynamic practices of seed saving, storage and exchange that allow for continued innovation in plant breeding.

**Use of indigenous seed varieties in development of new varieties**

Researchers especially plant breeders in NARO explained that the have developed many of the new varieties from crossing with local or indigenous varieties. For example the cereals breeders have collections of local seeds of varieties of sorghum and millet collected from different parts of the country. For each of the varieties, they said they are aware of the good attributes desired by the farmers, and market/consumers. They also said local varieties were very well adapted to the environment and had good traits such as drought tolerance, disease and pest resistance and good culinary properties (cooking properties and taste). According to the research scientists, most indigenous varieties have very low yields, even when the best looking seeds are selected. The good attributes in indigenous varieties are what the research scientists seek to introduce to other varieties with other attributes such as high yield so as to bring all the good qualities together in one variety. Examples of such varieties that have been an improvement of local ones include sweet potato variety ***New Kawogo***, and some beans of NABE series.

**Biodiversity**

Seeds and the knowledge that goes with their cultivation has been passed on and perfected over generations and seasons. Farmers freely exchange seeds as an accepted community value which emphasizes cooperation and reciprocity. This exchange, contributes to strengthening biodiversity. Genetic diversity helps farmers to cope with environmental shocks because different varieties react differently to challenges such as drought, floods, soil infertility and pests and diseases. Samples of bean seed collected from the farmers showed diversity having 3 to 6 different types in the mixture. When asked why they had the mixture rather than one type, farmers said although they may occasionally select the seeds and plant them separately, they preferred to plant them mixed so that in case of any stress such as drought or diseases, some of the types may survive and complete loss is avoided. In addition, they also knew that they did not mature at the same time so they could harvest in piece meal and be assured of beans for some time before the next season.

**Adaptation and Resilience to Biotic and abiotic stresses**

Farmers in all regions of Uganda agree that the reason their indigenous varieties have stood the taste of time is because they are adapted to their ecological conditions, such as soils, rainfall,

temperature, altitude, and also meet specific community nutritional, medicinal, cultural and spiritual needs. They are also resistant to pests and diseases compared to new varieties released and promoted by government and Civil Society Organizations (CSO).

Some of them like yams are very resilient to drought and will remain in the soil and re sprout when the rains return. The yam variety *Kyetutumula* can yield over 50kg. Another example is sorghum varieties such as *Abir* which is common in parts of Teso and Northern Uganda are very tall, take over 6 months to mature, a trait that may not be desired by plant breeders. However, farmers have persistently grown that variety because it is very drought tolerant, disease and pest resistant, and has a long shelf life. Besides, it is liked for its brewing qualities.

**Cultural importance**

To farmers, seeds go beyond being a means of reproduction and production. Seeds in themselves are a form of cultural expression, and association with specific communities. Ms. Francis Akello of a member of Iteso Cultural Union (ICU), thinks that the culture of the Iteso cannot be fully explained without talking about our food and therefore the seeds they are grown from. She says in the Iteso cultural museum they intended to display different kinds of traditional seeds associated specifically with the Iteso as a tribe. Seeds are therefore an element with which people can identify themselves.

Some seeds of some crops have a sacred role in their society. A newly married bride would be given seeds as some of the gifts when starting her new life in marriage. Seeds would also be symbolic of blessings of a fruitful marriage.

In Central Uganda, the Baganda have some banana varieties that are mandatory to have in the plantation for their cultural importance and beliefs. For example women interviewed in Luwero said that when a woman is widowed, she is supposed to wear undergarments of her deceased husband before his burial. After the burial ceremony she then discards that piece of clothing by burying it in the stool of *Embidde* banana variety specifically. This is believed to prevent the spirit of her dead husband from visiting her in dreams or otherwise. Also, the placenta or "afterbirth" following the delivery of a baby is specifically buried under the stool of the *Nakitembe* variety of banana.

## 3.4 Management and Preservation of the Seeds by communities

***Central Region: The case of Luwero Distict***

For legumes, seeds were selected after harvest and properly dried and then stored off in Kavera for planting the next season. Sometimes this seed was mixed with red hot paper and soil from anthill to keep off pests and the women monthly brought out the seeds for continuous drying and monitoring. Such seed could stay pest free for up to one year. Good maize cobs were specifically

selected from the gardens without removing the covers and stored above the Kitchen to dry. The intention was that the smoke from the fire would continuously keep the maize pest free for a long period of time.

*Figure 3: Storage of maize above the fire place in the Kitchen*

In addition, it was a practice for the farmers to continuously maintain their Banana plantation by continuously planting new suckers within the same plantation. In this way managing and preserving their seed.

***Eastern region: The case of Katakwi District***

Traditionally the seeds of cereals for planting were selected from the field before the major harvest. A woman or rarely a man would break by hand or cut using a knife mature heads of millet or sorghum with the stalk measuring about half a foot (30 cm). The selected heads for seed would be of big size and good looking filled with grain. They would also be carefully examined to be sure they are free from disease and pest infestation. These heads are dried separately and put in a special

granary for preservation called '*Emono'* in Ateso as confirmed by Lawrence (1957) Sometimes the seeds were stored separately from the whole harvest in special large baskets similar to but smaller than granaries. The Emono was a special granary that was registered by the sub-county chief in every home. It was for keeping harvest which would only be opened after approval of the traditional leader referred to as ***"Omusalatoo***". This leader was paid by government to ensure food security in the village by everyone having the special granary. He would enforce the byelaws for food security. He monitored and confirmed that truly an identified household was faced with a hunger or famine situation. It is only after the assessment and verification that the traditional leader gives permission to the household to access the food from the *Emono.* However, the selected heads for seed were supposed to remain intact. In practice, households could take 2- 5 years before changing the contents of the *Emono.*

The *Emono* was not only used for cereals but for groundnuts as well. Groundnuts seeds were not harvested separated from the major harvest. In the past, before storage, groundnuts was very well dried, winnowed and sorted. Just before planting, some of the groundnuts is hand shelled and then only the big good looking seeds were used for planting. Any cut, shriveled and small nuts were sorted and discarded by giving to chicken or roasting for children to eat.

