

Socio-Economics and Extension is a division that coordinates activities within the department. It also acts as a link with other departments within MAFS and other Ministries. It carries out research in areas of extension, sociology, biometrics as well as economics and marketing. This division is also responsible for relaying feed back either positive or negative between the farming community and the researchers on the status of the released technologies. Among many successes that the division has include research on mechanised conservation agriculture that was conducted in Butha-Buthe and Quthing districts as shown by the picture below.



A maize field in Butha-Buthe planted using conservation agriculture

## SOIL SAMPLING PROCEDURES

When sampling soils for soil testing and fertilizer or lime recommendations, the primary concern is how to obtain a sample that accurately represents the field from which it was taken. Several different soils may be found in each field with variable nutrient levels. A representative soil sample must be a composite sample formed of a mixture of a number of sub samples taken from the field. Good samples mean more reliable results and recommendations.

### TIME OF SAMPLING

Soil samples may be taken any time of the year when soil is not frozen and the moisture conditions permit sampling. Very wet or very dry soils are difficult to sample. Early autumn is often preferred, or anytime after harvesting and before planting. Sampling for nitrogen, sulphur, and boron is recommended in the spring rather than another season because of their high mobility. Allow enough time to get test results back from the soil laboratory before making decisions regarding how much fertilizer should be purchased or applied for each field.

### FREQUENCY OF SAMPLING

In general, for most crops, soil should be sampled once every 2 to 3 years. For soils under intensive use, as in gardens and greenhouses or for high- value- per- hectare field crops, soils should be tested before planting each crop.

### TOOLS



Obtain a suitable sampling tool, and clean plastic bucket for each depth to be sampled. Special auger and tube are available at the Agriculture Research Soil Laboratory in Maseru. A spade will serve for topsoil samples if the steps below are followed.

### UNIFORM SAMPLING AREAS

Before sampling, the field should be examined for differences in soil characteristics. Consideration should be given to soil colour, texture, topography, drainage and pest management (past cropping and fertilizer treatment). Samples should be taken only from uniform areas. A field is called uniform when the above features are uniform throughout the field. If there is a great variation in any of those features (non- uniform field), the dissimilar areas should be separated into uniform sampling areas.

## NUMBER OF SAMPLES

From each separated uniform area, samples will be taken from approximately 10 – 20 locations, in a pattern that will represent the entire area. These samples are called subsamples. Add these sub samples from each area in a clean bucket. Mix them well, and then take about ½ kilogram or 2 cups in a plastic bag which will be sent for soil analysis. This final ½ kilogram sample is called composite sample. In case of large uniform fields each composite sample, consisting of 10 -20 sub samples, can represent about 5 hectares.

## DEPTH

Except for a few mobile nutrients (N, S, B) which require deep sampling, most of the immobile nutrients (P, K, Ca, Mg, Zn, Fe, Mn,Cu) usually require topsoil sampling. (a) For standard topsoil samples: take samples from surface to 30 cm depth. (b) For subsoil testing: Starting at the bottom of the topsoil sample hole to 60 cm and another to 90 cm depth. Record actual depth keep depth separate.

## SAMPLING

Scrape away grass or litter, avoid manure spots

Using tube or auger: Follow instruction given with the tool or by soil laboratory staff members

Using spade:

1. Dig a V- shaped hole to plough depth. Remove a 3 cm slice of soil from one side
2. Discard the edges of the slice until your sub sample is about 3 -6 cm wide. Put it in a clean bucket.
3. Repeat 1 and 2 for other sub sample locations for the sampling area.

Combine the sub samples in the bucket, mix them well, then take only one sample (composite sample) about 2 cups in a plastic bag to be sent for analysis. Be sure to label each bag for information, such as number of fields, number of samples depth of the soil, etc.

## SOIL AND CROP BACKGROUND

The following information should accompany the soil sample when sending it to the Research Soil Laboratory. The more complete the information provided, the better the fertilizer recommendation interpreted from soil analysis.

previous crop grown

Future crops to be grown

Yield goal

When the field was last limed and the rate of application

whether irrigation is to be used

whether the field will be manured for the crop being grown (kind and rate of application)

Soil series

Depth of ploughing

Whether drainage is good, intermediate, or poor

Other special problems or conditions that may affect plant growth

## **Agronomy:**

### ***MAIZE PRODUCTION AND DISTRIBUTION***

Maize is one of the world's leading crops cultivated worldwide. It is estimated that it is cultivated over an area of about 139 million hectares with production of about 600 million tonnes of grain. USA is the world-leading producer of maize followed by Brazil, China, Mexico and India. In Lesotho maize is grown on approximately one hundred thousand hectares each year, however, this does not meet the demand, consequently this calls for more effort in maize production, as it is our staple food. It is the most important crop in Lesotho and is produced throughout the country under diverse environments.

### ***CLIMATIC REQUIREMENTS***

#### **Temperature**

Maize is a warm weather crop and is not grown in areas where the mean temperature is less than 19 °c or where the mean of summer months is less than 23 . Maize is well adapted to the lowlands and foothills of Lesotho, nevertheless, it can still be grown in the mountains, but it is not very productive.

#### **Water**

Approximately 10 to 16kg of grain are produced for every millimetre of water used. A yield of 3152kg/ha requires between 350 and 450mm of rain per annum. At maturity, each plant will have used 250L of water in the absence of moisture stress.

### ***SOIL REQUIREMENTS***

The most suitable soil for maize is one with a good effective depth, favourable morphological properties, and good internal drainage, and optimal moisture regime, sufficient and balanced quantities of plant nutrients and chemical properties that are favourable specifically for maize production. It can be grown successfully in soils whose pH ranges from 5.5 to 7.5.

### ***LAND PREPARATION***

Maize requires a seedbed, which is friable, well aerated, moist, and weed free to provide better contact between the seed and the soil, however, there is no need to prepare an extremely fine seedbed. The first ploughing should be done with soil inverting plough so that at least 20-30cm deep soil may become loose. Disking/or harrowing should follow it.

### Maize Production Guidelines

#### Planting date

Planting can commence as soon as groundwater and soil temperature are suitable for good germination. If minimum air temperature of 10 to 15 °C is maintained for seven successive days, germination should proceed normally. In Lesotho, maize is normally planted during the months of September to November. However, in December it can also be planted. Care should be taken in selecting seeds: i.e. a farmer should select varieties with shorter growing period to avoid early frosts.

Crop	Variety	Soil requirements	Days to mature	Planting time	Spacing Rows	plants	Seed rate	Fertilizer rate	diseases	Insects	Stress tolerance
maize	Hybrids/white PAN 6363 6479 6549 SNK2728 SNK2551 Yellow maize PAN 6966 PAN 6480 PAN 6146 Natal 8 Row Open pollinated varieties ZM 421 ZM 521 ZM 623 KEP	Soil moisture 350-450mm rainfall pH 5.5-6.8 temperature 19 °C-23° C	120-140 frost free days	Lowlands Oct-mid Dec Foothills Sept-Nov Mountains Aug-Oct NB//it applies to all varieties	0.6-1M	20-30cm	15-25kg/ ha Or 20,000- 48,000 plants/ha	3:2:1(25)3- 6*50kg  2:3:2(22)4- 6*50kg	-Ear rot -Maize streak virus -Grey leaf spot -Rust -Cob & tassel smut -Stem rot & root rot Control Use of cultivars with best levels of resistance or tolerance	-cutworm -American boll worm -Maize stalk borer -Russian aphids -Maize spotted beetle Control Cutworm bait, kom- bat ,cypermethrin	All these maize varieties are both disease and drought tolerant.

