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**Farmer seed experts and their knowledge on seeds, forest food products and medicinal plants**

By O.K.K. Mponda, E.M Kafiriti, Wembah-Rashid, M.G. Kajimbwa, E. Ndedya, L. Kinyunyu, H. Hamza, and A. Mwijage

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### **Introduction**

Low productivity of agricultural crops is among the factors leading to low income and food insecurity for rural people in the southern zone. One way in which productivity of agricultural crops could be increased is through use of improved seeds. Among other agricultural inputs, seed is probably the most important and cheapest input that farmers can afford. For seed to be a catalyst in agricultural production the seed supply pipeline must flow freely. On the other hand it is appreciated that little has been done to understand how the informal seed/variety development operates. The informal seed/variety development experts can complement each other and produce better and sustainable solutions than each expert's isolated efforts (Ashby, 1987; Biggs, 1989, Sperling 1992, Lupanga, *et al* 1996).

Rural seed fairs were designed with the following objectives:

Short term

- To create awareness and accessibility of additional alternative seeds and planting materials available from research institutions, seed companies and farmers
- To enable researchers, extension and farmers to meet and discuss, exchange ideas on their strategies, skills they use in seed and variety development and sell and exchange seed materials
- To create working contacts between seed expert farmers, extension, breeders/researchers and national seed producers. The working contacts could lead to refinement of the extension content and creation of new seed/variety development programmes and schemes including more village based initiatives and researcher-farmer partnerships for technology development

**Mid term-**

- To increase significantly the number and availability of crop varieties bred from National Research Institutes, Seed Companies and Farmer's own Seed Systems in the southern zone
- To promote farmer's own seed and exchange systems such that the official efforts, in addition to normal commercial channels, also work increasingly towards enhancing indigenous systems
- To encourage an increased focus of official variety development/seed production towards joining with farmers in their own complementary seed/variety development

**Long term-**

- To increase agricultural productivity, food availability and income for rural people in the southern zone

*Components of Southern Zone Rural Seed Fairs*

The rural seed fairs started in 1997 in three villages of Kitangari in Newala District and Mbonde and Marambo in Masasi and Nachingwea Districts. In 1998 there were 9 seed fair sites which covered all 9 districts of Mtwara and Lindi Regions. While in 1999 seed fairs were extended to include Mtwara Urban District making the total of 10 seed fair sites. The sites and farmer seed experts are identified by extension and farmers in the seed fair village have a role of building structures. The seed fairs have been supported by Rural Integrated

Project Support (RIPS ), District Councils and Naliendele Agricultural Research Institute. (For Roles and responsibility of each of the stakeholders see annex. 1)

Southern Zone Rural Seed Fairs have been avenues for farmers to exchange and buy seeds he/she is interested in for testing. Seed for rural seed fairs are usually purchased from research institutions, Seed companies, Tanzania Farmer's Association shops and from farmers. The seeds are packed in small quantities of 5 – 200 gms. This allows the small amount of purchased seed to reach as many farmers as possible. On the other hand seed fairs are being used to demonstrate various skills such as grafting, blacksmith tools, seed/food processing and storage techniques, and video shows on various agricultural technologies and livestock breeds. The 1999 seed fairs apart from seeds and above-mentioned skills there were also demonstration of forest products and medicinal plants. Radio broadcasts are made before and live during the seed fairs to create awareness of the event. Similarly, video and radio are used to document the seed fairs events across all seed fairs sites. The seed fair is mobile and rotates through several rural towns/villages and stops for two days in each selected seed fair village. Media van is used to mobilise people and traditional dances and songs played by local people and school pupils are use to attract and entertain people during seed fairs. The majority of the songs emphasise the importance of the seed fair event, seeds and improved farming in general.

#### *Outcome of rural seed fairs*

The rural seed fairs have been a unique opportunity of raising awareness of the rural communities to a wider variety of official seed and farmer's varieties of cereals, legumes, legumes, oilseeds and vegetables and skills. In 1999 the scope of the seed fairs was extended to include tree seeds, medicinal plants and seeds of ornamental flowers. Owing to increase in awareness and demand the quantity of seed purchased have been increasing in each year, for example, 300 kgs (1997), 800 kgs (1998) and about 2000 kgs of seeds were used in 1999 seed fairs. Both farmers and researchers have brought to the seed fairs over 40 crops and over 100 crop varieties. The report on seed sales and exchange of 1999 has not yet been compiled. However, based on 1997, 1998 reports it can be estimated that over the three years the seed fairs seeds have been accessed by farmers from at about 400 villages and over 200 farmer seed experts have attended and participated. Since farmers have their local seed network of acquiring seeds it is possible that the seeds of preferred varieties have spread to other farmers and villages.

The three years the seed fairs have been running in the zone have greatly increased the awareness and accessibility not only of improved varieties but also farmer's indigenous varieties. Rural seed fairs supplied new crop varieties from research as well as existing ones that a particular farmer may have lost and wanted to replant. On the other hand farmers are exposed to a range of crop varieties during seed fairs. The outcome of these events may be decrease in genetic erosion and increase in crop diversity in the southern zone.

The rural seed fairs have brought together seed expert farmers, researchers, and extension, NGOs, policy/decision maker as service providers. The rural seed fairs have opened debate on seed issues, seed supply and participatory variety development and seed production in the zone. The rural seed fairs have created interest not only within the zone but also within the country and there are prospects of replicating the southern zone seed fair model to other zones by the ministry of agriculture in order to bring about the agricultural revolution in the country. There has been some interest on international organisation conducting similar events outside Tanzania. For example in the 1999 experts from Zimbabwe and FAO LinKS project Tanzania attended the seed fairs. Similarly, experts from Tanzania were facilitated by FAO LinKS Project to visit NGOs with similar events such as Community Technology Development Trust CTD in Zimbabwe in 1999 and 2000. The participants on these seed

fairs and the exchange visits between Tanzania and Zimbabwe have experienced an alternative way to promote sharing of information and seed.

## **1.0 Background and Justification to the study**

Rural seed fairs that were conducted in the southern zone for three consecutive seasons with the main aim of creating awareness of alternative seeds that are available from formal and informal sector, improve accessibility of these seeds to farmers and create working contact between researchers, extension and farmers. On the third season of conducting the seed fairs it was realized that little was known on who were the seed experts and what knowledge they possessed. The written information of the varieties they brought for sale/exchange with other farmers was scanty because little could be documented during seed fairs. Furthermore, gender imbalances had been observed regarding the number of farmer experts participating in the seed fairs. From a total 92 farmer seed experts participating in 1998 seed fairs, only 13 were women, and at 4 out of 9 seed fair sites no female seed experts participated.

Based on the above it was felt important to address a number of aspects related to local knowledge, to vitalize farmers' knowledge in agricultural development strategies, including the role of women as farmer seed experts and the process of documenting local knowledge on seeds medicinal plants and medicinal plants in order to improve the rural seed systems. The FAO LinKS Project agreed to sponsor an Action research with the main goal of improving farmer's access to seeds, medicinal plants and forest food products based on local knowledge systems. The specific objectives were as follows:

- Identify and describe "local experts" of seeds, medicinal plants and forest products according to gender.
- Document their local knowledge on seeds, forest food products and medicinal plants,
- Analyze how farmers get access to knowledge and plant material.

In order to achieve the above objectives, seed fairs that were conducted between 1997 and 1998 were seen to provide entry point owing to the contacts with seed experts that had been established.

The present report discusses the outcome of in-depth studies with farmer seed experts conducted in the southern zone of Tanzania. Before an in-depth study the research team conducted a pre-test survey. This report therefore, also discusses the results of the pre-test survey conducted by all members of the research team. Generally, the report deals with the methodology, results and discusses potential use of the results and future prospects of merging local experts and scientific experts to achieve a more sustainable rural seed systems that draws experience from both in-formal and formal knowledge systems.





Plate 1: The Seed Fair Poster designed by ARI Naliendele used in 1998 Southern Zone Rural Seed Fairs.

## ***2.0 Description of the study area – Southern zone***

### **2.1 Human population, ethnic groups and Land**

The southern zone comprises Mtwara and Lindi Regions and Tunduru district in Ruvuma region. The total area is 103,478 square kilometres consisting of 17,750 for Mtwara, 66,950 for Lindi and 18,778 sq km for Tunduru district. According to 1988-population census, the total populations for the southern zone amounts to 1.7 million. Mtwara region population is estimated to 0.85 million (nearly 50% of the zonal population), Lindi has 0.65 and Tunduru has approximately 0.17 million people.

The average population growth rate is 1.7% (2.4% for Mtwara and 1.2% for Lindi) compared to the national average of 2.8%. The main ethnic groups are the Makonde, Mwera, Yao, Makua, Ngindo, Ngoni, Ndendule Matumbi and Mawia.. Makonde are the largest tribe followed by the mwera.

In the southern zone land may be considered relatively plentiful as all farming households have access to land. However, there is scarcity of high quality land. The system of land tenure reflects that of a country as all land is officially owned by the government but is allocated to villagers by the village leadership

### **2.2 Physical environment**

#### **Climate**

Two major airstreams; the southeast trade winds in midyear and the northeast trade winds influence climatic conditions in the zone during the turn of the year. Movement of the equatorial trough (Bennet et al 1979) conditions the weather pattern.

Map 1. The map shows the villages that were surveyed during pre-test and in-depth studies in the plateau, medium plains and coastal zones of southern Tanzania.

Temperature varies very little; the average temperature mean being 24.3 degrees centigrade in the coolest month and 27.5 in December the hottest month. The mean maximum temperature is 30.5 and the mean minimum is 21.7 degrees centigrade. The southern zone lies towards the southern limit of the intricate pattern of air flows which produces a distinct wet and dry season. The rainfall pattern is unimodal but often has seasonal interruption in February when there is a dry spell of two weeks. Approximately 85% of the annual precipitate fall between December and April. The average annual precipitate varies between 810 mm and 1090 mm. The largest rivers in southeast Tanzania are the Rufiji and Ruvuma. Both rivers flow into the Indian Ocean. Other main rivers are the; Lukuledi, Mbwemkuru, Mavuji, Mambi and Mbuo. All these rivers drain the southern zone and flows into the ocean at times they are very disastrous like the Lukuledi in April 1990 when it caused severe floods.

The dominant soils are the reddish sands and loamy sands, which have been developed on sediments, granites and acid gneiss. These soils are well drained, moderately deep, red to yellowish, has poor structure and profile development with low natural fertility. Other soil types are reddish sandy clays with moderate organic matter content and high subsoil acidity. The central part of the zone i.e. Nachingwea-Masasi plain and Mnero-Ruangwa plain have soils which are basement red clays. These soils have great potential for agricultural development.

Bennett *et al* (1979) mapped fourteen farming system zones (FSZ) in the southern zone by then Tunduru district was excluded. The following factors were taken into consideration while defining FSZ: soil types and rainfall, population distribution, and the relative importance of major food and cash crops. These zones are the following ; East Makonde plateau, West Makonde plateau (north), West Makonde plateau (central), West Makonde Plateau south, Lindi Plateaux, Coastal Clays, Coastal uplands, Coastal plains, Alluvial valleys and flood plains, Matumbi hills, West Lindi/East Nachingwea North-East Masasi, South Masasi, Liwale/west Nachingwea/west Kilwa and South-East Liwale.

### 2.3 The study zones within the southern zone

For the purpose of this study the southern zone was divided into three major zones plateau, medium plains and coastal zone

#### 2.3.1 Medium Plains

West Lindi/East Nachingwea North-East Masasi was chosen as a representative of medium plains. This zone is known as farming system zone 8. According to Bennet *et al* (1979) FSZ 8 is characterized by predominant red clays, fairly high population density, has high agricultural potential, rainfall 900-1000mm. Maize and sesame are very important crops.

#### 2.3.2 Plateau zone

Plateau zone is represented by Makonde plateau that covers Mtwara and Newala. Annual rainfall ranges from 900-1200, Has uniform sandy soils. Cassava is the most important crop and cashew is the dominant cash crop.

### 2.3.3. Coastal Zone

The main characteristic of the coastal zone is the prevalence of Coconut, it is the only zone where in which this crop is important. Cassava and sorghum and to a lesser extent maize are the main food crops.

## 3.0 METHODOLOGY

### 3.1 Selection of villages

The selection of villages where studies were conducted was influenced by the need to have zonal representation. For this reason, Chiwonga was selected to represent plateau zone while Nandagala and Nyengedi represented medium plains and coastal zones respectively. The other factor that was considered in selection of villages were participation to the southern zone rural seed fairs. Therefore, was to enable the research team to make further follow ups with seed experts after the rural seed fairs. This Chiwonga village was selected because it was a near seed fairs site whose farmers participated in the 1998 rural seed fair at Kitangari village in Newala District. Nandagala village in Ruangwa District was a seed fair site in 1998 while Nyengedi in Lindi District was a seed fair site in 1999 seed fairs. On the other hand, Nandagala village represented farming system zone 8, the control zone.

### 3.2 The pre-test survey

Before the actual survey could be carried out a pre-test survey was conducted at Mnyambe/Mnayope village in the plateau zone. This was deemed important in order to test the PRA tools and to enable the team to have a common understanding on the methodology of the study. The PRA tools used and type of information collected for the study were as presented in Table 1 as follows:

**Table 1. PRA tools and type of information collected during pre-test survey at Mnyambe village in Newala District.**

<b>PRA Tool</b>	<b>Type of information</b>
Mapping: Resource map, village map and social map	<ul style="list-style-type: none"><li>• Natural resources</li><li>• Farming activities</li><li>• Location of seed experts</li><li>• Location of medicinal plants</li></ul>
Personal Observation	Observing what farmers do and present
Focused group discussion	
Ranking: pair-wise comparison and matrix ranking	Preference ratings, local criteria
Semi-structured interviews	Specific knowledge on seeds, forest products and medicinal plants.
Wealth ranking	Relationships of knowledge and wealth groups
Time Line and Trend Analysis	Change in varieties, forest food products and medicinal plants and knowledge over time

The pre-test survey was conducted in February 2000. Before the actual pre-test could be conducted one scientist left three Days before the pre-test to the Newala district Mnyambe (pre-test site) to inform the district officials and village authority about the study. The visit was also used to sample the key-informants. Similarly, general



background information about the village such as history, number of households, ethnic groups, other villages in the ward and Division. These information were obtained with the help of village and ward officials and extension officer. The proposed sample for the pre-test survey was to comprise of elderly group (people over 60 years), Adult men and women and youths (boys and girls). A total of 37 and 36 people were to be invited for the interview for Mnyambe and Mnyope villages making a total of 73 people. The list of interviewee was to include seed experts who participated in the seed fairs 1998. The village leaders were asked to invite the individuals to attend the meeting.

On the pre-testing days the research team was divided into three groups and therefore the key-informants were divided in three groups of women, Adult and Elderly men and youth men. The latter enabled the research team to test many PRA tools than could have been all in one group. The general meeting of all invited key-informants was conducted in the first day and objectives of the study were explained.

The group interviews were followed by a plenary session where results were presented comments received from other participants to improve the quality of information.

The timing of meeting were agreed to start at 11.00 am to 17.00 hrs however, in the preceding days started from 13.00 to between 16-17.00 hrs because farmers were busy planting and weeding their crops. The groups with the help of facilitators presented the results in the plenary session to share the results and invite comments from other groups to improve the quality of information documented. De-briefing sessions were conducted in the evening each day by the research team to evaluate the days' work and plan for the next day. The Zonal Communication Officer Mr. Mussa Fakihi documented the proceeding of the pre-test survey and the actual in-depth study through radio and video and photographing.

### 3.3 The in-depth studies

The research team was divided in three groups for the plateau, medium plains and coastal zones as presented in Table 2.

**Table 2. Facilitators during the in-depth studies in the three zones of plateau, medium plains and coastal zones in Southern Tanzania.**

Facilitators	Research zone	Village	Why village was selected
Dr. Wembah and Mrs Ndedya	Plateau	Chiwonga	Near seed fair site 1998, Kitangari
Dr. Mponda, Mwijage and Fakihi/Hamza	Medium plains	Nandagala	Seed fair site 1998
Mr Kajimbwa and Kinyunyu	Coast	Nyengedi	Seed fair site 1998

The plateau and Medium plains group conducted the in-depth studies mainly between April-May 2000. While the Coastal zone group due to other commitments did the in-depth study in November-December 2000. Each group after collecting information in

the first visit, conducted a follow-up visit to the sites to gap fill the information which were felt missing at the time of writing the report. The preceding section will highlight methodology and PRA tools used by each group. The research team benefited from comments by Dr. Gry Sinnevaag of Noragric, Norway as well as from participants of the Gender, Biodiversity and Local Knowledge organised by LinKS project in Kibaha, in February 2000.

### ***3.3.1 Plateau zone- Chiwonga village***

The team conducted the in-depth study in April-May and a follow-up visit in December 2000. As stated above Chiwonga village is found in the plateau zone in Newala District. The majority of villagers belong to Makonde ethnic group, which is the largest in the southern zone. The research team worked with a total of 40 farmers. Eighteen of them were male and 22 female respondents. Of the 22 female respondents 12 were young and 10 adults women. The research team comprised two scientists, a male and female researcher. Female researcher interviewed female respondents and a male researcher interviewed male respondents. Flip charts and marker pens were used to document preliminary information coming out of PRA discussions. The team held plenary sessions with group members to consolidate the results of their discussions. Besides group discussions personal observations and field visits were made.

### ***3.3.2 Medium plains- Nandagala village***

The village is located in farming system zone 8, which is famous for production of sesame and maize. The zone has great agricultural potential because of good soils, rainfall and valleys. The valley bottoms allows about two crops to be grown per season. The lowland soils are more fertile compared to the upland soil and therefore crops such as maize and vegetables are cultivated in the lowlands while crops such as sorghum cow peas and pigeon peas are found in the upland. Vegetables such as onion tomatoes are grown during the dry season under irrigation using ponds.

Besides growing crops for food and income generation people also depend on collecting forest food products and medicinal plants for their rural livelihoods. Most of the land surrounding the village has been brought under cultivation however, there still remains a forest area known as *Nambarapi* about 8 km from the village. This is the now the only area where natural vegetation can be found now. It is the centre of mushroom and forest fruits not only for Nandagala village but also surrounding villages. Apart from forest food products the nearby forest provides villagers with medicinal plants which some of them can not be found in the land which has been put under cultivation.

Before meeting the villagers the team first met the district officials and division officials to explain the objectives of the study and what was expected of the study. Then the team moved to the village level where we first met with village officials. Mr Vitus Mohamed Cheupe who is now a retired village chairman played a big role in facilitating the research team to meet with rural experts. Mr Cheupe has been the chairman for quite a long period and therefore he knows his village and people. He has also actively participated in the rural seed fairs. The 1998 seed fairs were organised at his village, Nandagala. In 1999 he led a team of seed experts to Ruangwa

town where the 1999 seed fairs was being held. He himself is a seed expert and respected medicinal plant expert. Similarly, Ms Bertha Mnonjela played an important role in encouraging more women experts to come and participate in the meeting and group discussions. She is an active chairperson of women group called VIWAMNA, (Vikundi vya wanawake na maendeleo Nandagala). In 1996 Bertha Mnonjela was sponsored by RIPS to visit India. She has also participated in the two seed fairs and therefore we had become friends.

The meeting was held at the village office. A group about 30 farmers who were identified as local seed experts, medicinal plant practitioners and forest food gatherers with the help of key-informants indicated above was interviewed in April –May 2000 for five days. In the first plenary meeting we explained what the study was about and what expected benefit were and how the study was to be conducted. After having explained farmers split into two groups of men and women. And From the gender groups, depending on expertise they further split into subgroups focusing on local seeds, forest products and medicinal plants. With regard to men group elderly people (above 50 yrs) were in the medicinal plant group while the medium age group (40-50) joined the local seeds group and forest products (below 35 years).

With regard to women, they way the grouped themselves did not show any age difference. The range of age in the women group was between 25-50 years. As there was a young woman in the medicinal plant group. The type of information collected during focused group discussions, semi-structured interview crop calendar, activity profiles by gender and personal observation are summarized in Tables below. Women appeared to be active and open to discuss their knowledge on seeds, forest products and medicinal plants than was for men.



**Plate 2: Women Group VIWAMNA at Nandagala village Ruangwa District doing matrix ranking during the in-depth studies with farmer seed experts.**

**3.3.3 The coastal zone- Nyengedi Village**

Nyengedi is a medium sized village situated 30 kms Westwards along the road from Mnazimoja to Masasi. The village started in 1974 and was officially registered in 1975. Nyengedi village is headquarter for Nyengedi Ward covering 11 sub-villages.

According to the village record of 1999, the village has population of 3812 of which 733 are males and 1097 females) are able-bodied persons. There are 69 males and 82 females (F) handicapped while 823 (M) and 1018 (F) are children. Ethnic groups are Mwera followed by Makonde, Makua Ndonde and Yao. The dominating religion is Islam with very few Christian..

The in-depth study with farmer seed experts medicinal plants and forest food experts started in Mid-November 2000.

The team applied selected Participatory Rural Appraisal tools as agreed during the pre-test survey for data collection. Some new tools were introduced (for example Village Billboard) depending on field situation. Tools include social mapping, village Resources mapping, personal observation and semi-structured interviews. Seed Box model, Wealth ranking, Transect walk, farming activity chart by gender and benefit analysis. Income and expenditure sources by gender and resource flows were used to explore information related to the study.