Although maize was grown in Teso, it was not a major food crop in the past. Seeds were preserved by hanging the best selected cobs over the fire place.

**Western region: The case of Isingiro**

In Isingiro, seed goes through a careful process of selection and processing. Beans are well dried, shelled and stored out of the pod. Special large baskets are used for storage. To store bean seed for long, the seed is sprinkled with dry cow dung mixed with millet husks to repel storage pests

For maize, stands with good quality seed and identified and tagged in the garden before drying. These would be large cobs with large grains and well filled cobs without gaps. These cobs would be hanged over the fire place in the kitchen.

To get good indigenous vegetable (IV) seeds garden patches were left around the compound to preserve the vegetables. These would be watered continuously every evening in case it didn't rain. All the 8 women in the Focus group discussions said they watered vegetables. For some vegetables such as Doodo (*Amaranthus spp*), many women said they did not necessarily keep seed as it was often a volunteer crop and always regenerates itself without special attention. The women just ensured that some plants were left in the compound or banana plantation to produce and scatter seed. For some IVs there was deliberate effort to keep the seed by storage.

Similarly for local fruits such as *Ebijuma*, and pawpaws, seeds are rarely stored. After eating, the seeds are thrown into the garden where they are expected to grown, and they usually germinate. Excess plants of fruits which look weak are weeded out.

Seeds of pumpkins and local eggplants (*Entula*) were preserved by cutting pieces of the fruit and pushing them though a stick and drying them thoughly. The sticks are then placed in the roof of the kitchen for storage, for not more than a year. Whenever the seed is needed the process can be repeated. Most of the time, vegetables are growing around the compound and the seeds rarely run out.

In the event that seeds are lost due to any catastrophe such as drought, they will be collected

**A case study of seed conservation in Isingiro**

Aidah Kamarembo a 78 year- old migrated to Nyakanyi village in Kikagate, Isingiro district from Bushenyi district when her deceased husband got a security job in Isingiro. She carried with her seeds from her community to Isingiro. She utilizes a combination of ash from burnt dry cow dung and dry bones removed from beef for preserving her beans. When she asked why she puts a dry bone from cattle to the mixture to preserve her beans, her immediate response is *"Enyama tejunda*" literally meaning a bone does not rot. She inherited the tradition from women in her community. She strongly believes that the bone has some repellent properties against storage pests and diseases that damage beans. When beans seeds are preserved this way, they remain in good condition for planting for up to 2 years after which they lose viability.

*Figure 4: "Enyama tejunda" An expression to mean bones do not rot, as used in bean preservation in Isingiro in Western Uganda*

Traditionally the people of Northern Uganda have rich practices for seed preservation and protection for the next planting season. Several of the practices are still being utilized by the communities in the region.

Sorghum was mixed with maize cobs (cobs were pounded or not) and stored off in a basket or granary. The cobs were known to have pest repellent properties. Pigeon peas were mixed with remains of husks for millet and this could be stored for a period of over one year without pests. They do believe that millet husks bitter taste destroys pests.

Groundnuts was dried up and special grass, mainly thatching and spear grass used for storage. A sizeable pole was used in the storage of groundnuts by sealing it off with mud at the bottom or ground. Then the groundnuts are placed around the pole covered with the special grass. This could keep groundnuts for over two seasons without pests.

*Figure 5: Inside an old woman's kitchen in Paico, Gulu, with various storage containers for indigenous seeds and foods*

## 3.5 Gender roles in management of Indigenous seeds

The study showed that majority of the women studied have always devoted a large portion of their time to ensure that they have access to seed and to make it available both in quality and quantity in all the regions visited. They have special knowledge of the value and diverse use of seed for food, cultural interests and social significance and propagation.

It is the role of women to ensure the perpetuity of indigenous seeds. They have the knowledge and expertise and therefore responsibility for saving, selecting, reproducing, storing and sowing indigenous seeds. This role is engrained in the minds of men and women as well as the youth and children. It is little wonder that during the study, it is mainly women that contributed to the discussions about seed.

It is the women who know when it is the right time to select the best millet and sorghum heads in Eastern and Northern region and cut these with the stalks, dry and store them in the granary. At the right time they thresh the cereals, winnow, sort and most often plant them ready for the next harvest and the cycle goes on and on. When seed of a particular crop runs out of the household, the woman will have to secure it either by buying it or getting it some other way from relatives, neighbors or any other farmer. When a woman travels to places outside her community and finds any new seeds, she will carry back some to grow in her own garden. And women freely share and exchange seeds amongst themselves within the community.

During periods of insurgency or migration as experienced for long periods in Gulu and Katakwi, women often packed seeds as an important possession to take with them to the new place of refuge. In Isingiro, some of the farmers had migrated from Kabale district and the women reported to have carried their bean seeds with them.