### ***FERTILIZER REQUIREMENTS***

Manures and fertilizers both play an important role in the maize cultivation. A liberal quantity of bulk manure should be applied in the field if available. Add 10 to 15 tonnes of well decomposed organic matter in the form of farm yard manure or compost before sowing. The application of organic matter to the soils ensures good tilth and improves water-holding capacity.

Hybrids and composite varieties of maize exhibit their full yield potential only when supplied with adequate quantities of nutrients at proper time. Nevertheless, fertilizer use depends mainly on the soil tests made; however, a blanket application is as follows: three to six pockets of 3:2:1(25)/150 to 300kg/ha. 2:3:2(22) can be used, but there will be a need o apply LAN at 50-100kg/ha (1-2pockets/ha).

### ***MANAGEMENT PRACTICES***

#### **Weed control**

Weeds emerge with the germination of maize seeds and grow along with plants till the early growth period. This causes severe crop weed competition. Failure of timely weed control would not only offer direct competition to the maize plant but also indirectly through reduction in fertilizer use efficiency. Losses through weed competition in early stages cannot be offset by keeping the field weed free later. Weeding can be done by hoeing, handpulling, as well as cultivation. Herbicides are also available for use in control of weeds, however, it should be under appropriate supervision. Herbicides such as Atrazine, Simazine and Alachlor are available in market for use.



Hand hoeing weeds in maize field

## ***INSECT PESTS CONTROL***

Maize crop is subjected to attack by a number of insect pests. Some of major insect pests are as follows:

Cutworms: controlled by cutworm bait or spray by cypermethrin

Stem borer/stalk borer: use Kombat

American Bollworm: controlled by synthetic purethium or organic phosphate

Maize spotted Beetle: controlled by synthetic purethium or organic phosphate

Russian Aphid: Organo phosphate such as Dimethoate can be used.



Controlling maize insect pests in a maize field

## ***HARVESTING MAIZE***

Maize is predominantly harvested mechanically, although exceptions do occur in the case of hand harvesting.

### **Hand harvesting**

The entire plant can be cut and placed into stacks while still green. Once it is dry, the ears can be picked and threshed, or the entire plant with the ea can be utilized as maize hay. Alternatively, the plants can be left in the field to dry and the ears harvested.

### **Mechanical harvesting**

Maize is normally left in the field until moisture % of 12.5 to 14.0 is reached before it is harvested and delivered to a silo or home. It is done by combine harvester.

## **SUNFLOWER PRODUCTION**

Sunflower is a major oil seed crop in Southern Africa and a major source of vegetable oil. It is one of the crops being promoted amongst rural people engaged in small-scale.

### **Climatic requirements:**

*Sunflower requires moderate rainfall in the region of 500 – 600 mm during crop growth. It is a drought tolerant crop hence provides good yields in dry years when most other crops produce low yields. More than 800 mm rain can be damaging. The crop should have enough water during its flowering stages otherwise the yields are reduced. Excessive rain after crop maturity leads to rotting of the heads.*

### **Soils**

Sunflower achieves higher yields in well-drained clay loams but will grow on almost all soil types. A pH value of 5.3 is considered ideal. Light soils pose the following problems:

Organic matter is low in light sandy soils and hence there is heavy leaching of nutrients;

The water-holding capacity of such soils is low;

Light soils are susceptible to capping after rains leading to poor plant emergence

Some soils are better than others for oil-seed production. Therefore it is important to have soil tests for planting.

### **Seedbed preparation**

A good tilth is required for good germination where available, use a plough followed by harrow to create a good tilth. On sandy soils a plough alone may be adequate. Harrowing may pulverize the soil leading to capping after rains.

### **Fertilizer**

Application rates differ with soil type and its nutrients status and fertilizer application rates should be based on soil analysis. Complete fertilizer or blanket fertilizer application where soil tests are not available a farmer can use (2:3:2 (22) or 3:2:1(25) at rates of 3 to 5 pockets/ha.

### **Planting time**

Sunflower germinates at lower temperatures than most crops if proper moisture is available in early spring. The crop can tolerate a light frost.

### **Weeding**

Weeding is normally conducted twice during crop growth and 3 times at most. It is important to keep crop weed-free during the first 8 weeks of growth. A general recommendation is to weed within four weeks after planting. Cultivator weeding should only be carried when there is no danger of burying the crop.

## Sunflower Production Guidelines

Crop	Variety	Soil requirements	Days to mature	Planting time	Spacing Rows	Seed rate	Fertilizer rate	diseases	Insects	Stress tolerance
Sunflower	Hybrids PAN 7351 PAN 7355 PAN 7369 PAN 7371 PAN 7033	Soil moisture 500-600mm rainfall pH 5.3 temperature 19° C-25° C	115- 130 frost free days	Lowlands Aug-mid Dec  Foothills Aug-Nov  Moun- tains Aug-Oct NB//It applies to all varie- ties	0.9- 1M  20-30cm	10- 15kg/ha 30,000-  50,000 Plants/ ha	3:2:1(25) 3-6*50kg  2:3:2(22) 4-6*50kg	-root &rot -red rust -Downy mildew Control Use of cultivars with best levels of resistance or tolerance	-nematodes -cutworms -Tipwiller -birds control use of car- bary 85% WP crop rota- tion Harvesting earlier is imperative or use of birds scar- ing device.	All these varieties are both dis- ease and drought tolerant.

**Sunflower trial**





A good sunflower stand after weeding

### DRY BEAN CULTIVATION

Dry beans (*phaseolus spp*) are pulse crops (grain crop legumes) originating from central and South America. Within the genus phaseolus there are three species, which are of agricultural importance, i.e. *phaseolus vulgaris*; these are small white beans, speckled sugar beans, brown and yellow haricot beans green beans. *P.acutifolius*; these are tapery beans. *P.coccineus*, they are large white kidney beans. Beans have been grown in Lesotho for quite some time, but it is reported that yield has been declining every year, and this calls for more efforts toward improved production methods and new bean varieties to attain high yield.

### CLIMATIC REQUIREMENTS

#### Temperature

Common dry bean is a warm season annual with an optimum temperature range of 18-24°C. Beans should be planted in a warm soil (preferably above 18°C) after all danger of frost has passed. A short exposure of 0°C or below will kill bean tissue. After emergence, beans grow slowly if day temperatures are below 20°C. After flowering, 15°C /12°C day/night temperatures will damage tissues, delay maturity and favour the development of empty mature pods. The yield of beans depends mainly on the temperatures at flowering time. The average maximum temperature during flowering should not exceed 30°C.

#### Water

Dry beans grown under dryland conditions require a minimum of 400-450mm rainfall in the growing season, but an annual total of 650-750mm is ideal.

## ***SOIL***

Beans grow well in soils with a depth of at least 90cm and which have no deficiencies, are well drained and do not interfere with germination or seedling emergence. Sandy loam, sandy clay loam or clay loam soils with clay content of between 15 and 35% are unsuitable. Beans are very sensitive to very acid soils, so a pH of 5.5-6.7 is appropriate.