## **4.0 RESULTS**

### **4.1. Results of the Pretest survey**

#### **4.1.1 Types of crops grown at Mnyambe/Mnayope village in Newala District**

Types of crops grown at Mnyambe are as presented in Table 3. The three groups were women group (including female youths), elderly men and male youth identified maize, sorghum, and cassava finger millet to be grown in the area. They considered major crops such as maize, sorghum cassava crops, which contribute greatly to household food security. Major food crops are those crops grown by many people and covers a greater part of the area and produced in large quantities. Crops such as pearl millet and finger millet are considered as minor crops. Few farmers, grow minor crops.

. Based on the listing, vegetable crops/fruits such as Tomatoes, ammarathus, eggplant and oranges were only mentioned by youth group. On the other hand old men and youth groups could, only mention sesame. Women group mentioned most of the minor crops (in italics). These observations suggests that there are gender differences with respect to types of crops grown. Women are more involved in those crops that supplements household food security such as the minor crops while men are more interested on those crops that provides cash return. As for youth are also interested in

cash returns particularly for those crops such as vegetables that have shorter growth cycle. These observations are valid for the whole of southern Tanzania.

**Table 3. Types of crops grown at Mnyambe/Mnayope village in Newala District.**

Women	Old men	Male youths
Maize	Maize	Cassava
Sorghum	Sorghum	Maize
Rice	Cassava	Sorghum
Bambara nuts	Bambaranuts	Bambaranuts
Groundnuts	Groundnuts	Sesame
<i>Matu</i>	Rice	Groundnuts
<i>Vinyamilwa</i>	Finger millet	Cowpeas
Fingermillet	Sesame	Beans
Pearl Millet	Pearl millet	Dengu
Yams	Pigeon peas	Pigeon peas
Sweet potatoes	Cowpeas	Green gram
<i>Luvale</i>	Beans	Oranges
<i>Dinikiti</i>	Pumpkins	Tomatoes
<i>Ding'ong'we</i>	Watermelon	Eggplant
Cassava	Yams	<i>Luvale</i>
<i>Dininji</i>	Sweet potatoes	<i>Mandale</i>
Pigeon peas	<i>Vinyamilwa</i>	<i>Matu</i>
Cowpeas	<i>Mandale</i>	<i>Vinyamilwa</i>
Phaseolus bean	<i>Luvale</i>	Sweet potatoes
<i>Dingau</i>		Ammarathus
<i>Mandale</i>		
Soya		

### Major crops

Maize besides being a food also is a source of income. White maize varieties are mostly grown as the market favours them. For this reason some farmers grow yellow varieties such as Ngundungundu which has yellow grains for home consumption (food security). The varieties identified for maize was as shown in Table 4. However, some farmers were not able to differentiate the type of varieties they grow. They could just say “ya kawaida” simply meaning common variety. However, if the variety is early maturing the term “Serena” is used. The term is used in many crops for any improved early maturing variety.

### Groundnuts

Farmers could differentiate two types of groundnut varieties “Za kuchimba” and “za kung’oa”. The classification of varieties is based on harvesting method. For the “za kuchimba” a hand hoe has to be used. These are local runner varieties. They are late maturing. With regard to “za kung’oa” the method of harvesting as the name suggests is hand lifting. These are normally early maturing erect bunch varieties. The hand lifting groundnut varieties were said to have been introduced in the village from 1970s while the local varieties have been existing since 1950s. There is a tendency of

many farmers adopting erect bunch varieties. The erect bunch varieties are easy to harvest thus reducing labour requirements compared to the runners

### **Bambaranuts**

Bambaranuts is the major grain legume grown in the area. The cream variety is the mostly cultivated. The variety is known as *Chingoni or za Kiyao*. Other variety is known as *Kalikulile*. Unlike *za Kiyao or Chingoni* which needs earthing *Kalikulile* does not need earthing as the young developing pods after fertilisation penetrates into the ground. The pods for this variety are usually big. The characteristics for *Mchanyara* could not be established.

### **Sweet potatoes**

With regard to sweet potatoes four varieties could be identified. These varieties are as presented in the Table 4. *Likomboleka* with white skin and white flesh was reported to have more fibre content while “*viazi njano*” was reported to be difficult in storing planting material since the variety requires moist areas. The plateau zone is mostly dry and water availability is a major problem. There are no streams even rice being planted is up-land rice.

### **Sorghum**

Sorghum is used for making ugali, rice and brewing alcohol (*Pombe*). The commonly cultivated variety was identified as “*wa Kawaida*” probably *Msumbiji*, a local variety. *Lionja*, a local variety grown in other areas is disliked at Mnyambe/Mnayope although the reasons were not apparently clear.

**Table 4. Local varieties used by farmers at Mnyambe/Mnayope village in Newala District**

Crop	Variety	Characteristics	Inconveniences
Maize	❖ <i>Ngundungundu</i>	Yellow grains	
	❖ <i>Pota</i>	Large grain	
	❖ <i>Ilonga</i>	Improved variety, late maturing	
	❖ <i>Kanjelenjele</i>	Early maturing	
	❖ <i>Tuxpeno</i>	Improved variety	
	❖ <i>Serena</i>	Newly introduced early maturing varieties	
Groundnuts	❖ <i>Za kuchimba 1950-1960s</i>	Virginia type, Runner, spreading bunch, local late maturing	Labour intensive at harvesting
	❖ <i>Za kung'oa from 1970s</i>	Spanish type Upright bunch, early maturity,	Attacked by fox and crawls
Bambaranuts	❖ <i>Kalikulile</i>	Mostly consumed at green stage and normally planted in	



Sweet potatoes	<ul style="list-style-type: none"> <li>❖ <i>Chingoni</i></li> <li>❖ <i>Mchanyara</i></li> <li>❖ <i>Kiyao</i></li> <li>❖ <i>Kayoma</i></li>   <li>❖ <i>Likomboleka</i></li> <li>❖ <i>Likomboleka</i></li>   <li>❖ <i>Viazi njano</i></li> </ul>	<p>small plots Cream seeds</p> <p>cream Takes six months to mature</p> <p>Red skin and white flesh</p> <p>White skin and white flesh, big in size</p> <p>Yellow flesh</p>	<p>More fibre content</p> <p>Difficult to store planting material because it prefers moist areas</p>
Sorghum	<ul style="list-style-type: none"> <li>❖ <i>Karoti</i></li> <li>❖ <i>Wa kawaida (Msumbiji?)</i></li> </ul>	<p>The flesh colour is like that of carrot</p> <p>Good for making Ugali, rice, alcohol</p>	
Cowpeas	<ul style="list-style-type: none"> <li>❖ <i>Litamba</i></li> </ul>		

#### 4.1.1.2 Minor crops

Usually, these are crops are produced in small quantities and does cover small proportion of area and grown by very few people

##### *Matu*

**Matu**, aerial yam (*Dioscorea bulbifera* L.) belong to the yams specie. Tubers are flattened brown in colour and the flesh is yellowish-green. The tubers are produced in the leaf axils. It is used as **futari** to go with porridge or tea. **Matu** is simply boiled, peeled and eaten as a snack. Currently, **Matu** is almost disappearing. The old people currently maintain it particularly, women). It was reported that to get **matu** seeds was very difficult because there are very few that grow the crop and these are normally, old women. The crop is planted in the new field where there are stumped trees to provide easy staking. And for this reason it can also be planted in the cashew field. Planting is done in October/November when the tubers has started sprouting.

##### *Vinyamilwa*

Vinyamilwa also belong to the *dioscorea* spp. (yams). It produces small hairy tubers that are brown, the flesh is white. When cooked the tubers are sweet. It is used as **futari**. As the case with **Matu**, **Vinyamilwa** is also a women crop particularly the old age. Old people fill proud to keep and cook the old food such as **Matu** and **Vinyamilwa** for their grand children. For planting the whole tuber is planted and therefore, it is difficult to keep seed. It is planted first when opening new field because of easy staking and fertility. Planting is done in September-October. The term women crop is used to refer to those crops that cared most by women usually for food security while the term men crops are those crops that have greater commercial

value. Crops such as maize, cassava, rice are intermediate; for cash and food are both men and women crops.

### ***Luvale***

**Luvale** belong to the root crops. It is women's crop. The roots are brownish-yellow and flesh is yellow. It is normally boiled and eaten as **futari**. And sometimes as **Mseto** when mixed with other vegetables. Small sized roots are used for planting. After harvesting the crop is stored in the house by spreading on the ground. They can also be left in the field and harvested whenever need arises.

### ***Vitundi (yams)***

There are several types/clones/varieties of yams. These are such as Nyati or Mkonga wa Nembo, Nnyuvele, Vyekundu, Hamandeke etc. This also was reported to be women's crop. It is boiled and eaten as **futari**. Normally eaten during the day. The head part is used for seed. The harvesting is labour intensive because it involves digging the tubers off the ground. The vitundi (yams) have currently gained popularity in the market particularly during the month of *Ramadhan (fasting month for Muslims)* and in towns where low -income earners can not afford to buy expensive foods such as bread.

### ***Mandale, (Chinese potato)***

Bears tubers like round potatoes or Bambaranuts. It is a food security women's crop. The tubers are small in size. Harvested during the dry season June-July. For planting the more small tubers are selected these are stored by spreading on the ground in the store. The tubers are planted after they have sprouted.

### ***Dinikiti***

**Dinikiti** (also called **Mamung'unya**) belong to the family of curcubitaceae, pumpkins. Farmers normally plant on new cleared field. The crop is considered women crop. It is a food security crop harvest at the time of hunger stress in February before maize matures. They are normally, planted in November before even the on-set of rains (dry planting) and harvested in February while still green. The selected fruits for seeds are left to ripen and dry. The selection takes into account of size of fruit to contain as much seeds as possible. Women do selection of good fruits for seeds. The seeds are stored within the dried fruits called **vibuyu**. Vibuyu are also used to store other types of seeds.

### ***Ding'ong'we and Dininji***

The crop belong to the same family as Dinikiti (pumpkins). It is grown for its seeds. The seeds are used as oilseed to provide **tui** for preparation of vegetables and soups. It is women's crop.

### ***Dingalaukila or Dingau***

The crop belong to Fabaceae family (Lima beans). It is women's crop planted along the fences and near the trees for easy staking. Pods are harvested while green as a vegetable. There are different seed colours but there is no differentiation to different varieties.

#### 4.1.2 Characteristics and change of cassava varieties over time.

In southern Tanzania cassava is important staple food crop considered as food security crop. The Government has always been emphasizing and sometimes with by-laws that each household should cultivate at least 1-2 acres to take care when other food crops fail. Cassava being so important the team explored what have appeared and disappeared and farmers' preferences on the choice of cassava varieties.

The results of matrix ranking and trend analysis of cassava varieties are summarised in Tables 5 and 6.

The main cassava varieties grown currently are as indicated on the Table. *Chimaji* is sometimes called *Mueda*. The variety was introduced in southern Tanzania from Mozambique. It is a bitter variety, high yielding and according to farmers the dry cassava stores well. The variety from planting to harvest can take about three years. It is normally planted first when opening the new field. It was also reported that cassava planted in the lowland areas has more fibre content than in the upland areas. It appears that the most grown varieties almost by everybody are bitter varieties such as *Chimaji*, *Nanjenjea*, *Kalinda* and *Mtunungwe* and according to results of the matrix ranking these varieties were ranked high in yield. Sweet varieties are normally grown in small scale and consumed either raw or boiled. The demand for sweet cassava is high during the month of fasting *Ramadhani* for Muslims. For sweet varieties such as *Kaselewende*, *Kigoma red*, *Kigoma Mafia*, *Mbwani* yield did not seem to be the major concern for villagers at Mnyambe/Mnayope because they are not grown in order to harvest dry cassava.

**Table 5. Cassava varieties grown and their characteristics**

Variety	Bitterness	Early maturity	Storability	Cookability	Sweetness	Raw eating suitability	Ability of dough to rise (Kuumuka ugali)	Yield	Disease resistance
Chimaji	5		8	5			10		
Kaselewende		10	10	10	5	5	2	10	
Mtunungwe	3		10	3	3	3	3	10	10
Kalinda	2		10	4	4	4	8	10	
Kigoma	1	10		10	5	5	3		
Mbwani			8		5	5			
Nanjenjea	7		8					10	
Lihumbukwa		10	8	5	5	5			

There have been some changes in composition of cassava varieties grown at Mnyambe/Mnayope village over the 40-50 years. The time line, Trend analysis done by old men group have indicated the disappearance of three varieties which were commonly grown in the 1950s before independence. These were *Mbwani*, *Likomboleka* and *Kammanyeye*. However, for *Mbwani* at least there are some trace in farmers' fields but *Likomboleka* and *Kammanyeye* are completely extinct. In the plenary session other farmers particularly women contributed more lost cassava variety names which are now no longer in cultivation. These were such as *Chinanyanga*, *Mgologolo* and *Hassan Raba*.

The main causes of variety disappearance at Mnyambe/Manayope village for cassava were theft and incidence of diseases and insect-pests. With regard to theft, Farmers reported that theft has discouraged them to grow sweet varieties. Therefore, some of the sweet varieties are being lost. On the other hand, variety susceptibility to diseases and insect pests were mentioned to be among the major causes of variety disappearance. For example, farmers reported that *Kalinda* variety is being lost due to its susceptibility to mealy bug and therefore farmers are moving to growing tolerant varieties.

**Table 6. Change of cassava varieties over time for the period up to 1960 (before independence), 1960-1970s (after independence) 1970-1980s (villagelization period) and from 1980s to date.**

Variety	Before 1960s	1960-1970s	1970 – 1980s	1980s – to date
<i>Mbwani</i>	10	8	4	2
<i>Likomboleka</i>	10	8	4	0
<i>Kammanyeye</i>	10	8	4	0
<i>Chimaji/Mueda</i>	0	1	4	10
<i>Kaselewende</i>	0	0	1	5
<i>Kalinda</i>	0	0	0	5
<i>Mtunungwe</i>	0	0	0	5
<i>Kigoma</i>	0	0	1	5
<i>Nanjenjea</i>	0	1	5	10
<i>Lihumbukwa</i>	0	0	1	5
Lost varieties identified in the plenary				
<i>Chifuu</i>				
<i>Chinanyanga</i>				
<i>Mdimbi</i>				
<i>Mgologolo</i>				
<i>Hassan Raba</i>				
<i>Mbonechi</i>				

The old varieties were being lost because change of farmers priorities and preferences. In the past the most commonly grown varieties were sweet and low yielding. Increased for food farmers opted to grow bitter high yielding varieties such

as Mueda/chimaji from Mozambique. Above all the new bitter varieties were said to be tolerant to cassava diseases and are not prone to theft and attack by vermin such as wild pigs. Over the recent times sweet cassava varieties have ready market in the urban areas, for fresh eating, boiling and chips. Therefore for households wishing to grow cassava for food security during times of food shortage will opt to grow bitter varieties. On the other hand farmers reported that bitter varieties stores well than sweet varieties. This explains why some varieties are being lost. The other reason could be due to the difficult of storing planting materials because of bulky and planting materials are susceptible to sun drying. They need to be harvested collected and kept under shade. This is an extra work for farmers.

#### **4.1.3 Seed experts, availability and sources**

According to the women group the seed experts are those with knowledge on

- ❖ Appropriate time of planting
- ❖ Where to get seeds
- ❖ Seed storage techniques
- ❖ How to use organic pesticides in seed storage

The main sources of seed acquisition were through:

- ❖ buying from neighbour or market
- ❖ seed exchange with relatives and neighbours
- ❖ exchange labour for seeds
- ❖ saving own seeds from previous harvest

Most farmers save their own seeds from previous harvest

#### **4.1.4 Method of seed production, selection and storage.**

Methods of seed selection are as summarised in Table 7. Farmers select seeds at the time harvesting and in store at the onset of rainfall. Basically, there is no distinct plot assigned for seed production. However, one farmer mentioned to be selecting maize plants for seed for the next season. The selected plant, the male flower are cut off probably, to encourage more cross fertilisation with pollen from other plants and therefore decrease the rate of inbreeding. The seed selection criteria are size of cob, panicle and seed size. Quality of seed is tested using floatation method. Good seeds sinks in water while those bad ones floats. Selection of seed by hand after winnowing is also practised to ensure only quality seed are planted

#### **4.1.5. Method of seed storage**

Seeds are store in the following structures and equipment

- ❖ *Naminga* (maize cobs hanged on fence) for maize but has the problem of theft
- ❖ *Likaku* (made from bamboos or grasses-conical drum shaped) for seeds such as Bambaranuts
- ❖ *Vibuyu*( dried gourds)
- ❖ Pots
- ❖ *Makungwa*( dried stem barks drum shaped)
- ❖ Used fertilizer bags
- ❖ *Dari-Likangala* (underneath of the roof surface made of bamboo stems or sorghum) for maize, cassava etc.

The kitchen is the best place to store maize, sorghum, cowpeas by hanging them under the kitchen roof.

**Table 7. Method of seed selection at Mnyambe/Mnayope Village in Newala District**

Crop	Selection methods/criteria
Maize	Most farmers select in store for big cobs, the grains on the centre of the cob are the one used for seed. However, some farmers select in the field at harvest
Groundnuts, Bambaranuts	The selection criteria are based on the seed size. the seed selection is normally done by women after shelling
Sorghum	The selection criterion is based on the size of the panicle. This is done either in store or at harvest.
Cowpeas	The selection is done in the field and prior to planting damaged seeds due to storage pests are removed

#### 4.1.6 Planting pattern and cropping sequence

Using a seed box model technique it was easier to understand the way farmer plant their crops which one comes first and last. For the newly cleared land, the planting pattern were as follows:

1. Maize
2. Sorghum planted between the maize rows when maize seedlings are 10-15cm high
3. Cassava after sorghum seedling emergence planted within the maize rows
4. Rice
5. Other crops such watermelon, pumpkins in selected areas in the field.

In the second year the same sequence could be adopted but rice is replaced by Bambaranuts. The cropping sequence is summarised in Table 8.

**Table 8. Cropping sequence**

Year 1	Year 2	Year 2
1. Maize	1. Maize	Fallow
2. Sorghum	2. Groundnuts	
3. Cassava	3. Cassava	



#### 4.1.7. Forest food products

The types of forest food products obtained at Mnyambe/Mnayope area were as indicated in Table 9.

Women and youth farmers classified the forest food products according to where they are found: **Jangwani** (fallow left fields) and forest areas (**msituni**). They indicated where particular product could be obtained. The names of forest food products are in local language (Makonde). We hope with the help of botanist/taxonomist in future will be able to determine their scientific names. However, from the listing there appear to be gender differences on who is involved in the collection/harvesting of specific types of products. Generally, Women and youth are highly involved in collection of food products. The old people group appears to be less involved. This implies that if we were to design research projects on forest food products youth and women could be our target group.

Within the two groups, youth and women collect different types of forest food products for example, girls and women are involved in harvesting/collection of root/tubers such as **Ming'oko** and **Ihangadi**, leaf vegetables and mushrooms. Similarly, based on the listing provided youth are more involved in the harvesting of forest fruits than the other two groups.

##### 4.1.7.1 Seasonal availability of forest food products

Using the seasonal calendar technique the monthly availability of forest food products was identified. *Ming'oko* was said to be available throughout the year. However, its abundance was recorded in August and September. This is also the period for harvesting fruit food products such as *Dinungulu* and *Dihambi*. While *Mangave* and *Makung'u* is highly abundant in the months of October and December.

**Table 9. Types of forest food products available at Mnyambe/Mnayope village in Newala District.**

Women	Old men	Male youths
❖ <b>Jangwani (bush)</b>	<i>Maungo</i>	❖ <b>Forest fruits</b>
<i>Dimbula -fruit</i>	<i>Makung'u</i>	<b>Makung'u</b>
<i>Dinungulu (fruit)</i>	<i>Vitolo-Manga</i>	<i>Maungo</i>
Mushrooms (various types)	<i>Mangave</i>	<i>Matili</i>
Wild animals	<i>Matili</i>	<i>Vitolo</i>
❖ <b>Msituni (forest area)</b>	<i>Ming'oko</i>	<i>Usofu</i>
<i>Maungo fruit</i>		<i>Vipwipwi</i>
<i>Vitolo (fruit)</i>		<i>Uhuhwe</i>
<i>Vipwipwi(fruit)</i>		<i>Uhongomwa</i>
<i>Ming'oko (sweet wild yam)</i>		<i>Ubobo</i>
<i>Ihangadi (toxic wild yam)</i>		<i>Mangave</i>
<i>Manyang'nya (wild yam)</i>		<i>Diminji</i>
<i>Malondolo (wild toxic yam)</i>		<i>Matengo</i>
		Mangoes
Indigenous leaf vegetables		❖ <b>Forest leafy vegetables</b>

<p>Wild animals</p> <p><b>Mushrooms</b></p> <p><b>Lowland</b></p> <p><i>Nannelele</i></p> <p><i>Chipatwe</i></p> <p><i>Linoha</i></p> <p><i>Mbohu</i></p> <p><i>Nakajete</i></p> <p><i>Mtima wa mbunju</i></p> <p><b>Upland</b></p> <p><i>Livanga</i></p> <p><i>Uyeye</i></p> <p><i>Uhutuka –on cashew debris</i></p> <p><i>Utuma</i></p> <p><i>Utope- under stem of Mtope</i></p> <p><i>Makutu mbogo- red in colour</i></p> <p><i>hard flesh sprouts on cashew</i></p> <p><i>dead stems (logs)</i></p>	<p><i>Mchukudi</i></p> <p><i>Liteledi</i></p> <p><i>Mnuvi</i></p> <p><i>Mchicha pori</i></p> <p><b>Cultivated leafy vegetables</b></p> <p><i>Mtolilo, Matembele</i> (Sweet potato leaves), <i>Liponda</i> (pumpkin and cowpea leaves)</p> <p>❖ <b>Mushrooms</b></p> <p><b>Lowland areas (Bondeni)</b></p> <p><i>Nannalele</i></p> <p><i>Imbohu</i></p> <p><i>Uhunda</i></p> <p><i>Ukundulakate</i></p> <p><i>Luhoha</i></p> <p><i>Ukambe</i></p> <p><i>Imbohu Namkuta</i></p> <p><i>Wongolo</i></p> <p><i>Nakajete</i></p> <p><i>Mtima wa mbunju</i></p> <p><b>Upland areas</b></p> <p><i>Livanga</i></p> <p><i>Uyeye</i></p> <p><i>Utuka</i></p> <p><i>Utohi- bush around hills</i></p> <p><i>Utuma</i></p> <p><i>Udungu</i></p> <p><i>Utope</i></p> <p><i>Litembo- very large sized</i></p> <p><i>Makutu mbongo</i></p> <p><i>Ususa</i></p> <p><i>Utenje</i></p> <p><i>Nakalataa</i></p>
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*Maungu and Matili* are available in January and February. From Table 10 it appears that forest food products are not readily available in March, May and June.