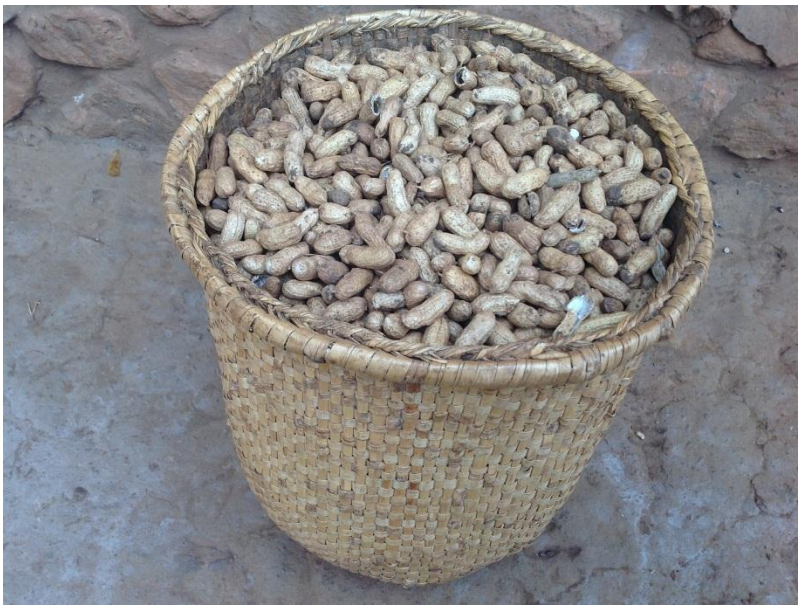

*Figure 6: Groundnut seed as commonly stored in baskets in Western Isingiro District*

During drought, women will ensure that patches of land where indigenous vegetables such as small wild tomatoes, local eggplants (Ntula) and Amaranthas spp (Doodo) , and local peppers are growing are watered to ensure that seed for the next crop is secured. They may do it personally or ask their children of reasonable age, both boys and girls to do the watering. These vegetable patches or plots are always nearest to the homesteads where they are tended to intensively. Women will often also sprinkle some ash around those vegetables to ward off pests and diseases and also increase fertility in those plots.

The older women are responsible for passing on the knowledge of seed processing and production to their daughters. This is done from a very young and tender age when she is able to grasp the knowledge gradually. An older woman also ensures that her daughter upon marriage takes with her seeds of the various indigenous varieties to her new home. This is how some seeds from one locality to another.

*Figure 7: The old woman shows of her groundnut seeds (Left) and she stands with her biological daughter to whom she has passed on some of her seeds (Right).*

Men to a large extent had some knowledge of indigenous varieties especially those that are vegetatively propagated like cassava, sweet potatoes, yams and bananas especially in Central

Uganda. This could be attributed to the fact that they were probably more involved during the planting of such crops compared to the cereals. On the other hand, the advent of new varieties which were being propagated for sale, made men more interested in understanding the kind of varieties being grown in their localities.

It was surprising that in Gulu in Northern Uganda, young adult boys had substantial knowledge of varieties of beans and groundnuts as well. When asked how they knew, many of them said they had been taught by a mother or a female relative.

Men are involved in construction of seed stores and other storage structures and such as granaries and large storage baskets in Northern and Eastern Uganda. In western Uganda, some women in Isingiro District also said granaries used to exist but have since become very rare. Cereals such as millet were stored just as it is done in other parts of the country.

Men may be directly interested in protecting seeds from fruit trees. When they are eating a fruit and think it is good and needs to be perpetuated, they may collect the seeds and ask the women to take care of the seeds from there on. Examples of such seeds include seeds of jack fruit in Central Uganda and mangoes in Northern and Eastern Uganda.

It was also found that men will be interested in seed only when it can be sold and specifically at the time of sale. They are therefore more involved in seed trading. This is true for all regions in Uganda. This is confirmed by research scientists and extension workers, that the farmer groups in Wakiso and Buikwe that have started growing seeds of indigenous seeds commercially include both women and men.

## 3.6. Adaptation of seeds to environment

Adaptation is an evolutionary process that makes a plant makes the most out of its environment. Most of the indigenous crops are open pollinated, so that they can easily be fertilized by wind and insects. They can therefore produce seeds that can be re used over and over. At the same time they have developed mechanisms to resistant biotic factors (pests and diseases) and abiotic factors such as drought. Those varieties that bear different adaption characteristics are described in table 1.

Seed dispersal is an example of an adaptation. Whereas plant breeders may think of modifying varieties that shatter such as cowpeas or Simsim, many farmers exploit that characteristic as an advantage. Farmers in Eastern and Northern Uganda take advantage of volunteer plants from of a previous crop from which seeds may be collected for the next crop.

Indigenous plants are well adapted to the environments in which they are grown. While most crops can be grown in any locality, they may be not perform to their full potential. Every area therefore has the best crops suitable for it and seeds which would perform best. For example bananas and beans perform best in the valleys of Kisoro and are very negligible in Katakwi district which is

semi arid. A women's group in Kisoro said that indigenous beans were preferred by most of them because one could still get a harvest even when they are grown in infertile soils.

Millet and sorghum perform best in the semi-arid areas of Katakwi and Gulu of Eastern and Northern regions of Uganda respectively.

### 3.7 The role of different actors in Management of Indigenous seeds

*Agricultural Extension Workers*

Agricultural extension workers can deliberately plan and budget for collection and multiplication of indigenous seeds in their yearly District Production Unit Plans. Their activities would span from community sensitizations on the health benefits of the indigenous crops. The entry point would be to identify the community lead actors, especially women who are currently still growing the indigenous seeds to play the role of providing the initial seed and running campaigns for popularizing the indigenous seeds through radio programmes.