## ***SOIL PREPARATION***

Seedbed preparation for planting of dry beans follows that same pattern as that of any spring/summer planted crop. However, seedbed should be deep, level and firm, but to minimize crusting and water logging in wet areas, it should remain a little cloddy between the rows. A firm seedbed ensures better surface contact between seed and soil, increasing the absorption of moisture, which is of importance in dry seasons. A level seedbed facilitates planting to a uniform depth.

## ***MANAGEMENT PRACTICES***

### **Weed control**

Weeds control can be achieved by either mechanically or chemically. Mechanical weed control by cultivation should begin during seedbed preparation and be repeated when necessary up to but not after flowering. Hand hoeing can also be done at the appropriate time.



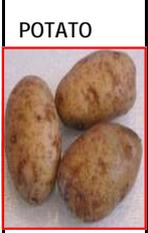
Bean stand at Maseru main research station

## Bean Production Guidelines

Crop	Variety	Soil requirements	Days to mature	Planting time	Spacing		Seed rate	Fertilizer rate	diseases	Insects	Stress tolerance
					Rows	plants					
Beans	Common varieties PAN 148 PAN 888 PAN 150 Pinto Mkuzi	Soil moisture 400-450mm rainfall pH 5.5-6.7 temperature 18° C-25° C	100-120 frost free days	Lowlands Oct-Jan Foothills Oct-Dec	0.6- 1M	30- 40cm	15-20kg/ha 30,000- 45,000 Plants /ha	2:3:2(22) 3-6*50kg 150-300kg/ ha	-Hallow blight -Common blight -Anthracnose -Bean rust Control Use of certified seeds and practice crop rotation.	-American boll worm -Aphids -Beetles <u>control</u> use of cypermethrin, Pyrethrins and parathion.	All these varieties are both disease and drought tolerant.

## VEGETABLE PRODUCTION GUIDELINES

CROP	VARIETY	MATURITY (DAYS)				SPACING		SEED RATE (Kg/Ha)	FERTILIZER RATE(Kg/Ha)	
			Low-lands	Foot-hills	Moun-tains	ROWS	PLANTS		BASAL	TOP
<b>GREEN BEANS</b> 	- CONTENDER - PROVIDER - STAR 2000 - ESPADA - LAZY - HOUSEWIFE - EDURANCE	60	Oct – Dec	Oct – Dec	Nov	50 – 80 cm	5 – 10 cm	80-120	800 – 1000 2:3:2(22)+ Zn	150 LAN
<b>BETROOT</b> 	- CRIMSON - GLOBE - DETROIT - DARK RED - EARLY - WONDER - LONG CAN- - NER - RED CLOUD	90-120	Sept - Nov	Sept - Nov	Oct-Nov	20 – 60 cm	5 – 10 cm	6 – 8	600 – 900 2:3:2(22)+ Zn	200 LAN
			Jan - Feb	Jan - Feb						
<b>BROCCOLI</b> 	- CALABRESE - CRUSADER - COMMAND- - ER - GREAT - LAKE	60- 90	Jan - Feb	Jan – Feb	Nov – Jan	60 cm	45cm	200g	800 – 1000 2:3:2(22) + Zn	150 LAN (28)
<b>EGGPLANT</b> 	- AFRICAN - BLACK - BEAUTY - FLORIDA - MARKET	100 – 120	Sept – Nov	Sept – Nov	Oct - Nov	90 – 100 cm	60 – 70 cm	500g	2:3:2(22) + Zn 40 – 60	7.5 kg
<b>CABBAGE</b> 	- CAPE SPITZ - BONANZA - GRANSLAM - DRUMHEAD - GOLDEN - ACRE - HERCULES - GREEN - CORONET - GREEN - STAR - STAR 3301 - STAR 3306 - TENACITY - BIG CROP- - PER	90 -140	Oct - Mar	Oct - Mar	Oct - Mar	50 cm Spacing can be reduced in order to produce Small heads	40 cm	250 g	800 – 1200 2:3:2(22) + Zn	150 LAN (28)
<b>CARROTS</b> 	- CAPE MAR- - KET - - CHANTENAY - KAROO - REGOL - IDEAL RED - SCARLET - NANTES - KURODA	90 - 120	Sept - Mar	Sept - Mar	Sept - Mar	35 – 50 cm	8 – 10 cm	3.5	700 – 900 2:3:4(30) or 800 – 1000 2:3:2(22)+ Zn	150 LAN (26)
<b>GARLIC</b> 	- GAINT - SMALL - EGYPTIAN - WHITE - SMALL - EGYPTIAN - PINK	210 - 270	Feb - Mar	Feb - Mar	Feb	30 – 45 cm	10 - 20 cm	1000kg or 370 000 bulbs	1000 2:3:2(22)+ Zn	100 – 150 LAN

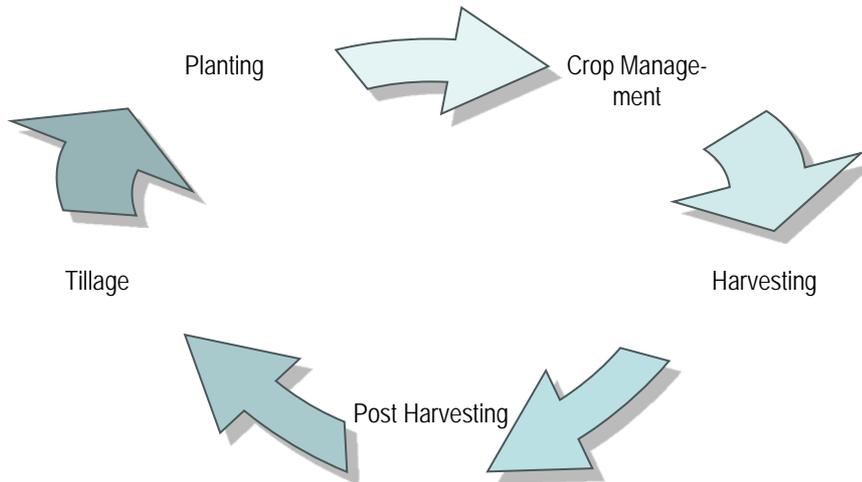
	MUSTARD -TENDER GREEN -FLORIDA BROAD LEAF -SOUTHERN GIANT CURL -BASOTHO MUSTARD	40 - 60	Aug - Dec Jan - Mar	Aug - Dec Jan - Mar	Sept - Nov	30 - 45 cm	4 - 6 cm	1.5kg	800 - 1000 2:3:2(22)+ Zn	100 - 150 LAN
	NIGHT-SHADE*	40 - 50	Oct - Jan	Oct - Jan	Nov - Dec	50 cm	40 - 60 cm	1.5	800 - 1000 2:3:2(22)+ Zn	-
	ONION - AUSTRALIAN BROWN - CALEDON GLOBE - TEXAS GRANO - HOJEM - GRANEX 33 - PYRAMID	130 - 230	Aug - Nov	Aug - Nov	Sept - Nov	40 - 60 cm	7 - 10 cm	3	1000 2:3:2(22)+ Zn	125 - 150 LAN
	PUMPKIN - FLAT WHITE BOER A - QUEENSLAND BLUE - GREEN HUBBARD - YELLOW HUBBARD - FLAT WHITE BOER, VAN NIEKERK - FLAT WHITE FORD - GROWN PRINCE	3 - 4.5 months	Oct - Nov	Oct - Nov	Nov - Dec	1.5 - 2.2 m	1.5 - 2.2 m	2.5 - 3.5	800 - 1200 2:3:2(22)+ Zn	150 LAN
	POTATO -BP1 -UP-TO-DATE -BASOTHO (PURPLE)	100-120	Sept - Dec	Sept - Dec	Oct - Dec	70 - 100 cm	30 - 40 cm	280	800 - 1000 2:3:2(22)+ Zn or 1235 3:2:1(25) or 741 2.3.0(35)  10 to 15 tons of farm yard	250 - 300 LAN
	SQUASH -BUTTERNUT -GEM SQUASH -VEGETABLE MARROW -WHITE CUSTARD	3 - 4.5 months	Oct - Nov	Oct - Nov	Nov - Dec	1.5 - 2.2 m	1.5 - 2.2 m	2 - 3	800 - 1200 2:3:2(22)+ Zn	150 LAN
	SPINACH -FORD HOOK -GIANT -LUCULLUS	4 -6 weeks	Sept - Dec	Sept - Dec	Sept - Dec	30 - 45 cm	4 - 6 cm	5	800 - 1000 2:3:2(22)+ Zn	100 - 150
	SWEET-POTATO -BOSBOK -BLESBOK -MAFUTHA -RIBBOK -NATAL RED	120 - 150	Sept - Nov	Sept - Nov	Oct - Nov	100 - 110 cm	50 - 60 cm	280 or 20 000 vines	800 - 1000 2:3:2(22) + Zn	150 LAN