**Table 10. Seasonal availability of forest fruit products (Old men group) at Mnyambe/Mnayope village in Newala District.**

Product	J	F	M	A	M	J	J	A	S	O	N	D
<i>Maungu</i>	6	10	1									
<i>Makung'u</i>	2										6	10
<i>Vitoro</i>			2	10								

<i>Mangave</i>								2	4	10		
<i>Matili</i>	5	10	1									
<i>Ming'oko</i>	1	1	1	1	2	3	6	8	10	4	3	2
<i>Usofu</i>			4	10								
<i>Dinungulu</i>							2	5	10	2		
<i>Dihambi</i>								2	8	4		

#### 4.1.8 Medicinal plants

##### *Types of medicinal plants*

These were classified as curative medicine and those used for seed storage and protection of crop plants from pests.

Women	Old men	Male youths
<p><b><i>Mmala</i></b> – the roots are ground and the paste used for dressing wounds (<i>Donda ndugu</i>)</p> <p>- roots are boiled and the red solution obtained used to cure stomach disorder, <i>Mshipa tumbo</i></p> <p><b><i>Mnutulutu</i></b> - roots grinded and flour applied on the wound.</p> <p><b><i>Pawpaw</i></b> – used by people with <i>Ngiri</i> problem</p> <p><b><i>Guava leaves</i></b>- used for stomachache, diarrhea, the leaves is boiled with salt.</p> <p><b><i>Chinamtanda</i></b>- used to cure <i>degedege</i>, the leaves are pound mixed with water and the filtrate is used for drinking and bathing the sick child.</p> <p><b><i>Nachitenje</i></b> – used for patients with low blood content. The bark of the tree is boiled with water and the solution obtained is used for drinking</p> <p><b><i>Mnindimila</i></b>- used to cure eyes and ear diseases. The roots are grated filtered and filtrate poured onto the eye or</p>		<ul style="list-style-type: none"> <li>❖ Seed storage</li> <li>Orange leaves</li> <li>Neem leaves</li> <li>Cashew leaves</li> <li>Eucalyptus leaves</li> <li>❖ Curative medicine</li> <li>Msonobari (Eucalyptus) cures Chidudu disease</li> <li>Mnyumbu- roots cures malaria. Roots are grated mixed with water and solution given to a patient for Drinking</li> <li>❖ Chaluka cures round/hook worms , roots are grated and mixed with water, use solution for drinking</li> <li>❖ Castor leaves cures inflammation disease</li> <li>❖ Mmala cures difficult wounds (kidonda sugu)</li> <li>❖ Mmula cures diarrhoea and stomach disorders</li> <li>❖ Pawpaw roots cures malaria, <i>mshipa tumbo</i> and <i>ngiri</i></li> <li>❖</li> </ul>

ear.  <b>Myumba</b> - used to cure Chidudu and malaria  <b>Pumpkin leavea and Mikwanga</b> – used to protect against snake bites <b>Other medicinal plants</b> Mwindi used for cure <i>majini</i> Banana Coconut		
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### Taboos associated with use of local seeds and forest products

Women farmers mentioned certain taboos which need to be followed when going for collection of mushroom. Failure to follow those taboos may result in getting lost in the forest. Similarly, women farmers mentioned the use of root crops such as *Luvale* in traditional ceremonies such as *Jando*. (circumcision) that a wife has to prepare *luvale* and provide his husband if they have sent their son for Jando. On the other hand it was also reported that *luvale* is used by lactating mothers to stimulate milk.

#### 4.1.9 Results of well being analysis

##### *Criteria used to stratify the seed experts socio-economic*

##### **Group I**

- ❖ Have enough food through out the year
- ❖ Have about 20 goats and above
- ❖ Other people depends on them for assistance
- ❖ Hires labour and exchanges food, meat for labour
- ❖ Housing quality and ownership of physical assets
- ❖ Have 4-5 acres under cultivation

##### **Group II**

- ❖ Have enough food just for his family but can not assist others with food
- ❖ Keeps chicken, goats 3-11
- ❖ Cultivates 2-3 acres
- ❖ Conducts Mkumi (exchange labour)

##### **Group III**

- ❖ Have no enough food for the whole year and depends on others, neighbours
- ❖ Does not own livestock
- ❖ Sales labour
- ❖ Poor housing quality usually small huts not enough to accommodate the whole family.

**Table 11. Results of wealthy ranking**

Category	Total	Male	Female
I	2	2	0

II	19	14	5
III	7	2	5

Based on the list of seed and medicinal plant experts the majority of experts in category III were women. However, there appears no obvious relationship of socio-economic differentiation with seed or medicinal plant expertise. However, women based on response to the question of types of crops grown and types of medicinal and forest products appeared to be well informed. Women went further in explaining the processing methods of some of the medicinal plants.

**Table 12. The relationship between socio-economic status (1 High, 2 moderate, 3 low) and local expertise**

Name of expert	Group	Gender	Area of Expertise
Kassim Lada	1	M	Traditional medicine
Mzee Mchewe	1	M	
*Alfred Dadi	2	M	Rice, Maize, seed storage
Said Mwindu	2	M	Seed storage
Yusuf Musa	2	M	Seed storage
*Yusuf Mtiniko		M	Maize (yellow corn)
John Masengo	2	M	Cassava, Bambaranuts, Groundnuts
Kazumari Selemani (Mapinduzi)	2	M	Medicinal plants (Gwiji= very famous)
*Hawa Naweka	2	F	Medicinal plants (Gwiji = very famous)
Damare Chiwile (Mrs Maluchila)	2	F	Seeds all types
Hassani Hitu	2	M	Finger millet
Barnaba Lipamba	2	M	Maize, seed storage
Hamis Hassani	2	M	Beans
Bakari Mnipa	2	M	Medicinal plants, Groundnuts, Sorghum
Mzee Mnipawa	2	M	Traditional medicine against snake bite
Hassani Nakopa	2	M	Traditional medicine against snake bite
Dismas Mnichelewa	2	M	Medicine against degedege disease
Lawi Kunnola	2	M	Traditional medicine against snake bite
Amina Salim	2	F	Medicinal plants
Johnson Bakari	2	M	Medicine against degedege disease
*Yustino Selemani	2	M	Medicine against degedege disease
*Mussa Yusuf	2	M	
Julian Chinama	2	F	
Binti Hamis	2	F	
Hassani Rashid Mmoto	3	M	Seeds and medicinal plants

Somoe Mfaume (Binti Mpinga)	3	F	Medicinal plants (Gwiji = very famous)
Esha Mwindi	3	F	
Hadija Fundi	3	F	
Maalimu Yusuf Mussa		M	Seed production
Tekla Mamu	3	F	Finger millet
Somoye Mdoka	3	F	Medicinal plants
Jerome John	3	M	Traditional medicine against snake bite
Kassim Lada		M	
Wanjenje		M	Sorghum
Edita Mkanula		F	Maize
Abdelehemani Hamis		M	Cassava
Ndege Yusuf		M	Cassava
Mika Mahmudu		M	Maize, groundnuts
Jailes Badoka		M	Groundnuts, Bambaranuts
Msham Halfani		M	Groundnuts, Rice
Selemani Mussa		M	Bambaranuts, rice
Hashim Yusuf		M	Beans
Marijion Nyaka		F	Beans
Andrea Abdala		M	Pumpkins
Andrea Naleja (Sijali)		M	Cashew
Michael Namahochi		M	Maize, Groundnuts, Cashew
David Akule		M	

### Summary of the main findings of pre-test survey

- The pre-test survey have identified major and minor crops grown. Within crops farmers have diverse criteria/reasons for growing different varieties. For example at Mnyambe village they grow white seeded maize varieties for sale and yellow grain variety *Ngundungundu* which which is desliked in the market is retained for home consumption.
- Women take more responsibility in growing and maintaining minor crops which have no commercial value but as food security crops for example, crops such as *Matu*, *vinyamilwa* and *Mandale*, Men are more involved in those crops that generate cash for the household.
- The local seed experts are those who crop management practices, knows how to store seeds and they know seed sources
- Local bred varieties are lost through insect damage and diseases, theft and poor storage
- A number of forest food products have been identified. Women and girls take more responsibility in collecting forest food products such as mushrooms, leaf vegetables, roots and tubers while boys collect fruits from forest.
- Women reported more medicinal plants than men which could probably mean that they are more knowledgeable on medicinal plants than men. Other hand it could be said that men were probably cautious to expose their knowledge on medicinal plants to strangers. The knowledge is not readily shared and it is considered to be a secret.



- The results of wealth being analysis does suggest that more seed experts are in the second category of socio-economic status (medium). More women experts were found to be in the third category (poor).

## **4.2. Results of the in-depth studies**

The pretest of research tools conducted in the plateau zone villages of Mnyambe/Mnayope shed some light on the division of responsibilities labour, knowledge, skills in agriculture, medicinal plants and forest food products with reference to gender and social economic status.

It was important and interesting to conduct the in-depth study because:

1. It provided an opportunity to address research questions in a more focused context. For instance through this exercise the study has obtained specific and indigenous perspectives on the term expert, identification criteria and the social economic contexts in which the term derives its meaning.
2. Agriculture extension officers often complain of the slow or non-acceptance by farmers of new agricultural innovations. This study revealed that this assessment needs qualification. There is evidence that the plateau zone farmers have accepted localized and use extension information in their agricultural activities.
3. Work in the field revealed the great stores of local knowledge, skills and technology that are still undocumented about crops, forest food products and medicinal plants.

The notion that rural seed systems need has its own inadequacies. The contribution of this in-depth study is to establish whether the prevailing system has any inadequacies, and if yes, which ones. It is from identifying those inadequacies that ways and means to improve the situation can be devised. However,, considering that this study contains an element of mutual learning, it is possible that its findings can contribute to the improvement of local as well as non-local seed systems.

### **4.2.1 Plateau zone the case of Chiwonga village**

#### *Participatory Rural Appraisal Tools used and why*

Participatory research methodology has several advantages when viewed against conventional social science research methodologies. The most important is that it gives the researcher the opportunity to generate reliable and verifiable information which carries both internal and external validity within a relatively short time. The process of analyzing the generated data is collective and insistent, it takes place in the field. The entire PRA process is transparent, mutually beneficial to all stakeholders particularly the researcher and therefore not extractive or exploitative; often it is action oriented.

#### *Identification of Local Seeds Experts*

Two different approaches were used to identify local experts in the three area listed above in that order, i.e., agricultural seeds, medicinal plants and forest food products.

*Definition by male and female respondents*

All the 18 male respondents know how to read and write. The researcher asked them to write down on cards provided with marker pens the criteria for identifying specific individuals as experts in each area. Respondents working in pairs were required to write one or two criteria.

The 22 women comprising 12 young and 10 adults were asked by the female researcher to do the same exercise through open discussion. The researcher wrote down the criteria on a flip chart as they were mentioned by speakers. When no more new ideas were emerging the listed criteria were systematized to obtain a consolidated definition. Criteria generated were:

<b>Definition by male respondents</b>	<b>Definition by female respondents</b>
<ol style="list-style-type: none"> <li>1. Has or plants many kinds of crops</li> <li>2. Possesses and plants many varieties of same type of crop</li> <li>3. Is never short of seeds even in bad years</li> <li>4. Is ready or willing to give/sell seeds</li> <li>5. Raises a big family</li> <li>6. His/her food store are always full</li> <li>7. Knows how to store them so that they are protected</li> <li>8. Many people depend on him/her for most of seed supplies</li> <li>9. Old person</li> </ol>	<ol style="list-style-type: none"> <li>1. A progressive person who has traveled a lot</li> <li>2. A rich person</li> <li>3. Knowledgeable of seed preservation methods</li> <li>4. Has many farms planted with different crops</li> <li>5. Works hard to produce food/has plenty of food</li> <li>6. Can help others by giving them work on farm in exchange of food or seeds or cash</li> <li>7. Has a good house/safe storage facilities</li> <li>8. Does not consume all the crop harvest</li> <li>9. Has a good and cooperative spouse</li> </ol>

The definitions provided by the two groups were put together at a plenary session. The outcome was that local seed experts are relatively well off farmers according to village standards, they produce most of the seeds in different varieties on their own farms. They often exchange seeds with others and know seed storage facilities and mechanisms; when and how to plant and harvest crops.

*Local Experts on Medicinal Plants*

<b>Definition by male respondents</b>	<b>Definition by female respondents</b>
Can identify different types of trees	Known and acknowledged by community that he expert (fundi)
Ability to prepare and administer medicines from plant material	Provides good service/treatment not after money
Knows where the plants are located / obtained	Tells the truth about ability / knowledge of medicine

Knows how to obtain them	Enjoys the trust of all people
Can relate diseases to the right medicines	Knows exactly where medicinal plant are in which area.

During plenary presentations by the group leaders clarification and explanations were made, examples of real experts as well as bogus ones in the village and its neighborhood were given by name. It was finally agreed that a generic term for local experts on medicine and medicinal plants is **fundu**. **Fundu** is also used to describe experts in other fields such as artisans dancers singera it therefore needs to be qualified by saying the specific expertise that the person has. However, the were designation of an individual as **fundu** denotes that such an individual has excelled in the field under reference. In the realm of medicine expertism can be specific or general, of medicinal pants or other.

To conclude there was an agreement by both male and female respondents that a **fundu** in medicinal plants knows and can identify different/many types of plant material useful for medicine, where they are usually located and how to obtain and prepare the relevant parts for medicine. Knowledge of appropriate administration and prescription are essential qualities of a **fundu**. However, the listed criteria must go hand in hand with people's trust, a quality that differentiates a **fundu** from a bogus practitioner of plant material related medicine.

*Local Experts on Forest Food Products*

Definition by male respondents	Definition by female respondents
Can identify many varieties Know when to harvest what	Knows where to obtain them Knows many uses and preparation procedures to avoid poisoning
Know the dangers often encountered during harvesting forest products and ways to avoid them	Knows anti-dots in case of poisoning by forest products Knows rituals and taboos associated with harvesting of forest products

Plenary session discussion revealed that local forest food experts are defined as those who know and can identify various or many varieties located within the immediate environment and outside. For instance the plateau zone forest food experts had knowledge about forest products from other zones too.

Unlike the case of local seeds and medicinal plant experts where there is no gender specificity, with forest food products two observations were made:

1. Most experts on forest food products are women followed by girls and children (boys and girls). This fact is not evidenced by percentage of women/children versus men who know or do not know forest food products.

Further from the fact that the former as individuals or as a group know more forest food products than the latter

2. It was pointed out that these groups by virtue of their being directly involved in harvesting, preparation and consumption, and are necessitated to acquire the knowledge skills and expertise that enables them to appropriately exploit them. It was also observed that most of the forest food products are used as snacks by children and women; very rarely men eat them. Forest food products are also exploited by poor people in lean years or periods as substitutes to agriculture food products.
3. Contact between the plateau zone people and outsiders e.g., colonial government agents, and the introduction of new kinds of snacks, there is growing tendency to regard forest food products as poor peoples' food. Some people who take themselves as affluent, developed or have acquired western school education and way of life consider forest food products to be primitive fit only for the use of backward people. However, some staff members from allopathic medicine institutions strongly recommend to some of their patients to use certain forest food products, e.g. to combat anaemia, protein deficiencies and for some to enrich their vitamin intakes.

### ***Characterization of seed, medicinal plant and forest experts***

#### *Seed Experts*

Expertism on local seeds is associated with farming. In the pre European contact and introduction of school education respondents observed that farming on the plateau was everybody's occupation. Knowledge and skills in agriculture were passed on from parent to sibling or older generation members to young ones. Though not always but farming skills, knowledge and seed expertism were likely to follow the household, lineage and clan lines. In that sense because the plateau was resided by one ethnolinguistic group, Wamakonde, their knowledge, skills and expertism were on the main locally oriented and therefore ethnic. On the other hand it is also true that ecological differences dictated the kind of knowledge that was developed by the inhabitants of a specific ecological zone. Similar ecological zones allowed for the growing of similar seed types irrespective of the ethnolinguistic group clan or lineage living there.

Today seed experts can be found (usually as individuals) in different clans, lineages and households. Several reasons account for this:

1. There are more opportunities for young generation members to take up productive activities other than agriculture. When they choose activities other than agriculture they find no reason in learning to become seed experts from their kins.
2. Agricultural extension services are offered to all people interested e.g. in village settings. Under the circumstances households, lineages and clans cannot monopolize that knowledge by passing it only to their kith and kin. This view must be seen in view of the fact that some of the seeds considered local today were actually introduced onto the plateau by agricultural extension officers.
3. Whereas in the past marriages were very much localized, currently spouses may come from outside or another plateau zone. When such a situation

happens some of these spouses may come in with their own expertism which cannot be characterized as derived from the household, lineage or clan. In other words today's seed experts on the plateau zone may derive their expertism from a variety of sources learning from their elders in the household, lineage or clan, as well as from peers, agriculture extension services and through information from neighbours, books, magazines, radio and television.

#### *Medicinal Plant Experts*

The knowledge of medicine is a strictly guarded treasure by the **fundi** in the plateau zone and southern Tanzania generally. Before describing how it can be characterized it is pertinent to know how it is acquired in the plateau zone. The main methods for acquiring medicine knowledge (which includes plants) are:

1. through handing over from kin to kin, e.g. fundi/parent to oblong or relative.
2. by apprentice usually fundi to no-kin
3. through spirits.

Experts on local medicinal plants can be characterized by two groups:

1. those who acquire the skill from their kith and kin either through systematic learning (apprenticeship) or through spirit revelations (which originate from ancestor spirits who lived as experts)
2. acquiring the knowledge through apprenticeship between non-kins.

#### *Forest Food Products Experts*

Forest food products expert are generally like local seed experts. There are those who come or have developed the skill and knowledge by learning under experts in their own households, lineages or clans and the *Wamakonde* ethno-linguistic group of the plateau zone. On the other hand there are experts who acquired this knowledge from extension officers e.g. those from health, agriculture, natural resources and education sectors. In the latter case their expertism is restricted to those products recommended by their respective sectors for use.

#### *Categories of seed experts*

The experts identified by farmers during the seed fairs belong to the following categories on account that they are good and big farmers according to village standards, i.e., those who have great or productive ability middle level productive ability. No expert came from the poor or low level productive group.

#### *Role and Potential of Seed Experts According to Gender*

In the plateau zone agriculture is a major economic activity for almost every able bodied individual living in villages. Individuals may acquire and practice other trades, e.g., carpentry, blacksmithing, shop keeping or be local medicine practitioners, these are still supplementary activities to agriculture. Under these circumstances, seed experts are described by farmers as holders of keys to village peoples livelihood. They have or are expected to take the responsibility to pass down the knowledge they have accumulated and are also obliged to keep the seeds and maintain their quality. In as much as there are no laws to force them to do this.

Nowadays local seed experts have a potential to work with various researchers in agriculture to explore and initiate use of alternative seed types and varieties through collaborative farmer to farmer and farmer to researcher work. In this process the potential for documenting and disseminating local seed technology is high.

In the plateau zone roles and potentials of seed experts transcend gender, farmers observed that this situation should continue. There are no inhibitions along gender lines; this should be taken as strength and opportunity to be positively used in the process of food production.

Some farmers (well over 50% of the female and 20% male respondents) pointed out that agriculture extension officers should not ignore local expert knowledge in agriculture generally and seeds in particular. Local expert knowledge should be taped, analyzed and where possible incorporated into new ideas and operationalized. Local experts must be listened to, they possess age long accumulated and tested information, knowledge, experience and skills.

#### *Sharing of knowledge between experts*

Within the community experts share their knowledge in many ways. The mere fact that they are seed custodians and supply these seeds to others whether gratis to relatives or by exchanging/selling to non-kins, these transactions constitute knowledge sharing. However respondents both female and male said that these transactions are not systematic as is the case between experts and their apprentices between farmers and extension officers. What happens is that when new seeds or seed varieties are brought or obtained by one of the experts he/she propagates them. Propagation can be done during the process of giving and receiving or buying and selling; the one more knowledgeable passes the necessary information to his/her counterpart.

Sometimes seed experts arrange for work parties by inviting community members to work in their farm for some hours on one special day in return for payment in kind, e.g. food or beer. If it happens that other experts or farmers notice the presence of some seed variety that attracts them, they ask the owner to furnish them with the necessary information. Usually this request is honoured.

In communities where seed experts network and socialize they visit each other and often perform many social activities together. These meetings provide occasion for exchange and sharing of information not only on seeds but also on many other issues of public interest.

On the plateau zone resident agriculture extension officers are found in many communities and wards. Some of these work in close cooperation with local seed experts and learn a great deal from them. After acquiring that seed knowledge from local experts on seeds who are also great farmers, they pass it on to other farmers and seed experts through individual farmer visits or public meetings.