**A report from an Extension worker on Indigenous Seeds**

Joy Kansiime is a recently retired Extension worker in Isingiro. She expressed disappointment on the current extension approaches and also the quality of farmers. In her own words she says:

"Extension workers should be the ones, training farmers in communities, sensitizing them on benefits of indigenous seeds and knowledge, and using associations such as Mothers Union in Church with the aim of sharing local seeds.

They are the ones who should be promoting indigenous knowledge however planting traditional seeds is considered a last resort. If the farmers got money, they would go in for improved varieties. Instead many of them are so spoilt, looking for projects with money and forgetting their work. Anyway they also need to be facilitated to do their work. The farmers also are spoilt. When they are invited for trainings, they will first want to know how much allowance they will be paid".

She is also disappointed by the attitude of the young people towards farming and specifically indigenous seeds and knowledge. About the young people she said:

"The young people now associate anything indigenous with backwardness, or being old fashioned. They generally shun anything to do with agriculture. I have some children in University and they refer to agriculture as 'burying the feet in the soil'. It becomes very difficult for elders to pass on knowledge seeds to such young people. I think practical agriculture should be introduced at a very low level, i.e. Primary School and carried on at all levels. Perhaps then the children will appreciate indigenous seeds and knowledge".

Research has an ongoing role in management of indigenous seeds in the country. Currently the Genetic plant Resources centre collects germplasm of all different crops from the whole country and are maintaining the germplasm at the centre. The center endeavors to promote the knowledge and appreciation of plants for scientific research, education, awareness and recreation purposes. This in a way has protected the indigenous species in the country. It is from here and the community that the researchers collect germplasm for developing the various seed varieties by crossing with local or indigenous varieties that have been released of the different crops. The researchers pick on the good traits in indigenous varieties and introduce to other varieties with other attributes such as high yield so as to bring all the good qualities together in one variety.

In NARO institutes like Mukono ZARDI and NACRRI, have been increasing efforts to deliberately do research on Indigenous vegetables derived from *Amaranthus* spp., *Cleome, Solanum*, and *Vigna* for commercialization purposes. Also the Zonal Agricultural researches Institutes, that are located at each of the Agro-ecological zones are implementing a component of ITKS, where they are working with farmers to multiply indigenous seeds. A case in point is Mukono Zonal Agricultural Research and Development Institute that is working in collaboration with the Center for Agri- Biosciences International in training farmer groups on how to plant, manage, harvest, process and store indigenous vegetable seeds. They are currently working with over a hundred farmers who have been linked to a SIMLAW seed company that was formerly Mt. Elgon Seed Company.

In addition to what is ongoing, researchers can support the communities in germplasm collection; develop the descriptors of this germplasm. They too can play the role of training farmers in understanding the indigenous seeds and their management and further certify them for production of seed.

Furthermore researchers can share knowledge and experiences with other actors in the indigenous seed production from other countries as they are exposed and more knowledgeable. This will enhance the capacity of the indigenious seed producers.

*Seed companies*

From the discussions with some seed companies, they indicated their inability in marketing local seeds due to lack of market. However there is need for Seed companies to take interest in producing seed for niche market. For example in the United States of America their specialty seed companies that produce Heir Loom Varieties with a special niche market. The products are known to have health benefits and are sold in specific stores. The company has contract farmers who grow the

seeds and supply only to Heir Loom. Hence there is need for more seed companies to join the SIM LAWS in working with farmers to promote local seed production.

The seed companies too should play the role of marketing the seeds, training the farmers on modern ways of managing the seeds for instance on how to plant, harvest, processing, storage and packaging and provide the market. Although some of these plants are only useful to fill small niche markets, others have the potential to become new products for consumers.

Other roles include conducting advertisements about indigenous seeds and their health benefits, values. The key strength of the seed companies is that they have resources to conduct most of the promotional activities for indigenous seeds such as conducting the campaigns to popularize the indigenous seeds

*Cultural Institutions*

We visited some cultural institutions and found out that they can be able to play a big role in indigenous seeds management. The cultural institutions can display local / traditional seeds and their health benefits to the communities through traditional museums. For instance in Teso, the museum can be enhanced to contain all the traditional seeds for the region. The cultural institutions can play the role of sensitizing the communities on how to grow the indigenous seeds. This can be done through developing on farm demonstrations line the case of the Buganda Cultural Agricultural Development Foundation. Also cultural institutions can plan to set up a model village with a mixture of indigenous foods and knowledge for access by all.

*Farmer Groups*

Farmers and farmer groups are playing the role of maintain the traditional seeds. This can be enhanced by training the farmers on seed management (agronomy, harvesting, and storage) for better yields. Famers too can share the seed with those who do not have for multiplication purpose. The role of storage and protecting the seed for future generations is the role of famers, without which this seed will be lost. Farmers should ensure that as they grow old they pass on the knowledge and seed to the young generation.


*Figure 8: Researchers in a discussion with a women farmer group about their perceptions on indigenous seeds*

*Non Governmental Organizations/ Civil Society*

Inherently most members of the Civil society have platforms of advocating for indigenous seeds. They should consider conducting further researcher such that the make recommendations from an informed point of view, otherwise they will not be successful with their advocacy.

They too can build the capacity of the communities to participate in the advocacy process, sometimes hearing from the affected people makes a difference, train and sensitize the communities to do the advocacy at given foras.