<p><b>TOMATO</b></p> 	<ul style="list-style-type: none"> <li>-FLORIDADE</li> <li>-HEINZ</li> <li>-RODADE</li> <li>-ROMA</li> <li>-TENGERU</li> <li>-TANYA</li> <li>-STAR 9006</li> <li>-STAR 9008</li> <li>-MONEY MAKER</li> </ul>	50 - 60	Sept	Sept	Oct	50 cm	40 cm	120 – 150 g/ha	1200 – 1600 2:3:4(30)	150 LAN
<p><b>PEPPERS</b></p> 	<ul style="list-style-type: none"> <li>-CALIFORNIA WONDER</li> <li>-CAYENNE</li> <li>-LONG RED</li> <li>-LADY BELL</li> </ul>	75	-	Oct	Oct - Nov	90 – 100 cm	45 – 50 cm	500g	40 -60	
<p><b>GREEN PEAS</b></p> 	<ul style="list-style-type: none"> <li>-PRINCESS</li> <li>-</li> <li>-GREEN-FEAST</li> </ul>	75	-	May - June	May - June	100 cm	10 – 20 cm	75	200-300 2:3:2(22) + Zn	150 LAN
<p><b>WATER-MELONS</b></p> 	<ul style="list-style-type: none"> <li>-CRIMSON SWEET</li> <li>-SWEET PRINCESS</li> <li>-CONGO</li> <li>-ALL SWEET</li> <li>-</li> <li>-CHARTESTON GREY</li> <li>-</li> <li>-GREYSTONE</li> <li>-EMPIRE</li> </ul>	90 - 120	Oct	Sept - Dec	Sept - Dec	100 – 150 cm	100 cm	1 - 2	800 -1200 2:3:2(22) + Zn	7.5 LAN

### Plant Protection

Weeds associated with crops differ from one geographical location to another. They also differ with soil fertility and type. Certain weeds and diseases attack specific plants while some can damage almost every plant. Some attack plants at the certain stage of crop development therefore different weed management strategies (Integrated Weed Management) must be employed in order to optimize weed control in crops. Weed management should be employed at all stages of plant growth

### Crop Production Cycle.



#### **I). Primary Tillage.**

Tillage helps in weed control by:

- Burial of weed plants.
- Uprooting/ cutting of weeds.
- Predation of weed seeds by soil microbes and other soil organisms.
- Dehydration and freezing of propagation material e.g. stolons, rhizomes, and bulbs.

#### **(ii). Stubble mulch Tillage.**

- Leaving about 30% of the land covered with plant residues.
- Some residues control weeds through allelopathy.
- Residues block light attenuation resulting in the release of infra red, which hinders seed germination and growth.

### Sanitation.

Cleaning of tillage equipment is very important to minimize the spread of weeds. Farm equipment must always be cleaned whenever it is moved from one field to another

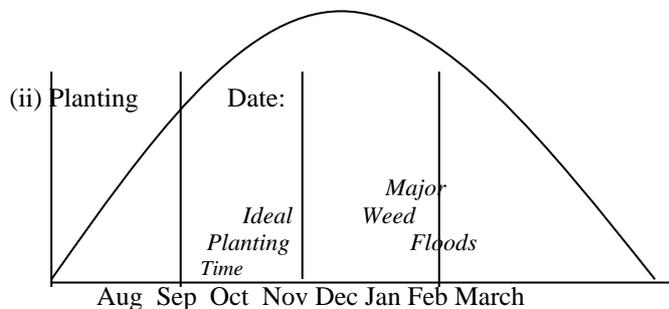
### Planting.

#### (i) Plant Densities and arrangement.

The higher the plant densities the earlier maize and sorghum produce full canopy or ground cover. Once full ground cover is attained weed germination in under storey of the crop is curtailed or reduced. However should be aware of intra-plant competition.

#### (ii). Arrangement:

lower row spacing brings about quicker canopy. 90cm between the rows is ideal for quicker canopy cover whilst ensuring that intra-plant competition is avoided.



Early planting results in relatively fewer weeds.

Major weed Floods in maize and sorghum are stimulated by:

#### (ii) Tillage: increases aeration, Scarify weed seeds, brings weed seeds to the surface.

Increase in wetting and drying cycles. High temperatures stimulate germination in noxious weeds like *C. esculentus*

#### (iii) Intercropping.

Pumpkin being a prostrate crop has proved to be effective in suppressing weeds as an intra-row intercrop in maize and sorghum.

#### (iv) Seed soaking (Priming).

Promote early growth.

Competitive advantage via early starting position.

#### (V) Placement and rate of fertilizer application

The higher the fertilizer the higher the growth rate and more competition against the weeds.

More precise placement, greater access to the nutrients than to the weeds.

Vi) Manure Curing.

- Induces mineralization.

Kills weed seeds in the manure

Manure heats up to 80 – 100°C due to activities of micro-organisms.

Methane and ammonia are released.

Weeds associated with manure pigweed, buffalo grass, etc.

(vii) Planting with weed free seeds.

**Weed Management.**

A number of methods must be used as a single method leads to resistance in some weeds

Weed control using hand hoeing and inter row cultivation must be done as early as possible before the weeds start competing with the crop for resources.

**Chemical control.**

Lesotho does not have pesticide registration scheme and all the pesticides that are used in the country are from neighbouring countries mostly South Africa. However these are some of the pesticides that can be used for weed control in maize, sorghum and beans.