*Which crops are grown by men and women (by wealth category) for consumption and sale, and how do the different crops contribute to household food security.*

The process of generating information on the above questions from farmers of the plateau zone was structured into two main areas representing

1. the two mini agro zones within this main zone and
2. gender and social status differences

#### *Mini agro zones in Chiwonga Village*

Using the experience gained in the pretest study in Mnyambe/Kinyope villages also situated in a plateau zone the researchers sought to establish whether or not Chiwonga farmers classified their land into **nyitu** or **kunnyitu** and **lilanga** or **kwilanga**. Although male and female labour use overlaps in the two mini agro zones, it is generally accepted by plateau farmers that men work more on **nyitu** farms and women on **lilanga** ones. This exercise was conducted through brainstorming in a plenary session where all respondents were present, i.e., forty during the first visit and ten during the second visit.

#### *Nnyitu*

A **nyitu** means forest. On the Makonde plateau a virgin forest is of scattered big and tall trees amidst **miombo** woodland with thick undergrowths and creepers. In areas where natural forests are cut down to allow crop cultivation, regenerated vegetation after these areas are left fallow for several years occurs. When this regenerated vegetation grows thick and tall it is also designated **nyitu**; the method for its exploitation for crop cultivation is similar to that employed on farms cut out of virgin forest land. Characteristically its top soil is humus.

#### *Kwilanga*

**Kwilanga** is equivalent to a veldt. On the Makonde plateau **kwilanga** or **lilanga** is caused by continued cultivation after a **nyitu** has been cleared and the area not allowed time enough to regenerate its natural vegetation. For this reason **kwilanga** fields are generally less fertile compared to those situated in **kunnyitu**, hence different crops are grown which calls for slight differentiation in responsibilities on social economic and gender lines.

Land use for crop cultivation on the plateau zone is organized on a three year rotation basis beginning from the establishment of a field out of virgin forest to the time it is left to lie fallow. In the first year the field is referred to as **munda**, in the second it is **ntema** and for the third year it is **lihala**. In each year specific crops are grown and management structure may change depending on availability of forest virgin land and labour capacity to cut down a virgin forest to open up a new field after the third year. For instance in some villages on the plateau there is no more virgin forest land other than forest reserves which are not for cultivation. In other cases men who have the responsibility of opening up new fields by cutting down virgin forests are too old to do that kind of work. In both cases farmers may be forced to work on the same and old field in **kwilanga** even after the three year normal cultivation period is over.

On the plateau agricultural zone as noted in both Mnyambe/Mnyope and Chiwonga villages no crops are grown by men or women alone, however there is division of labour in agricultural activities between them. The crops identified by respondents for the plateau agricultural zone are:

CEREALS	ROOTS/TUBERS	SEEDS & NUTS	LEGUMES / VEGETABLES	FRUIT
Maize Sorghum Paddy Finger millet Bulrush	Cassava Yams Sweet potatoes Mandale Manjano Ginger	Groundnuts Bambara nuts Kweme	Peas Beans Pumpkins Water melons Cucumbers Tomatoes Spinach	Pawpaw Mango Bananas Oranges Lemon Lime Forosadi Kungu

To obtain the above list respondents were asked to work in groups composed of young women, adult women, young and adult men together and old men alone, thus forming four groups. Each group was asked to list on cards all the crops they knew to be commonly cultivated in their village under the five subheadings of cereals. Roots/Tubers. Seed/nuts, Legumes/vegetables and Fruit Berries. The lists were presented in a plenary session by each group before being amalgamated into the order they have appeared above.

*Who grows what crops in the plateau zone*

Findings from the pretest study conducted in Mnyambe/Mnayope villages showed that agriculture work in the fields is commonly shared between man, women, the youth, adults and old people. A field and the crops therein is primarily the property of the household although it is often referred to by the male adults' name where the household head is a male. In female-headed households, the female head is the owner of the field.

However two contexts tend to designate crops grown in a field commonly managed by either the male or female head to the manager. For instance, a new field developed out of virgin forest **munda**, often under the charge of the male household head. On this field different kinds of crops are grown some of which are claimed to be placed under the charge of the male head or his spouse. Similarly in the **ntema**, both the household male and his spouse work on the field collaboratively. They grow maize, sorghum and cassava. These crops are not designated the property of any single individual of the two.

In the third year the **ntema** becomes known as **lihala**. In terms of division of labour in farm management, in a household composed of wife, husband and siblings, the husband and male children shift to cut out a new field from a forest. The wife and female children become responsible for working in the **lihala**. In the **lihala** farmers mainly grow cassava, peas, legumes, ground and bambara nuts, maize, yam, sweat potatoes and a variety of vegetable crops.

The foregoing crop list compared with crops cultivated in the second and first years shows no clear difference in ownership. For example the crops grown are:



FIRST (MUNDA)	YEAR	SECOND (NTEMA)	YEAR	THIRD (LIHALA)	YEAR
Cassava		Maize		Cassava	
Maize		Sorghum		Peas	
Sorghum		Beans		Legumes	
Rice		Cassava		Groundnuts	
Sesame		Pumpkins		Bambaranuts	
Finger millet		Green gram		Sweat potatoes	
Water melons		Matu		Yams	
Pumpkins		Vinyamilwa			
Cucumbers		Mandale			
Yams					
Luvale					
Mandale					

In response to the question who grows which crops on the plateau zone, the general answer is all household members irrespective of sex and age collectively grow all the crops in their field.

Whether farmers grow certain crops according to their economic status, e.g. wealth category the answer is no. Although there are differences between one household and another in terms of the quantity of crops grown and harvested, the listed crops above are commonly cultivated by all villagers.

These crops are primarily grown for consumption and every household makes efforts to grow its own food although they are not necessarily self sufficient. There are no specific crops grown by specific groups of people.

In Chiwonga village there is no cash crop as such, part of the food crop is sold to obtain cash for the purchase of requirements other than food or some other types of food which some individual farmer may lack.

#### *Contribution of different crops to household food security*

Earlier on in this discussion it has been indicated that all of the crops identified and cultivated on the plateau agricultural zone are primarily for household consumption. However from time immemorial there has been exchange of some portions of what was harvested to obtain and satisfy other needs. This element is becoming even greater with the introduction and wide use of money in the region, food crops are sold to obtain cash.

As regards to their use to cater for household food security several points can be made. Farmers in their agricultural system gear for what can be considered as the main or staple foods as well as supplementary ones. On the plateau zone maize, sorghum and cassava followed by rice are the main staples. Their importance in terms of quantities and combinations cultivated and harvested depends on the household work force, the cultivation duration of the field (whether **munda**, **ntema** or **lihala**).

Under normal favourable weather conditions the farmer with a **munda** will be expected to have a bumper crop of all that he/she planted in his/her field. That state of affairs assumes food security for that particular household. A similar situation will be expected to be true with a farmer with **ntema** although he/she is also likely to have a reduced volume of the total harvest.

In the third year as noted above the main cereal staple grown here is maize. In addition the farmer has root staples of cassava, yams, **mandale**, **vinyamilwa** and **matu**. It will be noted that because of the relatively cool weather on the plateau it takes up to three years for cassava to mature.

Taking a time cycle of three years, households are likely to experience lean periods from the third year if they depend solely on crop from the **lihala**. This is why there is need to start the cycle by opening up cutting out a **munda** to ensure more food crops are grown and a better yield.

It is noteworthy here that cereal and root food staples are not prepared and eaten on their own, they have to go in combination with beans, peas and vegetable, i.e., other than meat, fish and mushrooms. These supplements are either grown in the **munda** or in the **ntema** and **lihala**, hence the cultivation of all three or two of the field types is a symbiotic necessity for those who can afford it.

Another context of viewing household food security is within the annual calendar; in the sense that there are months of abundance as well as lean ones. On the plateau zone from March through to August/September food is in plenty. About 50% of the farmers have relatively less food or cannot afford to partake of many varieties of foods between October and January. Indeed 25% of the farmers may depend solely on cassava which is often referred to as 'poor man's food' or 'food for the lean period'.

*Who Does What, When Activity Analysis by Gender*

Activity	Women		Men	
	Girls	Women	Men	Youths
Knowledge about seasons	000000	000000	000000	000000
Tilling the land (kwilanga) ntema	00000000	00000000	000000	00000000
Clearing of lihala	00000000	00000000	000	000000
Clearing of munda			0000000000	000000000000
Rituals before planting		0000	0000000000	0000000000
Planting	000000	000000	000000	000

Weeding	00000	00000	00000	00000
Rituals before harvesting			0000000	0000000
Harvesting	00000	000000000	000	000
Seed selection	00000	000000000 000000	00000 000	0000
Food storage	000000000	000000000	000000000	0000

From the matrix above it clearly shows that knowledge about seasons in this agricultural environment is equally shared between females and males, boys and girls while filling of the land is done by all, women and girls take the largest share of **lihala** and **ntema**. Opening up of a new farm **munda** is an exclusive activity of male adults and boys. Planting and weeding is shared by all the household while female and male adults take care of ritual. Harvesting, seed selection and storage is an activity led by female and male adults with great support from their children.

#### *How do Farmers Get Access to Seeds*

In the traditional setting on the plateau zone each household head (whether male or female) kept their own seeds. These seeds were selected and stored in the manner already explained in the preceding section of this paper. However, it was not the case that household heads were able to keep and store all types of seeds each year. Consequently whatever seeds they lacked and wanted for planting they had to get these from elsewhere.

It follows thus that if they did not produce these seeds themselves, they would obtain them from their relatives, neighbours and even from distant places by exchange. Relatively poor farmers would work in relatively rich farmers in exchange for seeds. Some farmers would take seed loans from neighbours or relatives or just for free as a gift.

With the establishment of research and extension services by the country's Agriculture Department new varieties of seeds have found their way to farmers. Sometimes farmers get them for free in order to assist researchers and extension officers in their research and extension piloting. Seeds are also available in the local shops and markets and these are either local varieties or 'improved' varieties marketed by seed producers from other parts of Tanzania or outside.

Seed Fairs were not common before they were introduced by ARI Naliendele and the RIPS Programme. In any case they do not cover many villages, in the districts of Mtwara and Lindi regions not even the plateau zone. Seed Fairs are a relatively new thing in the region. In this context there are no seed dissemination networks either for local seeds or for introduced varieties other than what has been explained here.

#### *How do Farmers Assess Seed Quality*

In the discussion on selection of seeds criteria for that process were enumerated. These criteria form the basis for farmer's assessment of seed quality so it not be

repeated here. It can be added that the criteria go beyond agricultural zones, they are more or less similar to all farmers in all zones.

#### *How do Farmers Process Their Seeds & Store Them*

The main principle of seed processing is based on the application of heat to slowly dry the seeds to avoid rotting. Heat application is of two kinds

1. natural heating by exposing seeds to solar radiation
2. smoking or putting seeds under fire or in a fire heated room.

Exposure of seeds to heat from the sun is often done in conjunction with airing by putting the seeds out in the open or in containers that allow adequate circulation of air. To illustrate the use of these principles information obtained from Mnyambe/Mnayope villages was further tested at Chiwonga. Specifically information was sought on one type of crop from the cereal, tuber/root, seeds/nuts and vegetable and fruit/berries groups in the following order.

#### *Cereal Crop Processing And Storage: Maize & Sorghum*

The crop is removed from the field during May and July when the stalks are already dry. In the home the cobs still with their outer covers can be

1. hung upside down on racks built outside the house but within the backyard enclosure; or
2. placed on top of a house roof. Alternatively the cobs will have half their outer covers removed first before being put either under the fire place over or under the kitchen ceiling. In isolated cases plateau farmers may hang maize cobs on trees near their houses put together in several batches.

Currently maize can be removed from cobs and the grains after treatment against pests are placed in sacks, pots, and plastic containers or similar containers for well keeping. The process and conditions for storing sorghum are more or less similar particularly those that which has to do with hanging by the fireside inside a house under or over the ceiling. It is also similar to storage in bagging containers, pots, plastic and tin material. The treatment of seeds against pests has been described earlier on in this chapter. Generally it involves mixing seeds with ash or pounded leaves of orange, cashew or other trees.

#### *Root /Tuber Crops Processing And Storage: Cassava*

It has been indicated that on the plateau zone cassava takes up to three years to mature ready for harvesting. It must be mentioned that it is not necessary to harvest it in the third year, it can be left in the field for another year or two without destroyed. Consequently one way of preserving the crop is to leave it standing in the field till the day it is required for harvesting.

However, when harvesting the process involves digging it up which is done by women and girls on the main, but males also do participate depending on household relations. The dug cassava roots are peeled and dried right away in the sun either on the field ground or on some platform.

Dried up cassava which takes one month or so to completely reach that stage is taken home and staked away on the ceiling of the kitchen. Here it continues drying and the smoke which turns its colour from white to brown is also an anti-pest treatment.

Today some farmers put their cassava in bags and can prevent it from pest destruction by dusting it with chemical material.

Yams are harvested from the field anytime from May each year. They are usually stored above the ceiling in a cool room under dry conditions. But is also possible to keep yams in containers that are airy placed in cool and dry places.

#### *Nuts/Seeds processing and storage: Ground & Bambara Nuts*

When groundnuts become mature the farmers dig them up. In areas where pests and thieves are not rampant, the farmer leaves the crop on its ears to dry for some time. When it is sufficiently dry the farmer picks the nuts and takes them home.

In the home the drying process can be continued outside the house with the crop placed on a platform structure. Here it dries with heat from the sun, natural dry air or with fire heat supplied from below the platform. When the farmer is satisfied that his/her crop is completely dry it is packed in storage facilities built outside or inside the house; big pots, plastic or tin containers as well as in bags. Unshelled groundnuts need no antipasto treatment. The process described above for groundnuts goes with bambara nuts. However, sometimes farmers may want to temporarily store the nuts in their fresh condition. This is done by digging a hole under a shade, the nuts are buried here until they are needed for cooking. They can stay fresh for at most four weeks.

The advent of iron roofs in villages enable farmers to use their roof tops for drying nuts and seeds of various kinds before they are shelled and stored away or can be left there as part of the storing process.

#### *Vegetable Foods: Pumpkins And Legume Leaves*

Under pumpkins one could include water melons and cucumbers. In as much as it is possible to harvest and store this category of foods, their lifespan after harvest is relatively shorter compared to cereals and tubers. The only exception is one type of water melon which is hard inside locally called **likong'we**. Under the circumstances all mature pumpkins and watermelons are harvested and can be kept in the home over the kitchen ceiling away from the fireplace. Here they can last for slightly over 4 months after which begin rotting or lose their taste.

The leafy vegetables can be preserved by boiling them, salt is added and then dried in the sun for several days. When they are completely dry they are stored away in a pot or basketwork container and well covered. In this state they are preserved ready for use during the dry months of July through to November.

#### *Fruits Processing And Storage: Pawpaw And Mangoes*

On the plateau zone types of cultivated fruits are relatively few compared to those harvested from the forest zone. The few cultivated fruits mature for consumption when it is also raining, e.g. mangoes, for that reason preservation can be difficult and rotting rate is high.

However, pawpaws do not need processing to long keep. When pawpaws mature they begin turning a little golden on the outside. Farmers can pluck them from the

trees and keep them in a warm place e.g. inside a well covered pot. To quicken the ripening action the farmer makes a cut at the head of the fruit and smears the ‘wound’ with ash. It takes two to three days before it is ready to eat. As the tree becomes taller and taller the farmer would leave the fruits to ripen on the tree till they are ready to it. He/she would use a stick to make the fruit fall or a boy climbs the tree and brings down the ripened fruit. Pawpaws from tall trees usually break up when they fall down if they are real ripe and have turned yellow and soft.

Mangoes are treated slightly different from pawpaws on the plateau zone. Mangoes start maturing during the last days of the dry season or early in the rainy season. There is very little time to use solar radiation to dry some for preservation. However, unripe mangoes are peeled sliced and dried; they make good cooking spice. Otherwise ripe mangoes which fall down on their own accord are best eaten while fresh or a few days after picking, they are not easy to keep for longer period.

#### *How do Farmers Keep Varieties Pure*

Before wide use of extension services in agriculture, farmers depended on their own seed varieties, i.e., those used within their localities. In this case plateau farmers had varieties suited to their zone. It must also be noted that traveling from the plateau to other agricultural zones was not easy and as often as people do today. Respondents explained that local seed varieties kept rotating through exchange system of various kinds within the plateau. Therefore because not many seeds came into the system, the existing ones remained pure.

Currently the situation is different, extension officers bring in new varieties and so do the local shopkeepers, the cooperative society and individuals. Mobility is high and knowledge exchange is greater than before. When farmers have new seed varieties they want to adopt or try they either plant them in a small area around the house or some corner in the field or in some separate field altogether. The aim is not necessarily to keep the seeds pure rather primarily to ensure that they do not impact negatively on others already established on their farmers. However, it is also an attempt to experiment, try and see whether what will come out of them will be real different and to what extent. So in a way that also controls the purity of the specific seeds.

#### *What is the Selection Criteria*

<b>CROP</b>	<b>VARIETY</b>	<b>CHARACTERISTIC</b>	<b>INCONVENIENCES</b>
Maize	<i>Ngundungudu</i> <i>Pota</i> <i>Ilonga</i>  <i>Kanjelenjele</i> <i>Tuxpeno</i> <i>Serena</i>	Yellow grains Large grain Improved variety, late maturing Early maturing Improved variety Newly introduced early maturing varieties	
Groundnuts	<i>Za kuchimba 1950 – 1960s (for digging)</i>	Virginia type, runner, spreading	Labour intensive at harvesting

	<i>Za kung'oa from 1970s (for uprooting)</i>	bunch, local late maturing Spanish type upright bunch, early maturity	Attacked by fox and crawls
Bambaranuts	<i>Kalikulile</i>	Mostly consumed at green stage and normally planted in small plots Cream seeds	
Sweet Potatoes	<i>Chingoni</i> <i>Mchanyara</i> <i>Kiyao</i>	Cream Takes six months to mature	More fibre content
	<i>Kayoma</i> <i>Likomboleka</i>	Red skin and white flesh White skin and white flesh, big in size	Difficult to store planting material because it prefers moist areas
	<i>Viazi njano (Yellow potatoes) sweat</i>	Yellow flesh	
	<i>Karoti (carrot type)</i>	The flesh colour is like that of carrot	
Sorghum	<i>Wa kawaida (Msumbiji) (ordinary)</i>	Good for making ugali, rice, alcohol	
Cowpeas	<i>Litamba</i>		

#### *When is Selection Done*

#### *Method of Seed Production, Selection and Storage*

Farmers select seeds at the time of harvesting and in store at the onset of rainfall. Basically, there is no distinct plot assigned for seed production. However, one farmer indicated that he earmarks or selects future seed material from maize plants while in the field. In this case the male flower of the selected plant are cut off probably to encourage more cross fertilization with pollen from other plants and therefore decrease the rate of inbreeding. The seed selection criteria are size of cob, panicle and seed size. Quality of seeds are tested using floatation method. Good seeds sink in water while bad ones float. Selection of seed by hand after winnowing is also practiced to ensure only quality seeds are planted.

CROP	SELECTION METHODS/CRITERIA
Maize	Most farmers select in store for big cobs, the

	grains on the center of the cob are the one used for seed. However, some farmers select in the field at harvest
Groundnuts, Bambaranuts	The selection criteria is based on the seed size the seed selection is normally done by women after shelling
Sorghum	The selection criteria is based on the size of the panicle. This is done either in store or at harvest
Cowpeas	The selection is done in the field and prior to planting damaged seeds due to storage pests are removed

### Forest food products (wild species in the forest used for food)

When probing on agricultural products the research team categorized them into five groups. The method used was to ask respondents to write down all crops they knew were grown in the plateau zone in each of the categories. For those who did not know how to write, they verbally gave their answers which were then written by the researcher.

The respondents were grouped into males and females and then sub grouped into male adults, old adults, young females and old females. The results were as follows:

#### Forest Food Products List Provided by female respondents

SUB GROUP	CEREALS	TUBOR / ROOTS	SEEDS/NU TS	LEGUMES /VEGETABLE S	FRUIT /NERPLE S
Old females		<i>Ihangadi Ming'oko</i>	Nil	<i>Lilende Nan'delele Mushroom</i>	<i>Makung'u Maungo Mangave Vipwiiipwi Vitolo</i>
Young females	Nil	<i>Ming'oko Ihangadi</i>	Nil	<i>Lilende Nan'delele</i>	<i>Vitolo Makung'u Maungo Mangave Vipwiiipwi</i>

#### Forest Food Products List Provided by male respondents

SUB GROUP	CEREALS	TUBOR / ROOTS	SEEDS/NU TS	LEGUMES /VEGETABLES	FRUIT /NERPLES
Old	Nil	<i>Ming'oko Ihangadi</i>	Nil	<i>Lilende Nan'delele</i>	<i>Makung'u Vitolo Maungo</i>



Adult	Nil		Nil	<i>Lilende</i>	<i>Makung'u Vitolo Maungo</i>
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During the research tools pre-testing exercise in Mnyambe/Mnayope villages, also situated on the plateau zone, the research team got the impression that forest food products are commonly used by children. The team was interested in delving further into this impression to establish its truth, it arranged to ask school children do the exercise that the village respondents did. The following was the result.