It is common that Nongovernmental organizations prefer to work as individuals with limited impact. There is need for them to pull together their resources that includes money and staff expertise such that they can cause impact.

## 3.8. Threats and opportunities for indigenous Seeds In Uganda

### Threats Indigenous seeds

The community systems of seed supply are increasingly facing pressure due to a number of factors. Factor listed below have together contributed to eroding both the quality and quantity of indigenous seed, and number of local plant varieties available to farmers.

***Weather***

Drought was mentioned as the main cause of crop failure resulting in loss of seed. Perepetwa Kamugisha of Isingiro emphasized that the issue of drought was her biggest challenge. Sometimes very heavy rains follow a prolonged drought, making the situation worse. This results in very poor harvest and sometimes all the seeds are eaten up during periods of scarcity and famine.

***Civil strife and Insurgency***

Civil strife and conflict has been reported as the lead cause of loss of seed in Northern and Eastern Uganda. Communities in Gulu were displaced for over 10 years and in Katakwi for 5 to 10 years. Women particularly reported that since they lost years of peaceful crop cultivation, they lost most seeds of their indigenous seeds. Moreover, many people lost their lives during the insurgency and with them valuable knowledge of seeds and indigenous knowledge was lost. Many of the varieties have never been recovered and existing people have forgotten some of their names. The women hoped that perhaps some communities still had them.

***Modernization of Agriculture and new crop varieties***

Farmers reported that with the modernization of agriculture, agricultural practices and cropping patterns changed and genetic diversity started getting lost. This is because farmers are only provided with improved seeds by government and NGOs. Seed brought in replaces older, local varieties which are becoming increasingly unavailable in many communities. They also said that new methods of agriculture advocate the use of chemicals such as herbicides, fertilizers and pesticides which they think may have had effects on their local seeds.

These varieties farmers said, were inherently more adaptable to local farming conditions, and economically practical and environmentally sustainable than the high yielding varieties being used today. They were also more resistant to pests, diseases, droughts and floods.

***Commercialization and privatization of seed***

The commercialization of seed has greatly contributed to erosion of local varieties as seed is increasingly becoming the ‘property’ of the private sector and big businesses. There are now a

number of registered as well as non registered seed businesses. The blossoming seed industry undermines the scope for farmers to save their own seed through a mix of technological, legal and economic strategies.

Big seed companies such as Pearl Seeds and Victoria Seeds Companies sell only varieties released from research institutes and some hybrids imported from other countries like Kenya and South Africa. Seed companies do not multiply seeds of local of indigenous varieties because they are not on demand. Farmers admitted that such seeds for Maize like Longe series and cassava like NASE 14 out yield local varieties and mature fast, so many farmers are going in for them and neglecting indigenous seeds.

Trade in grains and their seed is becoming more and more lucrative business even with local traders. Farmers are increasingly purchasing more of their seed requirements and this has caused erosion of local varieties. Moreover, when farmers are buying grains, they just mix up all the varieties and are not mindful of knowing the varieties. There is no specific seed centre so farmers just buy from any available source.

***Limited Storage facilities***

In the past, according to the farmers, it was easy to store seed in the granaries and jute bags. This cannot be done now because thieves still from granaries and people therefore abandoned them. Even the special materials (from shrubs) for making granaries and baskets are becoming rare. Seed is now stored in plastic containers and synthetic bags. Farmers say this method of storage does not keep seed for long as they may lose viability or get disease and pest infestation quickly.

***Limited land and Low soil fertility***

The women in Eastern and Western Uganda mainly, reported limited land and low fertility as causing low yields of local varieties. In the past it was easy to rotate land and a good harvest yielding good seeds would be realized. Due to low fertility some seeds survive and others are lost.

***Diseases, pests and weeds***

Farmers in all regions observed that over the years, they used not to experience serious crop disease and pests in the gardens. Even they have noticed some new aggressive weeds. Diseases such as cassava mosaic and brown streak virus caused loss of some varieties like *Ebwanaterak* in Katakwi and Teso generally. In Central and Western Uganda, Banana diseases were said to have affected a number of local varieties. Some bean varieties such as black bean *(Obote)* are also thought to have disappeared due to pest and disease damage.

***Reduced Interest of Youth in agriculture***

The older farmers of 50 years and above noted that younger people are no longer interested in agriculture and this gets worse each passing year. This has been worsened when youth get educated away from home. This therefore means their parents and other community elders are unable to pass on to them knowledge about indigenous seeds. Moreover, younger people even in the rural areas now want fast growing varieties and despise the local varieties with all their good attributes. During the visit, young people of below 18 years in all districts barely knew any local variety by name. For example in Katakwi they could name new varieties of groundnuts Serenut and Sorghum variety Epuripur which they said were marketable.

***Low Demand of Local varieties by the market***

The market demands new varieties and the price of such varieties is very attractive. This is the story in all regions in Uganda. An example was given of Serenut groundnut varieties whose seed costs 200,000= to 300,000= per bag (unshelled) yet local varieties such as *Etesot* cost 70,000= to 100,000=. This discouraged mainly younger farmers from growing indigenous varieties and therefore seed of such varieties was getting lost. A similar story was told of how seeds of NARO bean varieties called NABE costs more than 3 times that of locals varieties. Farmers therefore demanded more of the seeds of newer varieties which would yield a crop that sells much more.

***Legislation regarding seed production and Use***

In Uganda, requirements and the process for variety registration and seed certification provide no scope for enhancing farmers' practices and concerns in the area of indigenous seed production. There is yet no legislation and regulations with regard to Indigenous Knowledge Systems and seeds in Uganda, making it difficult to work on indigenous crops. Furthermore the research and development of the commercialization process is lengthy and costly.