<b>Maize@Sorghum (Pre-emergence)</b>	<b>Maize @Sorghum (Post-emergence)</b>	<b>Beans (Pre-emergence)</b>	<b>Beans (Pre-emergence)</b>
Bateleur Gold	Atrazine	Bateleur Gold	Basagran
Dual	Suprazine	Dual	
Gesaprim Super	Simazine	Alachlor	
Atrazine	Basagran		
Simazine	Servian		
Suprazine			
Alachlor			

### Harvesting

- Minimize the spread of weeds when harvesting
- Remove weeds and other contaminants from the seed.
- Seeds act as important noxious weeds carriers.

### Post Harvesting.

- Some burn the stubble to kill the weed seeds.
- Most farmers don't control weeds at this stage.
- Due to the plasticity nature of some weeds e.g. black jack (*B. pilosa*) which can germinate late in the season and produce seeds they need to be controlled.

### **A concrete silo:**

The concrete silo is the most preferred amongst other types of silos mainly because of its great durability and also that it is designed in such a way that it is absolutely water proof and frost proof.

### **Materials needed for construction:**

- Stones
- 6 inch bricks(600)
- 6 by 50 kg cement
- Course aggregates
- 4 by 4m poles
- Iron sheet

Fetch grass

### **Size of a silo:**

20mm diameter contains 100kg to each 30cm height

40mm diameter contains 200kg to each 30cm height.

The usual practice is not to make the inside diameter of a silo to be greater than one half the height.

### **Location of a silo:**

The location of a silo should be such that it permits easy feeding, and also that the flour level should not exceed 10cm to allow easy removal of the contents.

### **Requirements of a silo:**

The requirements of a successful silo are first, its airtight features. Also the silo is best when water proof and frost proof. The penetration of moisture through the silo is very apt to injure the contents. The water proofing of the silo can be easily accomplished by using any water proofing compounds in the local market, or by making the concrete in the walls to be very dense. Also the builder should try use the wet mixture of concrete. This will enable the mortar to move tightly packed together thus, reducing the size of the pores for the admittance of moisture to the contents.

### **Foundation of a silo:**

These must be given careful attention, as the life of the structure depends on it. In constructing the foundation we should bear in mind that it has to carry weight of the concrete structure and the weight of the column of grains is to contain. Dig hole that is 1m deep on average, and fill it up with the stones up to 100cm above the ground.

### **Practical Guidelines for Construction.**

1. Prepare a wet mixture of course aggregates and cement and fill the gaps between the stones, at the last course of the stone plaster until it is level.
2. In making the roof of the silo we cut the rafters to give the pitch desired, and the roof framed such that the opening is placed upon the side of the silo from which it will be filled.
3. The rafters are securely fastened to the wall by bolts imbedded into the concrete of the last course.
4. The silos should be plaster coated with concrete in the inside and outside.  
The inlet and outlet should be airtight.



**A picture of a complete concrete silo.**

# FOOD PRESERVATION GUIDELINES



## FRUITS

PRODUCT	PROCEDURE/METHOD	PACK STYLE	PROCESSING TIME
<p>Apples</p> 	<p>Wash, peel, core, and slice apples. Drain and rinse. Cook and pack. Cover with hot liquid or hot syrup.</p>	<p>Hot only</p>	<p>25 minutes</p>
<p>Peaches</p> 	<p>Wash, peel and pit. Slice if desired. Drain and rinse. Pack cooked or raw. Cover with hot liquid or boiling hot syrup.</p>	<p>Hot or Raw</p>	<p>25 minutes</p>
<p>Pear</p> 	<p>Tree-ripened pears may have a gritty texture when canned. Pick pears when they are full size but firm and green. Refrigerate for 2 weeks then ripen at room temperature before canning.</p> <p>Wash, peel, halve and core pears. Cut into quarters if desired. Drain with hot liquid and boiling-hot syrup</p>	<p>Hot only</p>	<p>25 minutes</p>
<p>Tomatoes, acidified and packed in water</p> 	<p>To loosen skins, drip into boiling water for about 30 seconds, and then dip quickly into cold water. Peel and core. Leave small tomato whole. Halve or quarter larger tomatoes. Pack cooked or raw.</p>	<p>Hot or Raw</p>	<p>45 minutes</p>
<p>Tomatoes, acidified without added liquid</p> 	<p>Follow directions above except when packing press tomatoes in the jars until spaces between them fill with juice.</p>	<p>Raw only</p>	<p>85 minutes</p>

VEGETABLES			
Beans, snap or green 	Wash and trim ends. Cut off snap into 5cm pieces. Fill jars loosely and cover with boiling water.	Hot or Raw	25 minutes
Beetroot 	Sort beetroot for size. Cut off tops, leaving about 6cm of root attached. Scrub beet well. Cover with boiling water until skin slip off easily, 15-20 minutes depending on the size. Peel and trim whole. Cut medium or large beets into 5cm cubes or slices. Cook and pack immediately. Cover with fresh hot water.	Hot only	35 minutes
Greens 	Remove tough stems and midribs. Place about 50g green in a cheese cloth bag and steam about 3 to 5 minutes or until well wilted. Pack loosely and cover with boiling water	Hot only	90 minutes

NB: Select high quality fruits and vegetables for better results

DRYING (SUN)



FRUITS			
PRODUCT	PREPARATION	RECOMMENDED STORAGE TIME	
		20°C	13°C
<p>Apples</p> 	<p>Wash, peel, core and cut into pie slices or rings. Dip in sodium bisulfite solution or lemon juice for 5 minutes. Rinse. Dry</p>	4-6 months	
<p>Apricots</p> 	<p>Wash, halve, and remove pits. Dip in sodium bisulfite solution or lemon juice for 10 minutes. Rinse. Dry</p>	6-8 months	

<p>Bananas</p> 	<p>Wash and remove stems. Dry</p>	<p>4-6 months</p>
<p>Peaches</p> 	<p>Wash, scald to remove skins. Slice into 1.6cm slices. Soak in sodium bisulfite solution or lemon juice for 5 minutes. Rinse. Dry.</p>	<p>4-6 months</p>
<p>Pears</p> 	<p>Wash and peel thinly. Remove core. Slice. Soak in sodium bisulfite solution or lemon juice for 5 minutes. Rinse. Dry.</p>	<p>4-6 months</p>

## VEGETABLES

<p>Beans</p> 	<p>Wash, snap off ends and cut diagonally to expose most surface area into 15 cm lengths. Water blanch 3-4 minutes. Steam blanch 4-6 minutes. Dry.</p>	<p>3-4 months</p>
<p>Beetroot</p> 	<p>Remove tops leaving about 12cm top and wash. Peel. Cut into strips of about 1cm thick. Dry.</p>	<p>3-4 months</p>

<p>Mushrooms</p> 	<p>No blanching required. Cut into 1.6cm slices. Dry</p>	<p>1-2 months</p>	<p>2-4 months</p>
<p>Peppers</p> 	<p>Wash, cutout stem, removes seeds and partitions. Dice or slice. No blanching required. Dry</p>	<p>6-8 months</p>	<p>8-12 months</p>
<p>Tomatoes</p> 	<p>Dip in boiling water to loosen skin. Slice crosswise 1.6cm thick slices. Dry</p>	<p>2-3 months</p>	<p>3-4 months</p>

## NUS TIPS

### HINTS FOR FREEZING

- Select only fresh, high quality ingredients because freezing does not improve food quality
- Slightly undercook prepared foods
- Cool foods immediately before packaging
- Freeze food promptly as soon as is cooled to room temperature
- Put no more unfrozen food in the freezer than will freeze within 24 hours
- Use frozen food within a short time
- Freeze temperature should be maintained at below  $-20^{\circ}\text{C}$

### HINTS FOR PACKAGING

- Use freezer containers or wrappings of moisture/vapor-resistant material
- Pack food compactly into containers
- In quart containers separate food into 2 or 3 layers by a double thickness of water resistant wrapping material
- Choose containers with wide top openings
- Label and date all packages and keep an inventory of all frozen foodstuffs

## CONSERVATION AND SUSTAINABLE USE OF NATURAL RESOURCES (PLANT GENETIC RESOURCES)



Natural resources especially plant genetic resources supply all our food, much of our raw materials and energy and many of our medicines. On the other hand plants are fundamental in stabilizing climate, protecting watersheds, soil and maintaining the chemical balance of the earth and when the key species are lost vital services are disrupted. Therefore, there is a need to conserve and utilize them in sustainable manner.