*Forest Food Products List Provided by School Children*

<b>SUB GROUP</b>	<b>CEREALS</b>	<b>TUBOR / ROOTS</b>	<b>SEEDS/NU TS</b>	<b>LEGUMES /VEGETABLES</b>	<b>FRUIT /NERPLES</b>
Girls	Nil	Ming'oko	Nil	<i>Lilende Nan'delele Mushroom Mchalendi Liteledi Mnuvi</i>	<i>Usofu Mangave Vitolo mapwiipwi i Makung'u Maungo Matili Uhuhwe Uhongom wa Ubobo</i>
Boys	Nil	<i>Ming'oko</i>	Nil	<i>Lilende Mushroom</i>	<i>Matili Makung'u Maungo Vitolo Mangave Usofu Uhuhwe</i>

From the lists above it is concluded that females including girls listed more products than any other. Reasons for this as explained in the section on local experts on forest food products include the fact that they are the ones directly involved in harvesting processing and consuming.

Using the lists provided by the various categories and subgroups, the team compiled the following inventory of forest food products.

CEREALS	TUBER / ROOTS	SEEDS/NU TS	LEGUMES /VEGETABLE S	FRUIT /NERPLE S
Nil	<i>Ming'oko Ihangadi</i>	Nil	<i>Lilende Nan'delele Mushroom Mchukudi Liteledi Mnuvi</i>	<i>Vitolo Makung'u mapwiipw i Mangave Maungo Matili Uhuhwe Uhongom wa Usofu Ubobo</i>

Under these circumstances it is interesting to note that the plateau agriculture zone, Chiwonga village according to community has no known cereal or seeds/nuts as forest products.

#### *Who collects food products by gender*

The exercise leading to the production of the *forest* food inventory also served the purpose of identifying those involved in collecting these products. By far women and girls are more involved in this process, particularly collection of those forest food products which are brought into the home for use by other household members these include mushrooms, and an assortment of vegetables, **ming'oko**.

Men and boys tend to harvest fruit which are eaten on the spot while engaged in other activities in the forest or bush e.g. while hunting, harvesting wood products or looking after goats.

#### *How are the forest food products used by gender*

Except for tuber/roots and legumes/vegetable forest food products, all others are used as snacks. The main users of products pronounced to be snacks are children both girls and boys followed by women. Those which are not eaten as snacks are brought home into the household, prepared and served for every member of the household to partake.

### **Medicinal Plants**

In Chiwonga Village respondents to questions related to medicine and medicinal plants were not as well answered as was the case in the pretest area of Mnyambe/Mnayope. The result of this was that the research did not generate as many examples as was expected.

The method used to generate the desired information was group work (of two persons per group). These were asked to name all the medicinal plants they knew. After naming lists of the plants were compiled. Respondents were then asked to indicate the kind of disease or ailment they cured and the exact parts of plants used, how it is prepared and administered. The result was that a matrix was drawn as follows:

### Medicinal plants

Plant Name	What/Who it cures	Part of Plant used	Preparation and application
<i>Chinamtanda</i>	Human malaria	Leaves	Leaves are pound mixed with water patient drinks and bathes
<i>Mnindimila</i>	Human eye and ear	Root	Grated mix with water, filtrate drops administered to eye or ear
<i>Nachitenje</i>	Human increase blood quality	Bark	Boil in water and drink
<i>Myumba</i>	Humans worms	Leave	Pound mix with water and drink
Guava	Humans diarrhea	Leaves	Pound mix with water and drink
Pawpaw tree	Humans, poultry, domestic animals	Leaves and roots	Pound mix with water and drink
<i>Mmula</i>	Humans malaria and worms	Bark or leaves	Pound mix with water and drink or introduced through anus
Castor	Human inflammation dislocation	Leaves	Warm on fire and press on affected area
<i>Mvule</i>	Grain protection against pests	Bark and trunk	Burnt to ash, ash mixed with grain
Orange tree	Seed /grain protection against pests	Leaves	Pound, dry mix with seed and seal off
Nim tree	Seed /grain protection against pests	Leaves	Pound, dry mix with seed and seal off
Cashewnut tree	Seed /grain protection against pests	Leaves	Pound, dry mix with seed and seal off
<i>Msobari</i> (casuarinas)	Seed /grain protection against pests	Leaves	Pound, dry mix with seed and seal off

From the matrix the question which diseases are cured and which part of the plants are used has been answered.

1. Medicinal plants can be used to cure humans, domestic animals and to protect seeds against destruction by pests.
2. Main parts of plants used for medicinal purposes vary according to plant and the intended cure. However, it is observed that from the matrix that by far leaves rank high followed by roots, bark and truck.

3. From the research team's experience (given that they are familiar with the research area), seeds/nuts and flowers are also used to prepare medicine.

### **Summary of the main findings in the plateau zone**

#### Seed experts

- Seed experts are farmers who knows how to store seeds, supplies seed to others, grows many crops and varieties, do not consume all the crop harvested.
- Ecological differences dictate the kind of knowledge that is developed this was observed through use of similar seed types
- Knowledge is passed from old to young generation following household, lineage and clan
- Work parties, social gathering and individual farmer visits facilitate knowledge exchange
- Seed experts pass down the knowledge they have accumulated and they are obliged to keep the seed and maintain their quality but there are no laws to force them
- Today's seed experts may derive their expertism from variety of sources; from elders in the household, lineage or clan, as well as from peers, agricultural extension, researchers, neighbours, books, radio, television and magazine.

#### Expertism in medicinal plants

- Experts on medicinal plants are locally known as **Fundi**
- The **Fundi** can identify different types of plant material for medicine, where they are usually located, how to obtain and prepare and always has peoples' trust.
- Medicines for humans, domestic animals and biocides for crop protection have been identified
- The knowledge is acquired from kin to kin from Fundi/parent to oblong or relative, by apprentice and from spirits

#### Forest food products expertism

- Develops the skill by learning under experts in their own households, lineage or clan.
- Women knows more forest food products such as mushroom, leaf vegetables and root and tuber crops
- Boys and men collect fruits that are eaten on the spot, do the hunting, harvest wood products and building materials

### **4.2.2 Results of in-depth studies in the Medium plains- the case of Nandagala village in Ruangwa District.**

#### *Local experts on seeds, medicinal plants and forest food products*

At Nandagala village the following definitions were given for local experts. The seed expert is the one who grows the crop successively. Medicinal plant experts are people who knows and practices traditional medicine to help people. While experienced gatherers of food products becomes expert in forest food products.

With regard to expertise in seeds is connected with wealth. Those who grows successfully particularly the major food and cash crops are well to do farmers and have enough to eat throughout the year. Because of the increased production they are able to keep seeds, they select seeds. During the planting season other people with no seeds come to buy or exchange labour for seeds. Within the household women selects and keeps seeds.



**Plate 3 and 4 a minor crop finger millet and a farmer seed expert. Finger millet is a women crop.**

As for minor crops, with civilization and increased income people tend to neglect minor crop although they contribute to household food security. The minor crops are cultivated by the elderly the young generation are not interested either for lack of seeds or knowledge how to grow. There are no formal ways of sharing the knowledge except through their participation in work. Young boys and girls learns from their parents and grand parents.

#### ***Local seeds genetic diversity and gender differentiated knowledge and management of crop diversity***

Results of interview of Men and women on what type of crops and varieties they normally cultivate are summarized in Table 11. Within the households men have more responsibility for cash crops such as cashew and sesame. Both men and women are responsible for the main food staples such as maize, sorghum, cassava and rice. However, their knowledge on varieties cultivated differed between the two groups. More varieties of food staples were mentioned by women than was for men group. This suggests that women cultivates a larger varieties within crops than is for men. Women for example, would plant different types of sorghum varieties that have different uses for rice (*Msumbiji*), *ugali* (*lionja*), sugar cane (*mikota*), green grains (*Ndungutu*) etc. Men on the other hand, for staples are more interested on those varieties with good yield potential. For example, with maize they would prefer growing high yielding varieties such as *Staha* improved variety which gives higher returns but not *Mnumbi* a local variety with red coloured grains which women will not miss to plant in their plots because it is considered as children's maize (for porridge and as toys to play with for children) .

For crops such as the pulses e.g. cow peas, bambara nuts, pigeon peas are considered as women crops. The knowledge of varieties they cultivate were familiar to both gender groups because the number of varieties mentioned were the same in both groups. However, following the interview of the two gender groups the results indicate that crops such as yams, cucumber, egg plant, pumpkins, *rosela*, okra, *ammarathus* to be specifically managed by women.

Based on the results provided in Table 11, twenty six crop varieties were reported be grown in the area. The total number of varieties mentioned by women were 83 against 46 varieties mentioned by men. As for modern/improved varieties men mentioned twice the number modern varieties mentioned by women. These results demonstrates that women are custodians of local varieties i.e. knows more local varieties while men are more knowledgeable on modern varieties. This means that if we are to document local knowledge on local crop varieties women could be the best respondents than women and therefore any research and development intervention with regard to local crop varieties should target women as partners. The same could apply for modern varieties, that men have greater access to modern varieties than is the case for women. Within crops sorghum, cassava, rice and banana shows to have greatest diversity (many varieties). While crops such as pearl millet, sesame, fiwi, finger millet had low number of varieties.

Table 12 presents the crop calendar and gender differentiated activity profiles for Nandagala village. The following paragraph will highlight on diversity with crops, characteristics of local varieties and gender roles

#### **Maize (*Zea Mays* L.)**

A total of seven varieties were mentioned to be grown; 3 local and 4 improved varieties. The more common local varieties mentioned were *Ng'alaya*, *Pota* and *Mnumbi*. *Ng'alaya* is characterised by yellow grains early maturity (less than 90 days), short cobs while *Pota* was reported to be the most popular late maturing (120 days) with multiple big cobs, large grains. *Mnumbi* is characterised by red coloured grains. *Mnumbi* was reported to be good for making porridge for children from point of view of nutrition. Similarly, unlike the majority of maize varieties that are white due to its unique colour (red) children prefer playing with maize cobs. Improved varieties *Ilonga*, *Staha*, *Katumani*, *Katumbili*. *Katumani* and *Katumbili* are early maturing varieties (90 days) while *Ilonga* and *Staha* takes about 120 days to mature. However, *Staha* matures earlier than *Ilonga*. *Staha* is the new improved variety recommended for low altitude areas such as the southern zone and is highly preferred. Both early and late maturing varieties are preferred. Early maturing varieties would provide them with food at the time of hunger stress in February-March. While medium-late varieties are considered to be the main crop to be harvested

**Table 11. Local and improved varieties mentioned by women and men groups at Nandagala**

Crop	Women Group		Men Group		Level of Diversity
	Local varieties	Moderate Varieties	Local Varieties	Modern Var.	
Maize	3	3	3	4	Moderate
Sorghum	9	2	3	1	High
Pearl millet	2	0	1	0	Low
Finger millet	1	0	1	0	Low
Rice	6	1	9	0	Moderate
Cassava	12	0	8	0	High
Groundnuts	1	1	1	1	Low
Sesame	1	1	1	2	Low
Pumpkins	4	0	0	0	Moderate
Cucumber	4	0	0	0	Moderate
Cowpeas	3	0	2	1	Moderate
Green gram	1	0	1	0	Low
<i>Fiwi</i>	1	0	1	0	Low
Bambaranuts	2	0	2	0	Low
Pigeopeas	2	0	2	0	Low
Onions	4	0	2	2	Moderate
Tomatoes	3	0	2	2	Moderate
Castor	2	0	0	0	Low
Rosela	1	0	0	0	Low
Yams	4	0	0	0	Moderate
Banana	8	0	6	2	High
Okra	2	0	0	0	Low
Egg plant	4	0	0	0	Moderate
<u>Ammarathus</u>	2	0	0	0	Low
Sweet potatoes	0	0	1	0	Low
<b>Total crops</b>	<b>26</b>	<b>8</b>	<b>46</b>	<b>15</b>	

and stored. The early maturing varieties are normally planted close to home. Early maturing varieties are planted in order to escape hunger. It was reported that seeds of early maturing varieties are difficult to keep because of temptation to eat up to the last cob for roasting and preparing *ugali* when they are at green-physiological maturity stage. Seed of early maturing varieties have to be stored for long period and therefore there a risk of damage by storage pests.

Seed selection and storage is done by women. The mass selection is done at the time of harvest or in the granary at the onset of rains by selecting big cobs free from insect damage. If the selection is done in the field at the time of harvest, the maize cobs are hanged under the kitchen roof.

### **Sorghum (*Sorghum bicolor*)**

Sorghum is the preferred cereal after maize. A total of 11 local sorghum varieties were mentioned by women group while men group mentioned only four presumably

these were more popular and highly cultivated in the area. Women mentioned varieties that although not grown in large scale but were being conserved in small plots because they had specific characteristics and use. The most common local sorghum varieties are *Lionja* and *Msumbiji*. *Lionja* has large grains and is suitable for *Ugali* while *Msumbiji* has small grains. In the southern zone is used for making rice and sometimes used as pop corn making sorghum balls (*kashata*). There are other local varieties such *mikota* planted for its stem as sugarcane and others are such as *Ndungutu*, *shijenja*, *Lipila* and *Lyanankutumbi* which complement other uses.

The seed selection is done in the field at the time of harvesting by women or in the granary (*kihenge*, *kikuti*) at the planting season. Farmers store sorghum with its panicles in the *kihenge* or *kikuti* made of either bamboo, sorghum, maize. The storage structures are designed and made by men but the grain and seed storage is done by women. The selection criteria in the field at the time of harvest is by the size of the panicle and free from disease and insect-damage.

The local varieties are most popular than improved varieties because they store well compared to improved varieties which have high yielding potential such as *Tegemeo* and *Pato*. Local sorghum varieties are late maturing, normally, planted in December and harvested in June-July.

#### **Cassava (*Manihot esculenta* L.)**

Cassava is the most important food security crop. It guarantees food availability when cereals fail due to inadequate rainfall. At least every household has a plot of cassava. There are two main groups sweet and bitter varieties but within these groupings farmers classify varieties according for example, to the place of origin, name of who brought the variety etc. The varieties differ in morphological and culinary characteristics.

A total of 12 varieties were mentioned by women while men group mentioned 8 varieties. The popular variety is *sheria* which was reported to be high yielding sweet and fast cooking variety. The name *sheria* is a Kiswahili word which means law in English. Some says it was introduced and made mandatory to be planted by every household. However, others are of the opinion that the name suggests the goodness of taste. Other common varieties cultivated are *nanjenjea*, *shimaje*, *liumbukwa kigoma* and *muunguja*. For cassava local evaluative criteria are based on taste, size of the tubers, time of cooking, number of tubers per plant, disease (root rot) and insect pest resistance. Selection of planting materials for the next season is done at the time of harvest by women. Cassava stems free from diseases are selected and stoke in the field under shade. The major constraint is the post harvest storage pests of dried cassava (*makopa*). Post harvest losses occurs in stores due to weevils. Women are more responsible for harvesting, transporting and harvest of the produce.

#### **Rice (*Oryza sativa* L)**

Traditionally, rice is a women crop but because of commercialisation of the crop men have become more involved in the marketing stage. A total of 11 varieties were mentioned to be grown. Men mentioned more varieties of rice than women. Most of the varieties were local except 1 variety identified by women farmers as improved variety *supa* (for market). *Manganda Manne* was the most preferred by women



farmers due to aroma. Other common varieties include *Linngwindimba*, *Sifara* and *Nakambakata*. Rice is normally planted in the lowlands. The selection of seeds is done in the field at harvest by women selection criteria being the size of the panicle and grains

### **Yams (*Dioscorea spp.*)**

Women mentioned 4 varieties of yams which they normally grow. These were *mapeta*, *yombo*, *ipandwa* and *magimbi*. *Magimbi* however, does not belong to the *Dioscorea spp.* Among the yams *mapeta* was the most common. Based on experience of the southern zone rural seed fairs yam is considered a women crop. Other varieties which are available in the zone are *vinyamilwa*, *mhoko*, *mkonga wa nembo*, *hangadi*, *hamandeke*, *Mnyuvele* and *vyekundu* (Mtwara and Newala Districts). The harvesting is done by women. After harvest heads cut from the tuber are planted during the same period of harvest July-October. The main distinguishing characters are the shape of tubers, colour of the flesh/cortex, colour of skin and taste. The *Ipandwa* variety which in Mtwara and Newala is referred as *Matu* bears aerial tubers (*Dioscorea bulbifera* L). According to farmers at Nandagala village, the extent of yams cultivation has declined compared to the past. Some of the varieties have been lost or are in the state of extinction because are mainly grown by the old. The few old people are still keeping the crop. Generally, most of the yams genetic resources has been lost and continue to be lost. This could be explained due to unavailability of planting material. The new farmers such as the youth do not easily access planting material as the case with other crops, such as maize, bambaranuts. For yams planting is during the same period of harvesting (dry season).

### **Pigeon peas (*Cajanus cajan L.*)**

Among the pulses pigeon peas are the most important in the area. Seed selection is done in the granary by women at the time of planting. Seeds free of insect damage are selected. Three varieties were mentioned to be grown, *Mitava*, *Nyasa* and *Utingo*. The variety characteristics were not clear but generally, local varieties takes longer period; about five months to mature. In the field they are harvested last after sorghum. They are stored in pods and only threshed when the need arises for food.

### **Cowpeas (*Vigna unguiculata L.*)**

Cowpeas are the second most important pulse after pigeon peas. Five varieties were mentioned to be grown. These were *kunde ati*, *ndamba*, *maponjolo shikundewa* and *serena*. Farmers have nicknamed improved varieties as *Serena*. The name applies to all improved crop varieties that are early maturing. *Ndamba* is a late maturing variety (120 days) runner type. Like *serena* *kunde ati* is determinate erect bunch variety. The seed selection was reported to be done by women at harvest. Selection criteria was based on the size of pods and free from insect-damage and diseases. The selected pods are hanged under the kitchen roof.

### **Pumpkins (*Curcubita pepo*)**

Four varieties were identified by women group. Skin thickness was reported to be the local criteria of differentiating varieties. Those with thick skin are called *mkokota* and with soft skin *shubedu*. Depending on stage of development of the pumpkin young ones are known as *litungulungu*. *Matigoligo* was another variety of pumpkins. The

pumpkins also differ in shape from round to ellipsoid shape is seems not be important in variety names. Local selection criteria is the size and taste.

### Onions (*Allium cepa* L.)

Onions are most important source of cash it is grown by both men and women but men assumes most responsibility because it involves cash generation. The number of varieties reported by both gender groups were four. Red Bombay is the most common variety. Other varieties cultivated were, Tropicana, red creole, *vitunguu swaumu*. Tropicana was reported to be good for market stores well for a long time. The seed selection is done by men. Small or big onions are spilt in four and making sure each has axillary buds. From these buds at flowering shoots develop. Fresh supply of onions seed is a constrain. Therefore farmers produce their own seeds. Onions being cross pollinated crop the quality of seeds is not always better the size of the onions diminishes from generation to generation. The general feeling in the women group was that, there is a need for the establishment of input shop in the village because prices for seeds are high for onions

**Table 12. Crop calendar and activity profile for farmers at Nadagala village in the medium plains**

Crop	Activity	Period	Involved	Remarks
Maize	1. Land/prep-tion	Oct-Dec	F +M	Virgin land M, Fallow land ( <i>Fundu</i> ) FF
	2. Ploughing	Oct-Jan	F +M	Mostly done by tractor
	3. Planting	Nov-Jan	F +M	Planting in rows, rats problem
	4. Weeding 1&2	Nov-Mar	MM, F	Start one week after planting
	5. Storage materials	Apr-May	FF	Men more involved, Women thatching material
	6. Harvesting	May-July	F +M	Men do not help
	7. Transportation	May-July	M	Men do not help
	8. Packing in store	May-July	FF M	Transported immediately after harvest (thieves)
	9. Threshing	July	M	
	10. Market	May-July	F	
	11. Seed selection	July	MM/F	At any time after consultation with wife
		Dec-Jan	FF	In the field and
		Dec-Feb	FF	done at home
		Apr-Dec		
		Apr-June		
		Nov-Jan		
Sorghum	1. Land Prep-tion	Oct-Dec	F +M	Given 1 <sup>st</sup> priority to avoid late planting
	2. Planting	Dec	F +M	Depends on rainfall onset
	3. Weeding 1	Dec-Jan	F +M	2 weeks after planting, mainly men
	4. Tansplanting	Dec-Jan	FF	transplants sometimes bought
	5. Weeding 2	Dec-Jan	MM	After weed germination
	6. Storage structure	May-July	MM	
	7. Harvesting	July	MM +F	Women less involved
	8. Panicle cutting	June-July	FF +MM	
	9. Threshing	July	FF	
		June-July	FF/M	M-involved if threshed for sale
		July-Aug-		

Cassava	<ol style="list-style-type: none"> <li>1. Land Preparation</li> <li>2. Plantin-material</li> <li>3. Planting</li> <li>4. Weeding 1 &amp; 2</li> <li>5. Harvesting</li> <li>6. Transportation</li> <li>7. Stora/structure</li> <li>8. Processing</li> <li>9. Marketing</li> </ol>	<p>Oct-Dec Dec. Dec. Jan-Mar Aug-Oct Aug-Oct Aug-Oct Jan-Mar</p>	<p>MM M +F M +F FF +M FF FF +M M F M</p>	<p>Selection by men mostly, planted in rows planted in the evening to avoid drying, after maize Men can help</p> <p>Done after 2-3 days of drying, men and children Can be stored under the roof When need arises for food or sale Decision making both but control of money by men</p>
Onions	<ol style="list-style-type: none"> <li>1. Site selection</li> <li>2. Nursery prep.</li> <li>3. Water wells</li> <li>4. Watering</li> <li>5. Land Preparation</li> <li>6. Ridge preparatn.</li> <li>7. Water wells</li> <li>8. Transplanting</li> <li>9. Watering</li> <li>10. Weeding 1</li> <li>11. Fertilizer appl.</li> <li>12. Watering</li> <li>13. Weeding 2 &amp; 3</li> <li>14. Harvesting</li> <li>15. Drying</li> <li>16. Cutting leaves</li> <li>17. Storage</li> <li>18. Marketing</li> </ol>	<p>March Mar- May Mar- May Mar- May May- June May- June May- June June May- June June May- June June 75 ays July-Aug Sept-Oct Sept-Oct</p>	<p>M +F MM +F MM M+F M+F M+F MM F +M M+F M, FF M+F F+M F+M F+M F+M F+M F+M MM FF MM/F</p>	<p>Good soils, not sandy, near water source After harvesting e.g. rice field</p> <p>Mainly done in June</p> <p>Can use hired labour or exchange labour system Can use hired labour Mostly girls, 2 weeks after transplanting Immediately after weeding 4-6 weeks after transp. Depends on variety</p> <p>Both and children Both and children Both and children</p> <p>Income from onion both decide how to use</p>
Cow peas	<ol style="list-style-type: none"> <li>19. Land prep-ation</li> <li>20. Planting</li> <li>21. Weeding</li> <li>22. Harvesting</li> <li>23. Selling</li> </ol>	<p>Feb-Mar Feb-Mar Apr-May Mar- June June</p>	<p>FF FF FF FF FF</p>	<p>Cowpeas is a women crop Grown as monocrop, can also be intercropped Insect-pest problems Has good market during traditional ceremonies</p>
Pigeon peas	<ol style="list-style-type: none"> <li>24. Land Preparation</li> <li>25. Planting</li> <li>26. Weeding 1 &amp; 2</li> <li>27. Harvesting</li> <li>28. Storage</li> <li>29. Marketing</li> </ol>	<p>As maize June- Oct. June- Oct. Jan-April</p>	<p>F+M FF F+M FF FF FF FF</p>	<p>Needs early planting, intercropped with maize</p> <p>Threshed when need arises It is a good cash crop for women</p>

	30. Seed selection			
Sesame	31. Land Preparation 32. Broadcasting 33. Weeding 34. Harvesting 35. Stooking 36. Drying 37. Threshing 38. Winnowing 39. Transport 40. Marketing 41. Seed selection	May Dec-Mar Dec-Apr May- June May- June 2-3 weeks July-Aug July-Aug	MM F +M F+M F+M MM M +F M+F FF F+M MM FF, M	Bush clearing  Very difficult to weed b'se not planted in rows  Women can help to make stooks  Mostly men

M+F = equal participation of men and women, FF= women involvement, FF, M= Women more involved

#### ***Local evaluative criteria for good seed/crop variety***

The general characteristics used to identify good seed/variety are summarised in Table 13.