There are laws governing use and sell of seeds that are beyond the scope and understanding of the small holder and mostly uneducated farmers, who grow and reuse indigenous seeds. For example laws concerning intellectual property rights, plant breeders' rights and patents make it illegal for farmers to reuse hybrid seeds. The owners of such seeds are at an advantage as they can make money and have the legal protection for their seeds.

***Lack of support from government and other institutions for local varieties***

Farmers in all regions visited said they had not heard of any government programme that was encouraging use of indigenous seeds or of growing local varieties. The message was always growing new seeds. This therefore was discouraging especially the younger farmers to stick to seeds of local varieties. Only in Isingiro district did one farmer mention that he had ever heard on radio one person encouraging people to grown local varieties because they were good for health. The older farmers (above 50) were still saving and growing local varieties mainly for home consumption and because they were cheaper and easier to grow.

***Opportunities available for Indigenous Seeds***

There is a growing interest to eat healthy among the middle class in urban and peri urban areas of Uganda. Indigenous foods have been identified to fill the need for health foods. Most indigenous vegetables have been applauded for their health benefits and their sale and consumption is growing. The farmers therefore see that opportunity to conserve, save and grow seeds of those vegetables.

The increase in actors advocating for preservation and use of indigenous seeds and varieties is an opportunity for the increase in preserving those seeds. PELUM for example is an umbrella organization of NGOs advocating for traditional crops.

There are still old people in the communities that are passionate about indigenous seeds and foods generally. These can be champions in passing on knowledge and information to the younger people.

Local seeds are easier and cheaper to produce. It is also easy to access and acquire the seeds from community members. Many farmers can therefore afford to multiply the seeds whenever they are needed.

## 3.9 Trends in Indigenous Seeds Utilization and Conservation

The Use and utilization of indigenous seeds is generally on the decline in all communities in all regions in Uganda. This is attributed to different factors.

***Central Region***

In Luwero in Central Uganda, farmers reported that before the 1950s, Matooke (bananas) was the major staple crops and there were probably over 10 types of indigenous varieties and planting materials were easily available. Matooke was mainly eaten with beans, groundnuts and indigenous vegetables. Farmers also had various yams *(Diascorea spp)* growing within the plantations, twining on the trees there in. In the same system was wide variety of vegetables like Entula (*Solanum nigram) or* bitter berries, African egg plant *(Entula*) and leafy vegetables. Most of these grew throughout the year, in a mixed cropping system with the major activity being general maintenance but no serious pest and disease control.

During the early 1950s, there was a major famine in the central region after which farmers started to diversify crops and also brought seeds from other communities. Farmers started to grow more root tuber crops including cassava and sweet potatoes in order to curb the effects of food shortage.

During the mid 1950s there was also a major shift in agricultural production not only for subsistence as more people started to also sell food crops. As many of the foods for home consumption also became a source of income, farmers began to grow more of the seeds of varieties desired in the market. Crops like maize began to gain more and more popularity and seeds came from different places both known and unknown. The farming methods also changed from intercropping to mono-cropping where the more competitive seeds and varieties were grown more to the detriment of the less yielding and desirable ones.

From around the 1960's, there was more movement of people from their birth places to other places in search of different reasons such as employment, looking for land to settle and marriage. Other cultures came into central region, including Batoro, Banyoro, Banyankole. This implies that they came in with other seeds along with the knowledge of their cultivation and food culture. For example they stored food like millet in granaries. Granaries were made using a special grass *eteete* (symopogun) to wrap the cereals.

Due, to the famous liberation war in the Luwero triangle of 1981 to1986 many people died and farming was greatly disrupted. Farmers reported that survivors fled to other places and young people started new lives in the urban and peri urban areas. Farming was left to the older and weak people. During the same time diseases such as coffee wilt and bananas diseases became rampant perhaps due to neglect of the crops. This resulted in the loss of many indigenous seeds and varieties of beans, bananas, sweet potatoes and coffee among others.

Like in most places, the late 1990s to 2000s saw the introduction of new seeds of improved varieties and most people abandoned the use of indigenous seeds, except the elderly people who appreciated their value.

***Western region***

The communities in Isingiro District said used to have granaries where they could keep seeds for the following planting season. They grew different varieties beans, millet, sorghum, maize which they stored in either granaries or special baskets. From around the 1970s, this practiced stopped with the incoming of plastics and polythene bags which were used for storage. Whenever people travelled out of Isingiro would also return with new seed as well as the new storage methods.

In addition, the younger generation abandoned the old storage methods because they said it was labour intensive. There was also increased theft of food from granaries leading to complete abandonment of the practice. Sacks could easily be stored under the beds or within the house.

In the 1980's to 1990s improved seeds were introduced in Western Uganda by the African Development Project (ADP) through the Extension system and by 2000s improved seeds that required purchasing every year had completely overrun indigenous seeds.

***Northern Region***

In Northern Uganda, communities think the steady decline of indigenous foods together with seeds started in the 1960s. This was attributed to immigration of people from other parts of the country to the region and also from other countries especially Sudan. Those immigrants came with different seeds and therefore began to influence the food culture. Trading also amongst the people from the North and other parts of Uganda resulted in exchange of seeds and the exotic foods gaining more ground, over the years.