All stakeholders should join hands to conserve the natural resources in the way they should be useful in the present and the future. Conservation and sustainable use of wild food plants and medicinal plants could improve the local community livelihoods. Many of the plant genetic resources are lost due to a variety of reasons including overexploitation of species in the wild in the form of overgrazing in case of forages and uncontrolled harvesting from the natural habitat of medicinal plants and firewood. The result of which can lead to complete habitat destruction. When one is moving through the major towns of Lesotho lots and lots of medicinal plants can be seen lying to be sold, as a result of uncontrolled harvesting. The exact damage need to be determined but many useful plant are no more found in place where they used to occur while many more are threatened to extinction. It is from this background that the Lesotho Plant Genetic Resources Centre is urging all the users of these valuable plant genetic resources to:

1. Seek permission to harvest medicinal/other plants of value from the authorities (community councils, chiefs, etc.) in charge.
2. Harvest with all care in order to protect your valuable plant genetic material from being lost:
  - do not harvest all the plants you find in the habitat. Harvest few plants and leave some to regenerate, for example if you find five plants, harvest two and leave the other three.
  - do not harvest plants which have already born the seedsif you harvest the roots do not forget to refill the dug hole with soil as this helps other plants to regenerate
3. Individually or in groups establish conservation gardens of these valuable materials
4. Avoid burning pastures because this destroys the plants, their roots and seeds



5. Avoid overgrazing because animals tend to eat other plants when the grass is finished



**6.** All stakeholders (community councils, chiefs, traditional healers, herd boys and the community at large/general public) are urged to work together to conserve these valuable materials.



**7.** Most important, all the people are advised to familiarize themselves with the rules and regulations concerning conservation and sustainable use of natural resources.

## Livestock

Goats and sheep are the third largest source of milk; they produce 524 million tons annually (FAO, 1988). From this source of milk goats produce 8.2 and sheep 9.2 million tons respectively. This comprises about 1.6 percent each of the total milk supply in the world. Dairy goats were introduced in Lesotho from the Republic of South Africa in 2004.

### POPULAR DAIRY GOAT BREEDS

#### TOGGENBURG

It is brown in colour, white line on the face, legs and tail. Male weigh between 70-110kg while female weigh 60-70kg live body weight. It produces up to 5 liters of milk per day and has a little bit higher butter fat content.



#### SAANEN

It is whitish in color, produces up to 7 liters of milk per day. Large 63-77kg for females and males weigh 80-100kg live body weight. It does not prefer hot areas.



## BRITISH ALPINE

Most Alpines are black and white, brown and white, but can have various other patterns. These are medium large breed. However, they are shorter than Toggenburgs. They have dished, or curved face and up right ears. They are popular with dairies due to the amount of milk they produce (produces up to 3 liters per day).



## **BREEDING**

Dairy goats are usually seasonal breeders. Most breeding occurs in late summer through early winter. The goat has an 18-21 day estrus cycle within a breeding season. The doe's estrus lasts from a few hours to two or three days. The gestation period is five months (150 days). Twins are common, but single or triplet births are rare. A doe milks approximately ten months (300 days) following kidding, and then is held dry for two months before her next freshening/milking after kidding down. All year-round breeding is possible if oestrus synchronization is employed, and this helps to ensure milk availability every season of the year. Bucks have a strong musk-like odor during breeding season, but are not offensive with proper management. The doe has no odor at any time. Many small herds do not keep a buck if stud services are available from other local herds. Only bucks from high quality parents should be kept for breeding purposes.

Yearling kids may be bred in the first year at 7-10 months of age, depending on breed and condition, if they have grown well to about 80 lb. and are of good size and condition. Body weight relative to breed is more important than age and can influence lifetime performance. In most cases, many bucklings are fertile by 5 months of age, but successful breeding has occurred as early as three months of age. The doe kid may be able to reproduce at three months of age, but should not be allowed to do so, as her growth may be permanently stunted. To prevent this, buck kids should be separated from doe kids at an early age. If breeding doe kids is postponed much beyond 10 months of age, they will be less productive. Older kids are not as easily settled at first breeding and may have lower lifetime productivity. If males are not intended for breeding castration should be done as early as one month.

## **FEEDING**

Dairy goats need a year-round supply of roughage, such as pasture, browse or well-cured hay (oats, grass, Lucerne, barley, teff). Winter browse and pastures should be supplemented with hay. Milking, breeding and growing stock need a daily portion of legume hay, such as alfalfa. Kids and bucks need a balanced grain ration and milkers should be fed a standard dairy grain ration. Kids are milk fed until two to three months of age, but should be consuming forages such as pasture grass or hay by two weeks of age and grain within four. All dairy goats must have salt and fresh clean water. Mineral supplements are desirable



### **Hay Rack**

Dairy goats have fastidious eating habits and are particular about the cleanliness of their food. Their natural curiosity may lead them to investigate newly found items by sniffing and nibbling, but they quickly refuse anything that is dirty or distasteful.

## HOUSING

Dairy goats are kept successfully in all climates. They do not need elaborate housing, but do require clean, dry, well ventilated, draft free shelter. Dirt pen floors are preferred over cement. At least 15 square feet of bedded area should be provided for each goat. The outside exercise lot should provide a minimum of 25 square feet of space per animal, well-drained and properly fenced. Dairy goats have a strong herd instinct and prefer the companionship of at least one other goat. Bucks should be kept in separate quarters away from milking does.

## MANAGEMENT

Ideally, goats should be dehorned when they are very young. It is advisable to wait until they are 1-2 weeks of age and in good flesh to be sure they are healthy and not coming down with neonatal diarrhea. If discolored skin is fixed to the skull in two rosettes, horn buds are present. Moveable skin indicates a naturally hornless condition.



## DEHORNER

For removing horns on small calves or goats up to about 2 to 4 months of age. Place the cutting edge straight down over the horn; press down and twist first one way, then the other until you cut to the skull, then turn dehorner at 45° angle and shove the cutting edge under the horn.

Hooves should be trimmed frequently to assure proper development of the hoof.



To check the health of goats and determine suspected illness, it is useful to know their normal physiological values. Pulse is about 83 per minute ranging from 50 to 115. Respiration is around 29 per minute with a range from 15 to 50. Body temperature ranges between 38.8°C to 40.2°C.