Table 13. General seed/variety selection criteria (crops)

Criteria	Rank
1. Well filled seeds	1
2. Drought resistance	2
3. High yielding	3
4. Big sized seeds	4
5. Early maturity	5
6. Free from pests and diseases	6
7. Good storage qualities	7
8. Easy of processing e.g. easy of pounding for maize	8

#### ***Forest food products***

As said above forest food products complements household food security. It becomes an important source of food particularly when crops fails in the field. Forest provide root crops, mushroom, leaf vegetables and fruits. The number of species which provide food sources are summarised in Table14. With regard to root crops a total of 7 species were mentioned. The number of species mentioned by each gender group

were the same. As for mushrooms at least there are total of 18 species of mushroom in the area. The men group mentioned more mushroom species than women. Similarly, forest fruit species were mentioned more by men than was for women. As for leaf vegetables a total of five leaf vegetables were mentioned. The genetic diversity for mushroom seems to be high in the area followed by forest fruits. This suggests that mushrooms and fruits are important popular forest food source than is for roots and leaf vegetables that are used in time of food scarcity.

Table 14. Forest food products at Nandagala, Ruangwa

	<b>Total</b>	<b>Women group</b>	<b>Men group</b>
Root crops	7	5	5
Mushroom	18	9	18
Leaf vegetables	7	5	4
Fruits	14	8	14

### ***Forest root crops***

A total of five species were mentioned. These were *Ming'oko*, *Nteng'ende*, *Hangadi*, *Ibu* and *Ilombelombe*. *Ming'oko* and *Hangadi* are wild yams. *Hangadi* is only used at the time when the household has completely nothing to cook and cash to buy food. It is very toxic and has to be washed several times to remove the toxic substances. *Ming'oko* (non-toxic wild yam) have gained popularity in the southern zone as a source of food even in urban areas in recent times. This could probably be explained due to the fact that life in towns has become very expensive and the low income earners wants to supplement with additional cheap forest food products. On the other hand this could mean sense of proud on traditional foods by the people. The collectors of forest roots such as *ming'oko* were reported to be women and girls. Girls therefore, learn from their mothers how to identify presence *ming'oko* in a thick bush using *ming'oko* flowers as indicator. However, there is male and female types of *ming'oko*. Nevertheless, men could also participate in digging the *ming'oko* but generally, the work is considered women responsibility. The *Ming'oko* requires special microclimate and attempts to domesticate has not been successful but are very popular in Mtwara and Newala Districts

### ***Mushrooms***

Mushroom is an important source of *mboga* (vegetable) during the rain season. Owing to expansion of area under cultivation. Rural people now get mushroom now at Nambarapi forest which is about 5-8 km from the village. Initially when the village was being established mushroom was reported to have been found within the vicinity of the village. We visited Nambarapi forest and participated in the collection of mushroom. Before getting to the forest to pick mushroom we had to pray in local custom so that we could not get lost, meet dangerous animals and that forest could provide us with enough mushrooms. The local prayer was performed by an elderly person living close to the forest.

Group interviews with men and women identified a total of 18 species of mushrooms (Table 14). *Mbou* was the most preferred. It was reported that both women and men collect mushrooms but women took more responsibility than men. We were told some mushrooms are found in upland land others in lowlands for example *Linjwembe* is normally found in the lowland called *Libote* (lowland clay soil) while *Uditi* is found in upland soil in stony areas. Similarly, *Nannelele* could be found in sandy/clay soils. However, the majority of mushroom species were reported to be found in forest sand soils. On the other hand mushroom such as *ukolovele* is normally found on stumps of *milonga* trees. Girls and boys participate in mushroom collection. But girls with their women elders participate more. Due to the participation of girls the local knowledge is transferred orally and practically from older generation to young generation. Within the mushrooms there are poisonous and edible mushrooms and one has to learn by doing. The local indicator for edible mushroom is by use of millipede. If the millipede eats then it is not poisonous.

With increase in population and therefore, more land being brought under cultivation areas where mushroom can be found are becoming scarce jeopardising the availability of mushroom in rural communities. There is therefore a need to conserve the natural habitats where mushroom could grow well.



Left: Mushroom variety *Ubulugwi*. Right: Expert in forest food products who led us to the forest. She knows where to get types of mushrooms and she can lead others in the Namarapi forest without getting lost. (Medium plains, Nandagala in Ruangwa District)

**Above: A millipede eating mushroom an indicator that farmers use to determine whether the is palatable and not toxic**



**at Nandagala village in the medium plains**

Table 14 Mushroom preference: Results of pair-wise comparison of mushroom species

Mushroom species	Preference score	Rank
<i>Mbou</i>	9	1
<i>Nannelele</i>	5	4
<i>Linjwembwe</i>	0	9
<i>Uditi</i>	4	5
<i>Nakatanga</i>	7	2
<i>Uchejea</i>	1	8
<i>Utunungu</i>	2	7
<i>Uburugwi</i>	6	3
<i>Mbunju</i>	3	6

### ***Leaf vegetables***

Besides mushroom and roots forest provide leaf vegetables. A total of 7 species were mentioned. These were *Luhu*, *Nandelele*, *Mkokobwalu*, *Lilende*, *Lianjani*, *Njecheta* and *majani ya mbuyu*. The collection of leaf vegetables was reported in both groups to be women responsibility except for *majani ya mbuyu* which are collected by men because it involves climbing trees and cutting branches before leaves could be picked up. *Mkokobwalu* was reported to be found along the river banks and lakes and therefore available during the rain and dry season. Similarly, *Luhu* was said to be found in the lowlands and was available throughout the year. *Nandelele*, *Njecheta*, *Lianjani* and *Lilende* were reported to be available during the rain season. Local leaf vegetables is an area which have been neglected by research particularly, in the zone but seems to have great potential in contributing to household food security. With civilisation forest leaf vegetables are losing popularity and knowledge associated to it is being lost. Therefore, promotion of traditional vegetables need to be high in research agenda in the zone.

### ***Forest fruits***

A total of 14 species of forest fruits were reported. Men group reported more species (14) than women. Most of the fruits were said to be available during the dry season and some were available up to the onset of rainfall. However, *Mapeme* was said to be available during the rain season. Collection of fruits in the forest was reported to be done by both men and women, boys and girls. In the women group women were reported to be more responsible for *Mabula and mbinji*. Boys are more involved in collection of forest fruits.

### ***Medicinal plants and gender differentiated knowledge***

During interviews with farmers a number medicinal plants were mentioned. We made follow ups in the field and forest where these plants could be obtained and how they were administered. These plants were as shown in Tables 15 and 16 for men and women group respectively. Medicinal plant question is a complex area where knowledge on medicinal plants is regarded to be highly secret. It is admitted that most of the names have not been translated in english and scientific names but efforts will be made to translate them. Three categories of medicinal plants were identified. These are medicinal plants for human, livestock and crops. Our interviews, observations and discussions with farmers have identified 32 species being used for human medicine, 1 for livestock and 7 for crop protection. The number of species used as veterinary medicine are low probably, because the area is not a livestock area. The medicinal plant identified for livestock was for treating Newcastle disease in chicken called *Liinji*.

Table. 15 Men group- Medicinal plants at Nandagala village (medium zone)

Category	Species	How and by whom
Human medicine	• Castor	Available in the field or homesteads, seeds are used to make oil, which is fed to infants when the new born don't stool. Similarly, leaves used for inflammation. Women are more involved in administering the medicine
	• <i>Nambili</i>	Nambili herb is found in the bush. Usually men administers the medicine. It is used to cure infants with deformed heads after birth.
	• Mtope	It is given to expecting mothers so that they could give birth safely
	• Mgilanyama	It is found in the bush and it is administered by men, used for curing skin disease such as <i>upele</i>
	• Mkwelambu mba	The Mkwelambumba is found in the bush/forest. The plant part used is leaves. Administered by men used to cure inflammation inside the stomach locally known as <i>bongi</i> . The problem affects women.
	• Nang'angwe	The plant is found in the upland bush/forest. The plant part used is leaves. Used to cure <i>Mshipa tumbo</i>



	<ul style="list-style-type: none"> <li>• Nakambweng a</li> </ul>	The plant is found in the upland forest. The roots of <i>Nakambwenga</i> is used to cure snake bite. Roots are ground mixed with water and then used for dressing the patient.
	<ul style="list-style-type: none"> <li>• Mpingapinga</li> </ul>	The Mpingapinga used against snake bite. The plant is found in the forest. The roots are ground and burnt into ashes which is used for <i>kuchanja</i> in the affected area. The medicine is administered by men. The plant is found in the upland forest.
	<ul style="list-style-type: none"> <li>• Mtumbati, Mkangaula and Mtomoni</li> </ul>	Used to for curing/dressing fractures. Stem barks from the plants are ground, mixed and the paste moulded and applied in the fractured area. The plant is found in the forest and usually administered by men
Livestock	<ul style="list-style-type: none"> <li>• Liinji</li> </ul>	<i>Liinji</i> can be found in the bush or the field as weed. It is a trailing plant produces very big tuber about 10 kg. The tuber is used to protect chicken against new castle disease. Newcastle is a major constraint hindering the chicken production. The tuber pieces or the whole tuber is cut and made hole. The maize bran and water are spread on the cut surface. The chicken feeds on the bran/water.
Crops	<ul style="list-style-type: none"> <li>• Maize cobs</li> </ul>	After burning maize cobs, the ash is used for seed dressing maize to protect against attack by storage pests
	<ul style="list-style-type: none"> <li>• Cowpea pods</li> </ul>	Pod ashes are used to protect grains against damage by weevils during storage.

Table 16. Women group- medicinal plants at Nandagala village

Category	Species	How and by whom
Human medicine	<ul style="list-style-type: none"> <li>• Mbalangawe, pawpaw roots</li> </ul>	Used to cure <i>mshipa tumbo</i> for men
	<ul style="list-style-type: none"> <li>• <i>Nambili</i></li> </ul>	Used to treat stomach pains locally, known as <i>Lichinga</i> . Leaves are pound mixed with water. The solution is given to a patient usually women and administered by women.
	<ul style="list-style-type: none"> <li>• Nangakatale</li> </ul>	Used to cure disease known locally as <i>likango</i> (children's fever), <i>homa kali ya watoto</i> . The medicine is administered by women.
	<ul style="list-style-type: none"> <li>• Liinji</li> </ul>	Used to patients with <i>upele</i> (skin rushes) and relieve stomach pains.
	<ul style="list-style-type: none"> <li>• Chiguluka</li> </ul>	Leaves and stem fibre used to treat <i>dege dege</i> . <i>Dege dege</i> was translated to be chronic malaria for children. Local people believe <i>dege dege</i> can only be treated by traditional medicine. There is

		no cure from western medicine
	<ul style="list-style-type: none"> <li>Naluluti and Chiguluka</li> </ul>	Fibre from these plants are used to stop getting pregnancy for lactating mothers and therefore, family planning. The fibre/rope is tied under the wrist ( <i>kiuno</i> ) for woman who have given birth. It is done by men.
	<ul style="list-style-type: none"> <li>Njiligwi, Likupukupu</li> </ul>	Used to treat polio ( <i>ugonjwa wa kupooza</i> )
	<ul style="list-style-type: none"> <li>Liula</li> </ul>	Used to treat a disease known as <i>Likonde</i> for women. This was translated to be malaria
	<ul style="list-style-type: none"> <li>Banana</li> </ul>	<ul style="list-style-type: none"> <li>Pseudo-stem juice used to treat fresh wounds</li> </ul>
	<ul style="list-style-type: none"> <li>Mtope</li> </ul>	<ul style="list-style-type: none"> <li>Used to stop coughing, Pieces of stem bark are boiled and given to a patient. The medicine is administered by women</li> <li>Similarly, warm stem fibre paste used for treating boils (<i>jipu</i>). The work is done by women</li> <li>Also stem fibre paste used to remove pains on the left side believed by locals to due to spleen (<i>Bandama</i>). It is done by women.</li> </ul>
	<ul style="list-style-type: none"> <li>Ndondwe</li> </ul>	<ul style="list-style-type: none"> <li>Used for treatment of asthma, the reproductive part is burnt and ashes used.</li> </ul>
	<ul style="list-style-type: none"> <li>Pigeonpea</li> </ul>	<ul style="list-style-type: none"> <li>Used to protect against witches (<i>wachawi</i>). Plant part used is root. It is done by men.</li> </ul>
	<ul style="list-style-type: none"> <li>Nalukali</li> </ul>	<ul style="list-style-type: none"> <li>Used to treat asthma. Leaves are burnt, ashes add salt and give to the patient.</li> </ul>
	<ul style="list-style-type: none"> <li>Chivava</li> </ul>	<ul style="list-style-type: none"> <li>Used to treat boil (<i>jipu</i>)</li> </ul>
	<ul style="list-style-type: none"> <li>Mng'ekee</li> </ul>	<ul style="list-style-type: none"> <li>Stem bark pieces are boiled and solution given to patient to stop coughing</li> </ul>
	<ul style="list-style-type: none"> <li>Nangundu</li> </ul>	<ul style="list-style-type: none"> <li>Used to treat eye disease, leaves are ground mixed with water and the solution apply to the eyes twice a day</li> <li>Similarly, roots used to treat <i>mshipa tumbo</i>. Women are involved.</li> </ul>
	<ul style="list-style-type: none"> <li>Mpweke (Mdaa)</li> </ul>	Women and girls chew the roots to whiten their teeth
	<ul style="list-style-type: none"> <li>Mkwelambamba</li> </ul>	The <i>Mkwelambamba</i> is found in the bush/forest. The plant part used is leaves. Administered by men used to treat stomach pains, locally known as <i>bongi</i> . The problem affects women only.
	<ul style="list-style-type: none"> <li>Nang'angwe</li> </ul>	The plant is found in the upland bush/forest. The plant part used is leaves. Used to cure <i>Mshipa tumbo</i>
	<ul style="list-style-type: none"> <li>Nakambweng a</li> </ul>	The plant is found in the upland forest. The roots of <i>Nakambwenga</i> is used to cure snake bite. Roots are ground mixed with water and then

		used for dressing the patient.
	<ul style="list-style-type: none"> <li>• Castor</li> </ul>	<ul style="list-style-type: none"> <li>• Seeds are swallowed to protect oneself from eye diseases</li> <li>• Seeds are pound and paste used for treating inflammation (<i>uvimbe</i>)</li> <li>• Castor oil used to clean the stomach when one fails to get stool particularly, infants.</li> </ul>
	<ul style="list-style-type: none"> <li>• Cassava</li> </ul>	<ul style="list-style-type: none"> <li>• If travelling on foot during the night carry cassava stem to protect yourself from meeting dangerous animals such as lion</li> <li>• Roasted cassava (<i>mhogo wa kuchoma</i>) tuber is given to a mother who has just given birth to speed up the removal of placenta (<i>tumbo la uzazi</i>)</li> </ul>
Livestock	<ul style="list-style-type: none"> <li>• Liinji</li> </ul>	<i>Liinji</i> can be found in the bush or the field as weed. It is a trailing plant produces very big tuber about 10 kg. The tuber is used to protect chicken against new castle disease. Newcastle is a major constraint hindering the chicken production. The tuber pieces or the whole tuber is cut and made hole. The maize bran and water are spread on the cut surface. The chicken feeds on the bran/water.
Crops	<ul style="list-style-type: none"> <li>• Mtumbati</li> </ul>	Stem bark of Mtumbati are spread in the sesame field to protect the crop from disease known <i>lijombo</i> (lodging) <i>Lijombo</i> is believed to happen if women during their menstruation period passes through sesame field.
	<ul style="list-style-type: none"> <li>• Bamboo shoots</li> </ul>	Young bamboo shoots are staked at the edge and in the field to protect sesame from <i>Lijombo</i> disease (lodging, wilting)
	<ul style="list-style-type: none"> <li>• Buffalo bean</li> </ul>	Used for maize storage, men involved
	<ul style="list-style-type: none"> <li>• Kangasudi</li> </ul>	Used for maize storage, men involved
	<ul style="list-style-type: none"> <li>• Libilakongo</li> </ul>	Leaves are pound and spread in the grain store
	<ul style="list-style-type: none"> <li>• Cowpea pods</li> </ul>	Pod ashes used for grain storage

The summary of total medicinal plant species given by men and women group are presented in Table 17. Women group reported more medicinal plants compared to men

Table 17. Number of plant species used as medicinal plants mentioned by men and women at Nandagala village (medium zone).

Category	Men group	Women	Total
Human medicine	11	25	32
Livestock	1	1	1
Crop protection	2	6	7

Total	14	32	40
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Above: Medicinal Plant known as *Nalukali*







### **Summary of the main findings medium plains**

- The seed expert is the person who knows: appropriate time of planting, where to get seeds, seed storage techniques and how to use organic pesticides in seed storage
- The knowledge on seeds is shared through seed exchange, sales and exchange labour for seeds
- Young boys and girls learn from their parents how to select and store seeds
- The opening of new virgin land is done by men but most of the farm activities are shared with the exception of harvesting which predominantly is performed by women. Selection of seed and storage is done by women
- Seed storage structures include *Naminga* for maize, *Likaku* for seeds such bambaranuts. Others include *Vibuyu* (dried gourds), pots, *Makungwa* (dried bark of trees), used fertilizer bags and *Dari-Likangala*
- A diverse number of crops and varieties are grown at Mnyambe village. Some of the local varieties and knowledge are being lost due to change of eating habits, pest damage, lack of efficient storage techniques, lack of awareness local varieties among the young generation because there is no proper mechanism of transferring local knowledge from the old to the young generation resulting to neglect of local varieties and knowledge.
- The main sources of seed acquisition is by saving own seeds, exchange labour for seeds, from relatives and seed exchange with neighbours and buying from market and neighbours.
- A total of 40 medicinal plant species have been identified. The medicinal plant species identified were for human, livestock and crop protection and seed storage. Women mentioned more medicinal plants than men
- A number of root and tubers, leaf vegetables, mushrooms and forest fruits have been identified that complements household food security. Most of the forest food products are harvested from the forest. Method of propagating forest food products are non- existence. With declining forest area some of the species will be lost.

### **4.2.3 The Coastal Zone- the case of Nyengedi village**

#### **Identifying The Seed Experts:**

This chapter discusses how the process of identifying experts on seeds, medicinal and forest food products was carried out and describes according to farmers own perspectives. The chapter also describes, according to farmers' criteria, the category of the seed experts. The role of the experts according to gender and how they share their knowledge within the community are discussed.

#### **Sampling for Experts on Seeds: The Use of Village Billboard**

Nyengedi village hosted for the 1999 rural seed fairs organized by Naliendele Agriculture Research Institute and managed by extension services. Since Nyengedi village served as centre for the seed fairs, offered an equal opportunity for all villagers to participate during the seed fairs. This does not mean that those who participated are all experts on seeds, medicinal plants and forest food products. A village billboard was introduced in the village as an entry point for identifying local experts on seeds, medicinal plants and forest food products. After introducing the

objective of the study to the first village meeting, a village billboard was then presented and discussed on how it could be used to identify the local experts. Villagers used the billboard to plot (by memory recall method) on, the villagers they considered as experts. Each satellite village had its own billboard affixed at a particular point known by villagers. The billboard was left for a period of one week so as to provide an opportunity for the idea to circulate in the village and for villagers to be able to plot by filling the name(s) of a farmer(s) and information on reasons (criteria) for expertise.