The major factor that led to the decline of indigenous seeds in Gulu and northern region generally was the insurgency caused by Kony's Lord's Resistant Army. After 1986 when the current government took over, the rebellion that lasted over 20 years saw different communities in and out of Internally Displaced Peoples (IDP) camps. This disrupted farming grossly and many indigenous seeds were lost in the process. A few that survived are those that remained in the wild especially vegetables and those that a few women could carry with them to the camps.

During the period of insurgency and years following resettlement in the 2000s, people got new seeds through seed aid provided by government and Civil Society Organizations (CSOs) and these were improved seeds. This even made indigenous seeds less visible.

***Eastern region***

In Katakwi in the Teso sub region in Eastern Uganda, farmers said up to the 1940s, there was variety in cereals such as millet, sorghum and pulses such as cow peas, groundnuts and Bambara nuts. For each indigenous crop they grew farmers say there were 5 to over 10 kinds of seed types or varieties.

The most well known episode that affected agriculture is the drought in the Teso region in 1940-41 which caused serious famine serious famine in the region. People resorted to eating 'ikorom' which are seeds of water plants. This is when some indigenous seeds and foods started to reduce in visibility.

Over the years a combination of drought, pests and diseases affected mainly cereals and root crops. In the 1970's insurgency and cattle rustling in Teso greatly disturbed populations and they started to abandon long term varieties. The local cassava varieties like *Ebwanaterak* was affected by cassava mosaic virus disease. In the late 1980's to early 1990s people in the many parts Northern and Teso regions went into IDP camps and were not actively growing crops and Indigenous foods were more affected. In the camps they were given seed of improved varieties and they preferred short term varieties mainly exotic. Some people started to grow other foods such as maize instead of millet because the crop addressed food security faster.

From the 1990s there was aggressive promotion of improved varieties by government and non-government organizations for food security and incomes and so many indigenous foods were neglected. Current government programmes make no effort to carry out research or extension on

indigenous foods. By 2000's most people had abandoned the long term indigenous varieties and grew more of the improve varieties.

## 4.0 Lessons from other countries

There are lesson to learn from countries such as India on how to promote indigenous seeds. These are the Green Foundation and Deccan Development Society that have done significant work in developing Community Seed Banks.

**The GREEN Foundation**

The GREEN Foundation is a community-based organization in India that has been working since the early 1990s with about 4200 households of small and marginal farmers spread across the country. It aims to preserve and promote agro-biodiversity in this region by conserving seeds of indigenous varieties of plants. In order to do this, the foundation introduced and promoted the concept of community seed banks in conjunction with other organizations working at the grassroots level with farming communities among small and marginal farmers where they could conserve, borrow, lend and multiply their seeds.

A seed bank is not just a store house where seed is kept for distribution or marketing or a sophisticated storage facility which is controlled for temperature and humidity. It is an important self-help strategy for maintaining genetic diversity in crop and plant species on farms. It is also a system in the process of community agriculture which includes village level facilities, a garden or field where traditional varieties are safeguarded. Through this system, farmers have played a key role in the creation, maintenance and promotion of genetic diversity. They have developed skills to meet their specific needs such as quality, resistance to pests and pathogens, adaptation to soils, water and climate etc. Under this system local farmers have established their own seed networks to facilitate seed supply to their families and local markets.

Seeds are given free of cost to members of a seed bank. Any one from the community can become a member by paying a nominal annual fee. The member then sows the seed, harvests the crop, and later returns to the seed bank twice the quantity he received to replenish the store. The seed bank also works on seed treatment, seed selection, maintaining a record of needs, and planning for the next season.

The seed banks are managed by women's groups. Their work involves the process of seed mapping which is to gather information about the varieties of seeds that had become extinct or fallen into disuse and then collecting small quantities of them. The foundation then multiplies these seeds by growing them on small plots of lands and setting up seed banks.

Among the various methods adopted by the foundation for this purpose, on-site conservation involves distribution of seed diversity among farmers, monitoring it using cards and then collecting them after the season. Seed bank register, monitoring card and in-situ farmers' list are maintained as part of conservation activity. The farmer is also encouraged to put aside part of her/his seed supply for sowing, farmer to farmer exchange and for selling in the market.

The Green Foundation also organizes seed fairs and exposure visits where farmers interact and understand the need to conserve agro-biodiversity and also get an opportunity to exchange seeds.

**Deccan Development Society (DDS)**

The Deccan Development Society (DDS) works with voluntary associations of poor village women, mostly dalit agricultural laborers in 60 villages in the Medak District of Andhra Pradesh. The community gene bank project initiated by the Society and targeted at women farmers envisages that the seed business will give the women a chance to enter the market once they become good seed producers. DDS visualizes a new context in which organic (non-hybrid) agricultural products will be bought at a premium. This will be to the advantage of the women who grow traditional crops using non-chemical farming practices.

Three main initiatives have been taken up by the Society under this project. These are: an Alternative Public Distribution System known as the Community Grain Fund; massive wasteland development; and the raising of traditional seeds and establishment of decentralized village-level seed banks called the Community Gene Fund.

The Community Gene Fund project identifies 30 acres of land per village to raise traditional crops for seed purposes. The lands are selected by the village leaders along the following criteria: the poverty of the woman who owns the land and her commitment to grow the traditional crop and the suitability of the land to grow the traditional crop as seed.