Keeping good weight records is important for proper feeding and medication, besides good management. Tapes can be used for estimation of weight by measuring the heart girth behind the forelegs. There also exists normal growth curve to age-weight relationships. For large breed male goats, they are in average as follows: 1 month-11kg., 3 months-25kg., 6 months-38kg., 9 months-50kg., 12 months-59kg., 18 months-70kg., 24 months-77kg., 36 months-92kg. For smaller breeds and females, these standards are less, proportionate to the lesser adult body weight.

### **MILKING**

On a worldwide basis, more people drink the milk of goats than any other single animal. A dairy doe should be milked in the same manner as a dairy cow, using good dairy hygiene. Does may be milked by hand or machine. The milk requires the same careful attention to cleanliness and cooling as any other milk.



## WHY CHOOSE GOATS` MILK?



Goat milk has a more easily digestible fat and protein content than cow milk. The increased digestibility of protein is of importance to infant diets (both human and animal), as well as to invalid and convalescent diets. Furthermore, glycerol ethers are much higher in goat than in cow milk which appears to be important for the nutrition of the nursing newborn.

Goat milk tends to have a better buffering quality, which is good for the treatment of ulcers.

Goat milk can successfully replace cow milk in diets of those who are allergic to cow milk.

For those people who experience cows` milk intolerance, goats` milk is an ideal substitute as its nutritional profile is greatly superior to soya or any other possible alternatives.

People who suffer from lactose intolerance with milk, rarely do so with goats` milk.

The natural homogenization of goat milk is, from a human health standpoint, much better than the mechanically homogenized cow milk product. It appears that when fat globules are forcibly broken up by mechanical means, it allows an enzyme associated with milk fat, known as xanthine oxidase to become free and penetrate the intestinal wall. Once xanthine oxidase gets through the intestinal wall and into the bloodstream, it is capable of creating scar damage to the heart and arteries, which in turn may stimulate the body to release cholesterol into the blood in an attempt to lay a protective fatty material on the scarred areas. This can lead to arteriosclerosis.

Many dairy goats, in their prime, average 2.7kg to 3.6kg of milk daily during a ten-month lactation, giving more soon after freshening and gradually dropping in production toward the end of their lactation. The milk generally averages 3.5 per cent butterfat. A doe may be expected to reach her heaviest production during her third or fourth lactation.

## Composition per 100g

(Milk composition will always vary slightly according to species, season and diet)

	Goat	Cow	Human	Soya	Sheep
Water	88.9mg	87.8mg	87.1mg	89.7mg	83.0mg
Fat	3.5mg	3.9mg	4.1mg	1.9mg	6.0mg
Nitrogen	0.49mg	0.50mg	0.20mg	0.52mg	0.85mg
Protein	3.1mg	3.2mg	1.3mg	2.9mg	5.4mg
Carbohydrate	4.4mg	4.8mg	7.2mg	0.8mg	5.1mg
Lactose	4.4mg	4.8mg	7.2mg	0mg	5.1mg

### Fatty Acids

Saturated	2.3mg	2.4mg	1.8mg	0.3mg	3.8mg
Mono unsaturated	0.8mg	1.1mg	1.6mg	0.4mg	1.5mg
Poly unsaturated	0.1mg	0.1mg	0.5mg	1.1mg	0.3mg
Cholesterol	10mcg	14mcg	16mcg	0mcg	11mcg

### Inorganic Constituents

	Goats	Cows	Human	Soya	Sheep
Sodium	Trace	55mg	15mg	32mg	44mg
Potassium	170mg	140mg	58mg	120mg	120mg
Calcium	115mg	115mg	34mg	13mg	170mg
Magnesium	12mg	11mg	3mg	15mg	18mg
Phosphorus	90mg	92mg	15mg	47mg	150mg
Iron	0.12mg	0.05mg	0.07mg	0.40mg	0.03mg
Copper	0.03mg	Trace	0.04mg	0.06mg	0.10mg
Zinc	0.5mg	0.4mg	0.3mg	0.2mg	0.7mg
Sulphur	None	30mg	14mg	None	None
Chlorine	150mg	100mg	42mg	15mg	82mg
Manganese	Trace	Trace	Trace	0.1mg	Trace
Selenium	None	1mcg	1mcg	None	None
Iodine	None	15mcg	7mcg	None	None

## Vitamins

	Goats	Cows	Human	Soya	Sheep
Retinol	44mcg	52mcg	58mcg	0	83mcg
Carotene	Trace	21mcg	24mcg	Trace	Trace
Vitamin D	0.11mcg	0.03mcg	0.04mcg	0mcg	0.18mcg
Vitamin E	0.03mg	0.09mg	0.34mg	0.74mg	0.11mg
Vitamin B1 Thiamin	0.04mg	0.04mg	0.02mg	0.06mg	0.08mg
Vitamin B2 Riboflavin	0.13mg	0.17mg	0.03mg	0.27mg	0.32mg
Vitamin B3 Niacin	0.31mg	0.08mg	0.22mg	0.11mg	0.41mg
Tryptophan /60	0.73mg	0.75mg	0.47mg	0.52mg	1.27mg
Vitamin B6	0.06mg	0.06mg	0.01mg	0.07mg	0.08mg
Vitamin B12	0.1mcg	0.4mcg	0.01mcg	0mcg	0.6mcg
Folic Acid	1mcg	6mcg	5mcg	19mcg	5mcg
Pantothenate	0.41mg	0.35mg	0.25mg	None	0.45mg
Vitamin B7 Biotin	3.0mcg	1.9mcg	0.7mcg	None	2.5mcg
Vitamin C	1mg	1mg	4mg	0mg	5mg
Energy kcal/ kJ	62/257	66/275	69/289	32/132	95/396

**Source:** Holland et al. *Milk Products & Eggs: The Composition of Foods: Sept 4 1989*

## PASTURE

Dairy goats will graze grass pastures, but prefer to browse brushlands and a varied selection of pasture plants, including non-noxious weeds. Dairy goats seldom thrive when tethered. They may be kept in a dry lot if fed adequate roughage and allowed shade and space for exercise. Dairy goats are curious and agile and require well built fences for containment and protection from predators.

In temperate climates, one-half acre of land per milking goat should be plenty. Under arid conditions, people must guard against the danger of overgrazing. Overstocking in temperate climates is also bad for goats, since it increases reinfestation of internal parasites. Rotational pasturing is one of the successful controls.

## HEALTH CARE OF YOUR GOATS

How to take a goat temperature



MERCURY-IN-GLASS AND DIGITAL CLINICAL THERMOMETERS

Wipe thermometer with antiseptic solution- alcohol, iodine or bleach. Shake the thermometer down to below normal, with a quick snap of the wrist.

Be sure not to hit anything as the thermometer breaks easily. Insert the mercury end of the thermometer into the goat's rectum. Wait for two minutes. Remove thermometer, wipe clean and read. Shake down again. Wipe with antiseptic before storing.

### HOW TO DRENCH AN ANIMAL

Liquid medication can be given as a drench. You need a dose syringe. Measure the correct amount of drench. Keep goats head in normal position. Place end of syringe or bottle in left side of mouth on back of tongue. Slowly pour drench into oesophagus.