### **Sampling: The Use of Snowballing Technique**

At the middle of the week a visit was made to the village to see how the method (village billboard) is progressing in capturing information on who are the experts. A total of 21 experts were already plotted in the billboard by the villagers. A mean meeting was then organized to meet with the 21 identified experts at the end of the week. During the mean meeting with the identified (18 attended) experts were asked to include other experts (here referred to as snowballing) who they know and why. By way of snowballing an addition of 13 other experts were identified making a sample of 34 experts on seed, medicinal plants, and forest food products.

From the sample of 34 experts 7 are women experts on seeds, medicinal plants, and forest food products were identified from seven (Mitondo, Mpandanje, Nananje, Namayanga Kilumanaga, Nyengedi and Lihihi) sampled satellite villages (out of 11 eleven satellite villages) using their own criteria as discussed in the section on criteria.

### **Using a Social Map for Locating Experts on Seeds and Forest Foods.**

The village billboard was supplemented by a Social Map, developed by the 34 experts of whom 7 were women experts, to locate for where they are in the village and the type of expertise they know. The social map was used to find out whether being at a particular location in the village have any relationship with particular knowledge and kind of expertise. It was found that 10 experts, of whom 2 were women, located themselves as staying at the periphery of the village. When asked on the kind of expertise they are involved in, 8 experts mentioned of being involved in traditional healing (one woman) and thus have knowledge on medicinal plants and 2 (a man and a woman) presented as good at forest food products. When asked as to why they are mainly staying at the periphery of the village, they said, it is easier for them to have access to medicinal plants and forest food products than staying at the centre of the village. From the social map one could conclude that there is a direct relationship between the kind of knowledge and location of an expert in the village.

### **Who is an Expert on Seeds, Medicinal Plants and Forest Food Products.**

#### **Criteria for Experts on Seeds**

The respondents perceived experts on seeds as, those who in the first place can store particular seeds of certain qualities by themselves for next season. "This is the main consideration" says Somoye Hashim, a woman, expert on cashew seeds (planting technique for faster and high vigour cashew seedling) and maize seeds (seed selection and storage techniques). An expert on seeds must be good, at least, at the following



criteria: selection of particular seeds of certain crops, storage techniques for particular crop, planting /sowing techniques for a particular crop. A well-being analysis was used to understand characteristics of the experts. It was found that (11.75%) experts belong to the well to do category, 11 (32.35%) average and 18 (52.90%) belonged to the poor category. All seven women belonged to the poor category.

**Table 1: Criteria for Category of well-being as Perceived by Seed Experts**

<b>Well off Category</b>	<b>Average Category</b>	<b>Poor Category</b>
<p><b>Criteria</b></p> <ol style="list-style-type: none"> <li>1. Big farms more 3 acres.</li> <li>2. Have cattle at least 1</li> <li>3. Have a milling machine</li> <li>4. Iron roofed house</li> <li>5. Enough food all round/throughout the year</li> <li>6. Employee for labourers in his/he fields.</li> </ol>	<p><b>Criteria</b></p> <ol style="list-style-type: none"> <li>1. Medium size forms: less than 3 acres.</li> <li>2. Have goats 5-10</li> <li>3. Grass thatched houses</li> <li>4. Food enough for up to 9 months</li> <li>5. Low income.</li> </ol>	<p><b>Criteria</b></p> <ol style="list-style-type: none"> <li>1. Form less than 3 acres</li> <li>2. Food enough for less than six months</li> <li>3. Labour for food/sell labour</li> <li>4. Poor houses</li> <li>5. Very low income.</li> </ol>

### **MAIN ACTIVITIES IN THE VILLAGE**

The main activities is agriculture which is being supplemented by livestock keeping.

#### **Agriculture**

The main cash crops are cashew, sesame, coconut and groundnuts.

The food crops by ranking are cassava, maize, sorghum and rice. Other crops include pigeon pea, pumpkins, watermelons, sweet potatoes, cucumber, gourds and sugar cane, onion and tomatoes.

The villages said they have 3 types of maize: One those maize which mature within two month; the second type is of maize that mature with 90 days and the third type is that which can mature within 75 days.

#### **LIVESTOCK KEEPING**

Livestock keeping is not practiced at a larger scale. In the village there are very few cattle being owned community i.e. by the village government and few individuals. Chicken, goats, sheep, pigeon are privately owned.

#### **OTHER ACTIVITIES.**

The other activities which are practiced by the villagers include pit sowing setting of traditional medicine, forest food, petty business masonry carpentry and blacksmithing.

#### **VILLAGE RESOURCES**

These include forest trees and fruit trees lake Lumindu and River Lukuledi are potential for fishing; Nyengedi River valley for gardening and some stones/quarry

found on the hilly forest area of the village area being sold to earn the village some income.

#### **AGRICULTURAL SYSTEM:**

Agriculture system was explored and found that the dominating system is the slash and burn followed by soil tilling. Usually tilling is not normal in new fields. Ridge type farming is not commonly practice. The use of tractors is very expensive therefore the alternative have been hand hoe. It is a mixed crop farming system carried out consecutively for 5 years in one filled and then the land is left fallow for 3 years (bush fallow period) and then it is cleared for agriculture again through slash and burn. The use of fertilizer is not commonly practiced.

Cashew planted fields/plantation are not cleared for subsistence farming. The cropping pattern for the five years and their mixtures crops in sequence is as follows:-

- 1<sup>st</sup> Year:
1. Maize in a row
  2. Sorghum in a row
  1. Pigeon peas in between those two rows
  2. Cashew at a favourable spacing as if grows to be a huge tree.
  3. Others: including: gourds, pumpkins, Watermelons, cucumber yams etc.

These crops mature faster so can affect hunger before actual harvesting period.

Mixing crops in done very carefully: actually they do not plant a second or following crop until the first sown crop have germinated. This is done so because they will be able to determine spacing for the other crops.

- 2<sup>nd</sup> Year -
1. Cassava
  2. Maize
  3. Pigeon peas
  4. Cucumber (*Mamung'unya*)
  5. Cashew – if the crop was not planted in the first year.
- 3<sup>rd</sup> Year - Cassava is harvested but the field is planted with:
1. Maize
  2. Sorghum
  3. Cowpeas (Indeterminante variety, long duration- *Litamba*)
  4. Yams (*Vitundi*)
- 4<sup>th</sup> Year: -
1. Ground nuts
  2. Cowpea (Determinante variety, short duration -*Kunde ndogo ndogo*)
  3. Cassava
  1. Water melon (*Makumbila*)
  2. Yams (*Vitundi*).
- 5<sup>th</sup> Year: -
1. The shamba is left for cashew.
  2. Legumes are planted in between cashews in order to

facilitate cleanliness of the shamba.  
3. Vitundi.

### **LIVELIHOOD ANALYSIS**

Livelihood analysis was conducted in order to understand the different roles and responsibilities of each farm members.

Discussion started with individuals and later on ended in group discussions.

The villagers of Nyengedi engage in activities such as agriculture and livestock production, marketing and wage labour in fields of wealthier people; to secure their basic needs and to earn income, but these activities on the other hand depend access to resources such as land, water, forest products and technology. Land is not scarce in Nyengedi but not all land is very fertile, so the problem is that not all people can have access to a more fertile land. Space for gardening around Nyengedi valley is not accessible to all. Access to resources varies by gender, age wealth and ethnicity.

Men own a larger part of the land resource . It is uncommon for younger people to own land. Most of the land resource is owned by a wealthier group. The *Wamwera* tribe is the main ethnic group which is owning most of the land resource.

Land ownership is guaranteed to a person who might have planted and owns a cashew tree.

Although data reveals that there are many women than men but there are very few women who are left unmarried some men have more than one woman. Therefore there are very few women headed households.

The analysis on the sources of income and expenditure indicate that they are mostly owned by men than women. Access to land by women is through heritage either from family share or after death of husbands. But the share is to a minimum compared to land allocated to men/boys. If a women needs more land for planting more crops she will have to bargain and compromise with her husband.

A fundamental aspect of well being was probed in order to understand poverty and economic vulnerability and as well as to relate the proportion of activities and resources devoted to meeting their basic requirements/needs which are food, shelter, clothing, health, care, education and water.

In this exercise, the identified experts on seeds medicinal plants and forest foods and being representatives of the other villagers ranked themselves into different wealth group.

The group established and put forward criteria for identifying wealth groups in the village. There were three groups A , B and C and each of the participants was grouped appropriately and openly by his follows as per appended list.

The livelihood analysis revealed further that resource control is mostly dominated by men rather than women,– except for the few women head households. Decision on the use of resources is also dominated or rested in man.

The farming systems was further explored in order to understand more about their household livelihoods, to highlight the farming system including on-farm activities such as land preparation crop production e.g nursery, planting, weeding and also off-farm activities like fuel-word collection and non-farm activities like marketing.

### SOURCES OR SEEDS

The villagers identified few sources: formal and traditional sources. Formal sources included the Agricultural Research Institute of Naliendele and from the Divisional Executive Officer – at Mtwara. (for onion Seeds and tomato)

Otherwise their traditional sources of getting seeds are from the nearby village of Rondo; from the market by petty traders and neighbourhood exchange either from relatives or friends.

The good seed is expressed by its filled and smooth shape, Heaviness and when it is tossed in water it sinks. Bad and weak seeds floats in water.

Seed selection and presentation has been explained in the Farming Activity Chart.

One interesting case is that the seed experts knows even how to propagate best plants for seed source and this helps to keep the seeds pure.

The main selection criterions is that the plant should produce as many as possible strong and healthier filed seeds. (morphologically).

### FARMING ACTIVITY CHART BY GENDER

*Farming season starts in August and Effective rains starts in January*

Rain Fall Pattern and Distribution.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
			●	●●	●●●	●●●●	●●	●●●	●●	●●		
					●●	●●●		●●●	●●			
Farming	Activity			Women/Girls Men/Boys			Location	Time	Example Notations			
	1. Land preparation - Slash and burn - Tilling			Men Women and men			Forest Fundu River Nyengedi	June-Sept. Sept-Oct.				
	1. Nursery			Mostly men								Dry season July-Sept.
	1. Planting			Women/Men, Girls/Boys			On farm	Dec-Jan.				

	<p>1. Transplanting:- Sesame, Rice sorghum</p> <p>1. Weeding</p> <p>1. Harvesting</p> <p>1. Hauling</p>	<p>Mostly women</p> <p>Women/Men, Girls.</p> <p>Women</p> <p>Mostly men</p>	<p>On farm</p> <p>On farm</p> <p>On farm</p> <p>From farm</p>	<p>Mar-Apr.</p> <p>Jan-Mar</p> <p>May-Aug.</p> <p>May-Aug.</p>	<p>Filling spaces.</p> <p>Participatin g man is Regarded having a secret agenda/jeal ousy</p>
Food/Plant (Forest) Processing and Preparation	<p>2. Harvesting of crops</p> <p>1. Collection of edible and medicinal plants.</p> <p>1. Processing of forest food crops and wild plants into edible form.</p> <p>1. Cooking</p> <p>1. Processing and preparation of medicinal plants</p> <p>1. Administering medicines</p>	<p>Women/men</p> <p>Women/men and traditional healers</p> <p>Women</p> <p>Women</p> <p>Traditional healers</p> <p>Traditional healers</p>	<p>Around home</p> <p>Forest</p> <p>Home</p> <p>Home</p> <p>Home</p> <p>Home</p>	<p>Nov-Apr (Fruits) All round (medicinal Plants. All round.</p> <p>All round</p> <p>All round</p> <p>All round</p>	
Marketing	<p>2. Crops</p> <p>1. Sale of edible forest foods and medicinal plants to local markets and buyers</p>	<p>Mostly men</p> <p>Women and Traditional healers</p>	<p>Market/hom e</p> <p>Homes market (food)</p> <p>Traditional healers home local (medicine)</p>	<p>Post-harvest</p> <p>Nov-Apr (fruits)</p> <p>All round (ming'oko)</p> <p>All round local (medicine)</p>	
<b>Seed Selection and Preservation</b>	<p>2. Seed selection - Rice - Maize</p>	<p>Women Women/men</p>	<p>On farm home</p>	<p>Jan-Aug. After harvest June-Aug. and prior to planting</p>	

	1. Other crops	Women/men	On farm	June-Aug.	
	1. Seed drying	Women	On farm and home	After harvest	
	1. Seed storage	Women	Dari (storey) Naming, Ngoleko in Homes.	After harvest	
	1. Seed exchange (buying)	Men	Home, Viosks and outside village to other institutions.	Prior to planting	

### ***SOURCES OF INCOME AND EXPENDITURE***

#### **INCOME:**

<i>Source Of Income</i>	Women	Men
Cashew nuts	2	8
Rice	6	4
Maize	4	6
Vegetable	4	6
Cloth sales	2	8
Petty business	5	5
Palm juice	2	8
Labour in farms	5	5
Sesame	2	8
Ground nuts	4	6
Coconuts	2	8
Boy friends	3	
Fruits	4	6

#### **EXPENDITURE**

<i>Source of Expenditure</i>	Women	Men
Basic requirements	4	6
Schools fees	4	6
Clothing	6	4
Food	4	6
Farm implements	4	6
Radio and watch	2	8
Seeds and inputs	3	7
Local beer drinking	3	7

Religions expenses	4	6
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**CASSAVA VARIETIES AND CRITERIA FOR PREFERENCE  
(MATRICE)**

Variety Characterisation Criteria	Nanj enje a	Shar ia	Kigo ma Mafi a	Tan ga	Chi maje	Kigo ma	Lim bang a	Muu nguj a	Mag olog olo	Yud a	Liu mbu kwa	Nac hiny anga
Storability (Kutokupuswa)	9	3	4	4	5	3	5	3	3	2	2	9
Bitterness taste (Uchungu)	10				10		10					
Good taste of leaves - <i>Kisanvu kitamu</i>		10	5	6		5		3	2	5	5	
Early maturity- <i>Kutia haraka/mapema</i>	6	8	4	1	1	5	1	4	2	1	1	1
Sweetness- <i>Utamu zaidi</i>	0	8	6	4	0	5	0	5	2	6	6	0
Cookability- <i>Kuiva haraka (laini)</i>	mata mba	8	6	6	mata mba	6	Mata mba	6	1	4	4	5
Absence of fibre- <i>Haina kambakamba</i>	6	6	5	5	6	8	6	5	2	1	1	6
Tuber rot susceptibility ( <i>Kuoza haraka</i> )	4	8	6	6	4	5	4	4	2	4	4	4
Ugali kunyambuka	6	4	4	4	8	3	8	4	-	-	-	4
Suitability for roasting- <i>Ukichoma mtamu</i>	1	6	6	5	-	8	-	5	-	5	5	-
Tubers per plant - <i>Kutia</i>	1	20	7	6	2	2	2	3	2	2	2	3
Kuoza haraka	4	8	6	6	4	5	4	4	2	4	4	4
Hardness of dried cassava- <i>Makopa magumu</i>	6	2	2	2	8	2	6	4	2	Kuta funw a tu	-	8
Sweetness of fresh cassava- <i>Mtamu</i>		6	5	4	-	3	-	5	-	8	8	6
Suitability for alcohol- <i>Kufaa kwa pombe</i>	6	5	5	5	8	3	8	5	-	-	-	-
Storability of dry cassava - <i>makopa</i>	8	2	2	2	8	2	8	2	-	-	-	2

**FOREST FOOD PRODUCTS**

The study which has been conducted in Nyengedi village reveal that forests and forest products continue to be central to the household economy as well as to household food security and health thought numerous traditional practices.

The forests and tree products form a significant part of house hold food security to most villages/farmers. The most significant forest foods which are found in Nyengedi village include: roots and tubers, forest fruits, vegetable, mushroom, Wild animals and birds. A list of which have been appended here with this report.

The study have shown that farmers know and greatly value the wild roots/tubers and wild fruits trees and manage them for food, cash, medicine, fodder as well as fuel, shade and as buildings material in the later date.

The study has shown that, forest foods are used as a regular item in the diet, some are used intensively during high time of agricultural fieldwork and some are exploited

when extra cash is needed e.g. the fruits and the tubers/roots such as Ming'oko; and the forth use is in time of food shortage and crisis when many tubers and roots are highly exploited.

The following are the forest foods by product as revealed by the study.

## ROOTS AND TUBERS

<b>TYPE</b>	<b>LOCATION</b>	<b>WHO COLLECTS</b>	<b>WHEN</b>
Ming'oko	Forest	Women/girls	All round on need.
Luvale	Fields	Women/men	Rain season/Part dry season
Matu	Fields	Women/men	Rain season/Part dry season
Mandale	Fields	Women/men	Rain season/Part dry season
Vinyamilwa	Fields	Women/men	Rain season/Part dry season
Vitundi	Fields	Women/men	All round
Hangadi	Forest	Women	During severe food shortage.

1. Luvale, Matu, Mandale, Vinyamilwa and Vitundi are domesticated forest foods.
2. Hangadi is poisonous: after being prepared to be taken as meal it needs to be tasted first by an adult before being taken by children in order to ascertain whether poison has been taken/ removed away during the preparation process.
3. Selling of roots and tubers in mostly done by youths and women. Very seldomly by men.
4. Ming'oko, a root product is clearly the most important food obtained from the forest. It is available all year round and most intensively during periods of food shortage. It is also the forest food which is of a significant economic value as it is often saleable even in regional headquarters which are Mtwara and Lindi towns.

## FRUITS

About twenty three varieties of fruits were reported to be in use in the study area. Fruits such as *matili*, *usofu*, *makungu* and *vitolo*, were plentiful in the study area and are important both for consumption and as a source of extra income.

Collection of these fruits is done by all: women, youths and men.

Despite this major role, no effort has been made to domesticate such fruit varieties.

Reported list by type of fruits:



<b>Type</b>	<b>Location</b>	<b>Collected</b>	<b>Time</b>
Matili	Thick forest	Women/men	Mostly at the start of the dry season
Usofu	Bush	All	April-June
Makungu	Thick forest	All	April July
Vitolo	Thick forest	All	May – August
Vigaga	Bush	All	July - August
Vipwipwi	Forest	All	Dry Season
Mambilu	Thick forest	All	Dry Season
Matengo	Thick forest	All	Dry Season
Mangave	Bush	All	Dry Season
Ubebede	Forest	All	Dry Season
Ukwaju	Forest	All	Dry Season
Mpindimbi	Forest	All	Dry Season
Ukulumwai	Forest	All	Dry Season
Vigongo	Forest	All	Dry Season
Ugambo	Forest	All	Dry Season
Uhyeu	Forest	All	Dry Season
Lipwawa	Bush/forest	All	Dry Season
Ndunguru	Forest	All	Dry Season
Makohe	Forest	All	Dry Season
Uhami	Forest	All	May-July
Uhuhwe	Forest	All	April-July
Diminyi	Forest/Bush	All	April-July
Uhongomwa	Forest/bush	All	May-August

### 3. MUSH ROOMS:

During the study; twenty five types of mushrooms were reported by using Local names.

<b>Type by Local Name (Ethnic)</b>	<b>Location</b>	<b>Time</b>
Utondo (Makonde)	Bush/forest upland	Rain Season
Uchinji (Makonde)	Forest up land	“
Ukongo (Makonde)	Forest	“
Mbohu (Mwera/Makonde)	Forest	“
Litembo (Mwera/Makonde)	Forest/up land	“
Nannelele (Mwera/Makonde)	Forest/low land/home stead	“
Ulamba (Makonde)	Bush	“
Chipatwe (Makonde)	Lowland	“
Namihodi (Makonde)	Lowland	“
Kutuka (Makonde)	Lowland/upland	“
Utohi (Makonde)	Up land forest	“
Utope Mwera/Makonde)	Up land forest	“
Lukolovela (Makonde)	Lowland/bush	“
Udungu	Upland	“
Maliwaule (Makonde)	Lowland/upland	“
Mbohunakuta (Makonde)	Upland	“

Livanga (Makonde)	Upland	“
Upambahi Mwera/Makonde	Uplands	“
Uhinda (Makonde)	Lowlands	“
Uonyo (Makonde)	Forest-mounds	“
Ukolovela (Makonde)	Forest	“
Ulanji (Makonde)	Forest – lowland	“
Ukundelekete (Mwera/Makonde)	Bush/forest	“
Ulonga (Makonde)	Bush land	“
Uyeye (Makonde)	Upland	“
Ubulua	Bushland	“

All these varieties are edible. They are prepared and used as vegetable. Sometimes some of the mushroom is sold to earn income. Further research is needed to know their scientific names.

Collection of mushrooms is done by all who knows the species – both women and men.

### GREEN VEGETABLES

Identified green vegetables from the forest were reported:

<i>Type</i>	<b>Location</b>	<b>Collected By</b>	<b>Time</b>
Lilende	Vacated homesteads/bush	Women	Rain Season
Mtimbamwisi	Bush/lowlands	Women	Rain Season
Nkokogwado	Bush/lowland	Women	Rain Season
Natolo	Bush/lowland	Women	Rain Season
Ndebele	Bush/lowland	Women	Rain Season
Ndwanga	Home steads/lowlands	Women	Rain Season
Mlonga	Home steads	Women/men	Rain Season
Kisamvu mpira	Homesteads/bush	Women	Rain Season

### 5. WILD ANIMALS

Available from the forest are wild animals such as paa (Ng’ombe) Ndogoro, Mbawala, Mbutuka, Nenje, Sungura, Njechele, Kongoni, Sindi, Swala and Njanga.

They are used as a good source of protein instead of cows and goats meat which are not in adequate supply. Hunting is done by men.