Once the lands have been selected, a specified amount of money is made available to the farmer as input support to cover the expenses towards timely ploughing, purchase and application of farmyard manure, timely weeding and harvesting. This is a one-time investment and is recovered in the form of seeds. The recovered seeds will be stored in the village to serve as an in situ gene bank to help other farmers grow traditional crops. The Community Gene bank project aims to:

- secure crop biodiversity in the area
- create an in-situ gene bank
- develop a seed distribution network for the local crop varieties and ensure large-scale re-emergence of these varieties
- ensure a safety net for women who are dependent on subsistence farming and empower them to reclaim their unproductive lands

- enable the women's groups to develop the skills and management capacity and empower them to develop into seed entrepreneurs and enter agribusiness.

## 5. 0. Conclusions and Recommendations on Protection, Promotion and Preservation of seeds

This study findings show that farmers have no motivation to get involved in indigenous seed multiplication as a business as there are no profits in traditional seed marketing. These are explained by the seed companies not selling indigenous seeds in their stores. These therefore call for strong farmer awareness of growing purposely for the market. For successful market linkage development, it will be inevitable that a collaborative actor approach be adopted in order to comprehensively meet the human, social and financial capital requirements to enhance indigenous seed multiplication and marketing

It is apparent that there is high adoption for improved practices due to the weak or lack of market knowledge and linkages that would otherwise provide a stimulating pull through effect for increasing production of traditional varieties. This has resulted to farmers using mainly improved seeds that are easily available in the seed companies. Hence this calls for creating of awareness of the benefits of indigenous seeds through sensitization radio programmes and other avenues like mothers union.

Stimulating increased commercialization of traditional seeds can be done through small holder agriculture by encouraging investment in forward and backward linkages that have "pull through effect in enhancing traditional seed performance. This may include establishing any demonstrations of these indigenous seeds as may be required during the process of adoption or use requires provision of clean planting materials for establishment of demonstration gardens

In order to maintain and develop utilization of Indigenous seeds, it would be necessary to build capacity of especially the younger people in the relevant knowledge. This would be spearheaded by indigenous peoples and local communities who are the holders of traditional knowledge about seeds and ITK. The youth need to be impressed upon from a young age to appreciate the benefits of indigenous crops as discussed already. One approach could be to introduce practical agriculture in schools right from primary level that will make traditional farming part of the growing student's lifestyle. This may include sensitization on the values of improved health as a result of traditional foods.

A clear message as well as communication channels should be strategically developed in the promotion and campaign for indigenous seeds and food systems. This should include the benefits such as adaptation to the environmental conditions e.g. drought tolerance, good yields in poor soils and marginal lands, the other major benefit is that seeds can be recycled, require low input use.

Communication should easily reach the target beneficiaries. Some avenues suggested by the farmers were seeds fairs, church fora, community gatherings and use of radio channels.

The success of seed diffusion to the communities has largely been due to government and CSOs intervention. It will therefore require the same energies to restore indigenous seeds to the communities. Funds for R&D should be identified for indigenous seeds and knowledge. Extension should have a specific component of indigenous knowledge to address and should have the necessary technical and financial support to do so.

One of the ideas and suggestions is establishing seed banks with the different indigenous crop varieties within the community. The concept of community seeds banks that is so strong in other countries such as India could be used as an example for reviving indigenous seeds and to support their multiplication. The seed banks would be for assembling of seeds for various agro-ecologies, and sharing them among end users. This would target the involvement of mainly women who are the custodians of seeds in communities. There are already groups that showed interest in multiplication of such seeds and these would be tapped in. In these banks farmers would be able to access seeds and therefore provide the necessary seed security and conserve agro biodiversity. To add value and obtain technical backstopping, community seed banks should be set up in partnership with the formal sector – such as research institutes and CSOs.

The role of Seed Companies as the lead actors mandated to produce and market seeds should be exploited by other actors interested in promoting indigenous seeds. Seed companies have an interest in seeds of commercial value and where they make profits. They should be interested to multiply seeds of with niche markets. Already, the growing interest in indigenous vegetables has created demand for seeds which are now being marketed by Simlaw Seed Company.

The study revealed that byelaws had their place to ensure that all households had seeds of crops of socio-economic and cultural importance. If indigenous crops are known to be for food security and health benefits then leaders would be used to enforce their cultivation.

Laws on seeds should be favorable to small holder farmers who depend on indigenous seeds and use the informal seed system to obtain seed. The laws should take care of the production, availability of seeds as well as protection of biodiversity. It should allow for free exchange of seeds and regulating their sale fairly. The regulation should foster the work of those who foster diversity and should offer opportunities in support of farmers who are guardians of registered varieties, and recognizing the role they play in the conservation and production and conservation of indigenous seeds.

Community seed banks would have seed collections from a wide range of individuals, informal groups and NGOs who share seed among themselves. Seed would primarily be retained from participants' own production with no formal quality control, but individual selection process and handling skills are involved. Seed banks would also facilitate farmers' access to markets and give

farmers more choice over what they grow. Transferring seed between individuals, households and the seed bank would be put in place. These are mainly informal mechanisms such as seed fairs, in-kind seed loans, barter or seed exchange and through cash sales and purchases.

The role of civil society i.e. NGOs and CBOs in advocating for promotion and conservation of indigenous knowledge of local users should be recognized and supported. Their expertise and other resources can be utilized by government and private sector to advance participatory agro-biodiversity management programs, which include advancement of various indigenous seeds.

The availability of the appropriate kind of seed is highly significant for agriculture because without viable seed, the survival of rural households is endangered. The ways that farmers obtain seeds are as old as agriculture, and most small-scale farmers routinely save their seed from one harvest to the next. Therefore, a combined effort of various stakeholders in the agricultural sector is required to provide interventions to strengthen informal seed supply systems in Uganda.

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