### 6. BIRDS

seventeen types of birds were reported that are available in the area. They are always available through hunting. They include Kanga, Kororo, Kerengende, Kwale, Kowekowe, Chidididi, Njiwa pori (Lideya) Nyehe, Kituku (Chindutu), Nguraka Tondoole, Lingoti, Lidonga, Ngwikwi (Kwepekwepe), Hondohondo, Likambavale and Wanda.

### TRANSECT

Transect walk was conducted by a group of six people which comprised two women; both well knowledgeable on their environment including the vegetation, trees and the different uses of trees. Three of them were medicinal plant experts – 2 were women.

This helped the study team learn and collect more details about the environment, economic activities and social resources in that community.

The focus was on soils, land use and cultivation, tree species and their uses vegetation, infrastructure and problems.

There were interviews with men and women along the way.

Due to the nature of the terrain and the purpose of the transect, it was necessary to do it on foot, and not in a straight line.

### **MEN AND WOMEN'S TRANSECT, NYENGEDI**

<i><b>Zone</b></i>	<b>Residence</b>	<b>Road</b>	<b>Residence</b>	<b>Forest Hill</b>	<b>Residence</b>	<b>Road</b>	<b>Residence</b>
Soil Type	Sandy loam		Sandy loam	Sandy Loam/Red soils.	Sandy loam		Sandy loam
Land use/Crops	Backyard crops-fruits trees, banana, maize	Communication	Backyard crops-fruits trees, banana, coconut, maize	Forest trees protected	Back yard crops	Communication.	Backyard crops
Tree species	Mtanga, mpira, mkolola, mlonge, mpalang'anga mnanaa minazi mikoroshu.		Mtanga Mvule, Mdonda, Mbambakofi, Mkoroshu, Mdibwa Mpera	Nchinantende, Mnanaa, Mbambakofi, Mtumbati, Mp aluta, Mnembenembe, Chaluka, Mpingapinga, Mjau, mkolola, Mmala, Mmula, Mmalala	Msonobali, Mwarobaini, Mjale, Mkongo, Mtumbati, Mnanaa Mkoroshu		Mpande Mwarobaini Msonobali
Problems	Safe water shortage		Safe water shortage	Regularly set ablaze during the dry season. Indications of rill erosion	Safe water shortage		Safe water shortage

### **MEDICINAL PLANTS**

Experts on medicinal plants comprised both men and women. All of them the medicinal plant expert whom we interview belonged to the lowest wealth groups.

Their knowledge or expertise were acquired through inheritance from their predecessors/parents. Additional knowledge was said to be gained from their superior practitioners freely or sometimes by paying something in cash or in kind.

According to the villagers, an expert in medicinal plants knows different types of medicinal herbs/plants and knows how they are being used whether to treat animals, or human beings. They most know also which part of the plant that treats what. In addition to this they must know very well the places/locations where to collect them immediately in particular ecological zones.

### Medicinal Plants for Human and Livestock

Plant Name (Local)	Part Used	How and Uses	Collected by	Time	Location
Msonobali	Bark/root	Boil and drink to cure malaria	Traditional healers	All round	Bush & Home stead
Mnyumbu	Root/back	Soak in water filter and drink cure malaria	Traditional healers	All round	Forest
Cashew tree	Bark	Boil and then drink to cure dysentery	Man/women	All round	Bush & Home stead
Mtanga	Bark	Grinded and sprayed in chicken house to scare “papasi & utitiri”.	Women/men	All round	Forest
Mkilola	Roots and bark	Boil and drink to cure dysentery.	Women/men	All round	Forest
Mjau	Leaves	Eaten raw to remove out wizardy-planted materials from human stomach.	Traditional healers	All round	Forest
Mpingapinga	Roots	Choma na jive kuchanjia penye uvimbe.	Women/men	All round	Forest

Mpuluta	Roots	Boil and drink to cure asthma.	Traditional healers	All round	Forest
Mpera	Leaves	Boil and drink to cure dysentery.	Women/men	All round	Home garden
Mnanaa	Leaves	Boiled in local braw to make it strong.	Women	All round	Forest
Mtumbati	Bark	Soak in water let chicken drink to control New castle Disease NCD.	Women/men	All round	Forest
Mdibwa	Stem	Grinded and fed to women in order to strengthen love.	Medicinal practitioners healer	Any time on demand	Forest
Mnembenembe	Root bark	Grinded – soaked and drink to cure “mkojo”	Traditional healers.	All round	Forest
Mwarobaini	Roots, bark	1. Boil and drink to cure malaria 2. For abortion.	Women/men	All round	Forest/home
Chaluka	Roots	Grinded bark applied through anus to kill worms.	Medicinal practitioners	Any time on demand	Forest
Mmala	Root	Grind it and apply to wound that is difficult to cure repeat day after day.	Traditional healers	All round	Forest
Mmula	Bark	Boil and drink to cure dysentery.	Women/men	Any time wanted	Forest
Mpapai	Roots	Boil and drink to cure		All round	

		malaria “mshipa, tumbo” and “Ngiri”.	Women/men		Home garden
Mwindi	Leaves, bark	Leaves grinded soaked in water to drink and cure dysentery bark chewed.	Women/men	All round	Forest
Mmalala	Leaves	Eatery chewed raw to cure dysentery.	Women/men	All round	Forest
Nchinantende	Bark	Soaked in water for drinking to cure convulsion higher stage of malaria.	Medicinal practitioners	On demand	Forest
Likonda	Leaves	Eaten and auld blood	Women/men	All round	Home

### Medicinal Plants Used for Seed Storage Against Pests

Plant Name (Local)	Part Used	How	Collected by	Time	Location
Msonobali	Leaves	Grinded and mixed with sorghum	Women/men	Harvest period	Forest/home
Mvule	Dry Wood	Burn them mix ash with grain	Women/men	Harvest time	Forest
Mtumbati	Bark	Mixed with sesame	Women/men	Harvest time	Forest
Mchungwa	Leaves	Grind and	Women/men	Harvest	Home/garden

		mix with maize or millet		time	
Muarobaini	Leaves seeds	Grind leaves or seeds to mix with grain.	Women/men	Harvest time	Forest/home
Any tree	Dry	Ash mixed with grain	Women/men	Harvest time	Forest/home gardens

### Summary of the main findings in the coastal zone

- Medicinal plant experts stay at the periphery of the village for easier access to medicinal plants
- There is a direct relationship between the kind of knowledge and location of an expert in the village.
- The main ethnic group at Nyengedi are Wamwera. Population of women is more than men. Polygamy reduces the number of female headed household.
- The quality of seed good for planting is determined by sinking the seed in water. Those seeds that sinks are good for planting and those which floats are rejected.
- In mushroom collection women take more responsibility than men.
- In the forest there is valuable store of food. There has been no effort to domesticate forest fruits such as *matili*, *usofu*, *vitolo* etc.

### POTENTIAL USE OF THE RESULTS

The results of this study show that local experts:

1. Possess great and useful knowledge, skills, experience and technology in agriculture, forest food products and medicinal plants pertinent to their environment.
2. There is a system of handing over this wealth of knowledge, skills, experience and technology to others equivalent to if not more effective than what is often termed 'modern' or developed ways of extension service and through formal institutional training.
3. Local experts are willing to have their knowledge, skills experience and technology documented if there is a mutual understanding between them and researchers. They object to extractive research because it is exploitative. The word extractive and exploitative are used to indicate some of the research being conducted which only extracts information/knowledge from community but with no direct benefit to the community (*See Annex 4 for definitions of extractive/exploitative, mutual learning and how closer collaboration with local experts can be achieved*)

These results can therefore be used to:

1. Re-examine the extension services in agriculture currently in use. The extension services were inherited from colonial system whereby National research centers were source of knowledge and the extension system that was developed was geared towards delivering extension messages to farmers under Transfer of Technology Model (TOT). It has been acknowledged by development practitioners that farmers also do research, they possess knowledge and innovations that has been developed over years. Some of the knowledge and innovations could directly be commercialized and some complemented with scientific knowledge.

Under the TOT model farmers have been seen as only recipient of information from research system. The results from this research and rural seed fairs have demonstrated that farmers have valuable knowledge and skills that need to be tapped to develop sustainable solutions for development and community benefits. The alternative model to TOT, Multiple Source of Innovations has been suggested (Biggs, 1989).

The new model requires participatory methods in technology development in order to make use of both in-formal and formal knowledge systems. Therefore, new innovative extension methods such as the rural seed fairs are required. Rural seed fairs in our case have demonstrated to be a good tool for transfer of technology for example, preferred crop varieties bred from research were (such as bean variety Selian -94 from Arusha, Selian ARI to Chilangala farming community in Newala District) quickly transferred to the farming community. At the same time researchers and extension learned about alternative seeds and knowledge available from the informal seed systems. The gained knowledge about seeds, farmer criteria and priorities by researchers can help to in designing/breeding new varieties that meets specific needs of farmers.

2. Explore new dimensions in relations between farmers and researchers or scientists (as they are officially known in Agriculture Research Institution). There is increasing demand that researchers and farmers should work as partners while developing solutions related to agricultural problems. The findings from this research justifies the need to merge local knowledge and scientific knowledge to produce more sustainable options. A number of local seeds, forest food products and medicinal plants have been found to be in use by local people. With the new international policies WTO under the TRIPS agreement researchers can help farmers in documentation of their knowledge and skills and demand for Intellectual property rights (farmers rights, patent rights) arising from their innovations.
3. Re-define the role/contribution of local bred varieties using the local knowledge system under liberalized seed industry. The local bred varieties have always been underplayed in the formal seed sector. There is a need for integrated seed system whereby both modern and local varieties will be promoted. Rural Seed Fairs enables seed producers both from in-formal and formal seed systems to sell and exchange seeds.

**Where do we go from here?**



One positive step from here is to be more focused in the next research activities in order to do more justice to the topics discussed. There are three general but clear lines that could be separately pursued without losing the general research objectives, these lines are:

1. Agriculture
2. Forest food products
3. Medicinal plants

With regard to agriculture a number of local seeds and modern varieties have been documented including their local practices and skills they use. The strength of local knowledge and seeds for food security has been recognized. The issue now is how those local seeds that has been neglected for sometime be brought up to contribute in research and development. One option could be strengthening rural seed fairs that, has shown to promote local seeds and traditional cultures by decentralizing seed fair events to community level. The other step could be establishing community seed garden/banks. Community seed garden/banks could be run by the seed experts (interest groups). During seed fairs seed produced from seed gardens could be sold to interested individuals. Similarly, experts in forest food products and medicinal plants could form interest groups and do more research in partnership with scientific experts on methods of propagating forest plants for food and medicine. For this purpose relevant experts will need to be involved in future.

### **What has been achieved**

Based on the logical framework of this action research (Annex 3). It is the study team's opinion that the identification of the potentials, the knowledge about seed, forest food products and medicinal plants of women and men experts in the context of southern Tanzania is a great achievement. Similarly, working contacts between rural experts extension and researchers has improved through seed fairs and action research. We now know which indigenous knowledge/seeds can directly be used/commercialized and which one will require refinement. At least now we can say who is doing what and where in relation to indigenous knowledge in the southern zone. This is essential for future networking of local experts to form interest groups that could influence policy decisions on seed issues, use of forest food products and medicinal plants for the benefit of community.

Issues that are constraints and the possibilities for the way forward have also been well discussed above. All these observations put together will not only improve the local but also the national situation in respect to the knowledge, skills, experience and technology on the three issues under discussion.

### **CONCLUSIONS AND RECOMMENDATIONS**

Given the results of this study on diversity local seeds, forest products and medicinal plants and farmers knowledge on plant genetic resources. It is evident that the southern zone is rich in Plant Genetic resources and knowledge on the utilization of these resources. Seed fairs have demonstrated themselves to be powerful tool to retrieve the local knowledge. Similarly, have demonstrated to be powerful tool for transfer of technology because seed fairs combined scientific achievements in the

formal sector and informal local/indigenous sector. There is a great potential of combining scientific knowledge and indigenous knowledge for sustainable food security and rural livelihoods. Participatory variety development and seed management and participatory research in areas of forest food products and medicinal plants is highly encouraged to generate more sustainable solutions for the rural people.

Given the above the following interventions can be recommended:

1. Community Biodiversity Development and Conservation-awareness, accessibility, utilization of germplasm resources through continuing rural seed fairs and organizing village workshops for exchange of information and training, establishing community seed garden/banks
2. On-farm seed production schemes intended to capacity build local seed experts to produce and use good quality seed of preferred crop species- low cost seeds and no transportation costs. This will empower communities to break into the seed industry by utilizing their local agro-biodiversity. Knowledge, Technologies and Innovations.
3. Policy advocacy - create enabling policy environment on the sustainable use of agro-biodiversity in light with National, International policies/agreement WTO, CBD, TRIPS issues on Intellectual property rights on technologies innovations developed from Indigenous Knowledge Systems on seeds, medicinal plants and forest food products.

The above interventions are achievable given the fact that Community Technology Development Trust, (CTDT) in Zimbabwe is working along those lines. Closer collaboration with Organizations such experience will be important if local experts and knowledge identified from this research is to be put in use by the stakeholders.

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#### **ANNEX 1: Roles and responsibility of the stakeholders in the Rural Seed Fairs**

<b>Stakeholder</b>	<b>Role/Responsibility</b>
District Policy Makers (District Commissioners DCs)	<ul style="list-style-type: none"> <li>• Inaugurate and give opening speech to seed fairs in their district</li> </ul>
District Councils (District Executive Directors DEDs)	<ul style="list-style-type: none"> <li>• Solicit funds from various sources</li> <li>• Invite NGOs interested in seed fairs to participate and support</li> <li>• Provide transport for farmer seed experts</li> </ul>
District Extension office (DEO and DALDOs)	<ul style="list-style-type: none"> <li>• Prepare seed fair budget and submit to District Councils</li> <li>• Mobilise mass to participate in seed fairs</li> <li>• Advice district Councils on seed fairs and seed issues</li> </ul>

	<ul style="list-style-type: none"> <li>• Collaborate with Zonal Research Centre to organise seed fairs in the district</li> <li>• Facilitate villagers to build structure, organise traditional dances and songs by school children</li> <li>• Mobilise seed experts to attend, bring seeds and other expertise</li> </ul>
Zonal Agricultural Research Centre (ARI Naliendele)	<ul style="list-style-type: none"> <li>• Display, sell and share knowledge of modern seeds with farmers</li> <li>• Exchange Improved seeds with local seeds of research interest</li> <li>• Co-ordinate rural seed fairs across the zone</li> <li>• Purchase, re-pack modern seeds in small samples and distribute to the seed fair sites</li> <li>• Document knowledge on local seeds</li> <li>• Organise video shows on various agricultural technologies</li> <li>• Provide logistics to participants from the centre e.g. transport allowances etc.</li> <li>• In collaboration with Media Centre and Radio Tanzania organise video and radio coverage of the seed fair events</li> </ul>
Farmers/villagers	<ul style="list-style-type: none"> <li>• Build structures in collaboration with district extension</li> <li>• Display local seeds, sell and exchange and share knowledge of seeds with farmers, extension, researchers and policy makers other interested farmers</li> <li>• Organise traditional dances during seed fairs</li> <li>• Demonstrate indigenous skills, e.g. blacksmith</li> <li>• Mobilise individuals for provision of catering services (food and drinks) at the seed fair site</li> </ul>
NGOs and Donors	<ul style="list-style-type: none"> <li>• Support District Councils implement seed fairs</li> <li>• Facilitate Zonal Centre to procure modern seeds</li> <li>• Support Zonal Centre Media services/facilities</li> <li>• Support seed fair team with transport during seed fairs</li> </ul>

## ANNEX 2. The differences between Agricultural Shows and Seed Fairs

During the implementation of rural seed fairs some have questioned why should it not be combined with National Nananene Agricultural shows to minimize costs. National Nananene is already an annual event in each district and at National Level. The reasons why seed fairs should not be mixed with Agricultural Shows are as summarized in below.

### **Agricultural shows**

- Extension staff influences what to display
- Undermines local knowledge and traditional cultures
- Demonstrates achievements from formal research only
- Uniformity is a major concern

### *Rural Seed Fairs*

- Farmers decide what to bring for display
- Promotes local knowledge and traditional culture
- Demonstrates achievements from research and farmers' own seed system
- Diversity of crop plants is a major concern

- Stresses increased production
- Encourages farmers to adopt best options
- Crops and Livestock displayed
- Encourages mono-cropping
- Commercialisation leads to genetic erosion
- Some minor crops are neglected
- Conducted after crop harvest in August
- The major objective is to show formal scientific achievements
- Stresses food security
- Monitors availability of seeds of various types
- The emphasis is on seed crops
- Encourages farmers to grow many crops
- Protects crops from genetic erosion
- Minor crops which might have medicinal properties are encouraged to be displayed
- Promotes soil fertility by growing many crops with different nutrient requirement, some of them improving soil fertility
- Conducted at the on-set rainfall season
- The objective is to improve seed supply bred from research and farmers' own seeds in rural areas.

### ANNEX 3. The logical framework for the action research

#### THE LOGICAL FRAMEWORK: DOCUMENTING LOCAL KNOWLEDGE

##### Narrative Summary

Hierarchy of Objectives	Objectively Verifiable Indicators	Means of Verification	Assumptions and Risks
<p><b>GOAL</b> To strengthen the capacity of the rural experts; men and women to actively participate in Research and Development seeds, forest products and medicinal plants for improved food security and rural livelihoods in the zone</p>	<p>Rural experts on seed, forest products and medicinal plants participating in setting research agenda and technology development increased by 2003</p> <p>Appropriate technologies and policies on sustainable management of seed resources, forest products and medicinal</p>	<p>Reports</p>	<p>Good cooperation between researchers, extension, farmers development workers, policy makers and donor agency</p>

	plants increased and strengthened		
<b>PURPOSE</b> To increase awareness of local knowledge of women and men on local seeds forest seeds and medicinal plants among rural people, researchers, development workers and policy makers	Awareness on rural people's strategies & techniques and management of seed issues forest products and medicinal plants by researchers, development workers and policy makers significantly increased by 1999	Attendance, report	Rural experts will be cooperative  Video films, radio programs booklets are printed and circulated/shown/aired to stakeholders.
<b>OUTPUTS</b> Men's and women's knowledge on local seeds, forest products and medicinal plants documented	Types of local seeds, forest products, medicinal plants known significantly increased by the end of the project	Report, Video films	Funds for the project will be availed timely
Working contacts(Linkage) between rural experts (men and women), extension and researchers improved	Researchers, extension, farmers development workers, policy makers attending rural seeds fairs and workshops	Report	people are encouraged and facilitated to attend the workshops and seed fairs
Southern Zone capacity to network rural experts to form interest groups on seeds forest products and medicinal plants for further research strengthened	Collaborative research work with experts in rural communities increased	Annual Reports	Funds for collaborative activities are availed to the zonal centre
Capacity of Zone and Districts to plan and take informed decision on seed, forest products and medicinal plants issues improved.	Various proposals on seed issues and variety development, forest products and medicinal plants presented by 2000	Proposals submitted	Researchers/extension are encouraged and motivated
Capacity of the zone to influence policy decisions on seed issues, use of forest products and medicinal plants improved	Various recommendations made during workshops on local knowledge on seeds, forest and medicinal plants	Reports	Workshops are organised and recommended actions are taken accordingly by policy makers

#### ANNEX 4: DEFINITIONS

##### *Extractive/exploitative research*

- Extractive/Exploitative research occurs when researchers collect data from respondents for the farmer's appropriation. Usually, researchers go to the "field" collect all the information they need either through the use of questionnaires or direct verbal question and answer situations giving no time for the respondent to ask to ask the researcher issues of interest to them. At the end of the day the data collected is analyzed away from its place of origin, papers, articles, theses, desertation and books are written/published which may not see those that provided the data in the first place.
- In this process nothings goes back to the "field" either in the form of information or material for use by the respondents. Occasionally, there is a situation similar to colonial economy, i.e. raw materials are extracted from the colony taken to the colonizer for processing and brought back or turned out for sale as manufactured goods. The consumer may necessarily be the original producer

- On the contrary participatory research generates data through dialogue—give and take, sharing, learning from each other—the researcher and the respondent. In this way the researcher leaves behind (in the field) something—knowledge, skills, experience and data that can be used by the respondents.

### ***Mutual learning***

- Mutual learning among other things it involves lateral communication in accessing information, knowledge, skills and experience and through or exploration, experience, peers and from below and beyond the specific confinement where research is being conducted.
- It involves consultation and ensuring that all participating parties learn something about the subject at issue. Mutual learning includes analyzing issues together, planning actions, monitoring and evaluations, it enhances participants to analyze their knowledge of life and conditions together.
- Under the foregoing situations local experts can understand that the researcher has brought in new things that they have learned; he or she has also learned from them what he or she was after. Through dialogue this can be either discerned or explicitly expressed depending on situations. The point made is that mutual learning underscores the fact that each one of the parties involved have things and knowledge, skills and experience in life which can be exchanged in a participatory research process. Similarly, there are things they do not know and that fact is also worth exchanging about.

### ***How could local experts agree to closer collaboration with the researchers?***

It is through mutual trust and security of their expertism. They know that what they know is of value. It should not be given away to any body who happens to be visiting/researching in their village. For even within their local environment knowledge, expertise that makes one stand out from the others is not given freely—it is provided on demand under certain terms and regulations. So collaboration and agreement can only take place when the above conditions are met. Unfortunately, some researchers think they have a scientific obligation to seek the “truth”, and those who hold it should give it to them in the name of science. This thinking is devoid of respect that should go to owners of the “truth” that is sought—Where there is respect there is collaboration and agreement.