Drenching Syringe

### HOW TO GIVE AN INJECTION:

#### intravenous injection I.V

Administering of a drug directly into a vein. This should be performed only by a veterinarian.

#### intramuscular I.M

Use 20 gauge 1" needle for adult goats. Use 20 or 22 gauge 1" needle for kids. Insert needle to hub in heavy part of neck or thigh. Draw back on plunger to aspirate for blood. If blood flows into syringe, withdraw needle and replace syringe, withdraw needle and replace into another site.

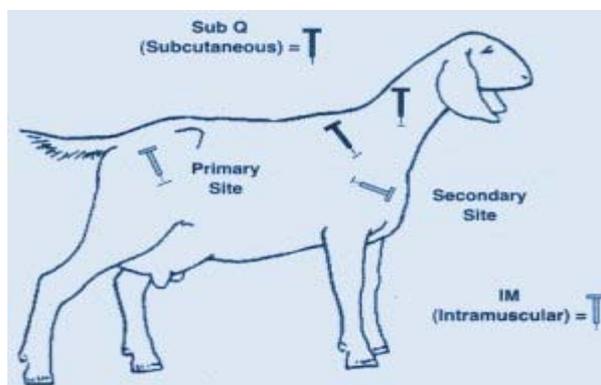
#### Subcutaneous Sub Q

Use the same size needles as for I.M. injections. Lift loose skin of the flank or underneath leg and insert needle in acute angle. Draw back plunger for blood as with I.M. If you see bubbles, the needle may have passed through skin to outside. If performed properly, a belb should appear under the skin to as the plunger is depressed.

#### NOTE:

Always use sterile needle and syringe when giving injections. Boil needles and syringes in water for 20 minutes to sterilize. Always check dosage for goats and for weight of animal. Always check for and follow milk and meat withdrawal times.

Always check dosage for goats and for weight of animal. Always check for and follow milk and meat withdrawal times.



## PRODUCTS

Goat milk is used for drinking, cooking and baking. It is used to make cheese, butter, ice cream, yogurt, candy, soap and other body products. Goat milk is whiter than whole cow milk. Butter and cheese made from goat milk are white, but may be colored during processing. Due to its small fat globules and soft small curd, products made with goat milk are smooth and cream-like. Goat milk is also naturally emulsified.



## GENERAL INFORMATION

The female dairy goat is a doe

The male is a buck/billy goat

Young goats are kids

Castrated male, a wether.

Dairy goats are hardy, gentle, intelligent animals. Their life span is eight to twelve years.

## NORMAL PHYSIOLOGICAL DATA FOR A GOAT

Temperature	38.7 <sup>o</sup> -40.2 <sup>o</sup> C
Pulse rate	70-80 per minute, faster for kids
Respiration rate	12-15 per minute, faster for kids
Rumen movements	1 to 1.5 per minute
Onset of heat (estrus)	6-12 months of age
Length of heat	12-48 hours
Heat cycle	17-23 days-average 21 days
Length of pregnancy	145-156 days-average 150 days

## Need for viable seed sector

One of the major challenges facing Lesotho as the developing country, is to achieve national food security while reducing environmental degradation and the depletion of natural resources.

Quality seed is one of the primary requirements for establishing food security to farmers. Guaranteeing farmers access to quality seed can only be achieved if there is a viable seed supply system achieved through multiplication and distribution of seeds that are well adapted to our environment.

The Department of Agricultural Research (DAR) undertakes initiatives of ensuring that major crops varieties released to our farmers are most appropriate to our agro-ecology, hence improve Basotho livelihoods through attainment of high yields. The recently released varieties include three maize varieties: ZM 521, ZM 421 and ZM 623 with a tremendous yield potential. There are also two beans varieties (pinto and Mkhuzi) and one sorghum multiplied together with the National university of Lesotho (NUL).



Apart from the seed availability, there is need to develop regulatory mechanism such as seed policy and seed legislation that is aimed to ensure availability of structures, human resource personal as well as procedures to be followed in the development of the national seed sector.

Currently the department of agricultural Research in collaboration with the DAOs have engaged Seed Growers to further multiply ZM 421, 623 and 421 as maize varieties in the northern districts (Botha-Bothe, Leribe and Berea) including bean varieties ( Nodak and Mkhuzi) and one sorghum variety (Thakhube), as an initiative funded by the Food and Agricultural Organization of the United Nations (FAO-UN).



Farmers trained as seed growers

### Why these varieties

These varieties have been selected after a lengthy process of breeding (selection and screening). This was carried out under different agro-ecological zones of Lesotho, hence choosing the best performers with high degree of adaptability. The selection was also done on the basis of yield from which the varieties were compared to the locally available maize and beans lines. Can withstand acidic soils, which is currently common in Lesotho.

### Variety description: ZM 521

Maturity: Intermediate maturity. Time to flower/tussle is 66 - 71 days after planting in the mid-altitudes of southern Africa, 60 - 65.

3. days in the mid-altitudes of eastern Africa and 50 - 55 days in the lowlands of eastern and southern Africa.
4. Grain: White semi-dent grain. 14-16 kernel rows per ear.
5. Yield potential: medium to high.
6. Abiotic stress tolerance: selected for tolerance to drought, N stress and low soil pH.
7. Resistance to biotic stresses: moderate to good levels of resistance to maize streak virus, grey leaf spot (*Cercospora zae-maydis*), common rust (*Puccinia sorghi*) and northern leaf blight (*Exserohilum turcicum*)



8. Target environment: mid-altitudes and lowlands of eastern and southern of the country.

The variety has relatively well compared to a number of maize fields in the country, particularly when taking into account the state of drought that has hit the country and the region in recent years.

## Principles of seed production

Seed is alive, hence need to treat it as such for better results. The initial stages of seed production starts with registration of growers to facilitate proper monitoring of the fields. The inspections are carried out to have information about the size of the fields as well as previous field history. The inspections are carried out throughout all the phases of the crop growth to ensure crop uniformity, varietal identity, isolation distance, disease occurrence, cultural practices are well maintained, as well as yield estimates. Inspections can be made during pre-flowering, flowering, post flowering, pre-harvest, during harvest and post harvest. These are done to maintain seed quality.

### Aspects of seed quality

The seed quality consists of three main aspects

- Seed testing
- Seed certification
- Seed legislation

The seed testing is done at the laboratory to test the seed lot for germination, purity and viability. In most cases the acceptable minimum germination percentage is 80 %, anything below this can be considered of poor quality. This service is offered free of charge at the Department of Agricultural Research.

The act of approving a seed lot for further multiplication or for sale is called seed certification. This entails measures such as field inspections, sampling and testing. The certification is based on minimum field achievements and laboratory standards, which have to be backed by legislation.



### Perceived Benefits:

- Basotho farmers are guaranteed of high crop yields
- Improved nutrition
- High domestic income for farmers, growers and seed traders.
- Establishment of good environment for community development
- Seed security, translated into food security
- Reduction in seed and food imports
- Increase in GDP
- Conservation of foreign exchange through reduced imports of food and seed.
- Stable political climate leading to good governance

The seed multiplication is open to both individuals, farmer groups and Non-Governmental Organizations (NGOs), who are expected to produce this seed on a larger scale for commercial purposes under the supervision of the Ministry of Agriculture and Food Security (MAFS) to ensure that principles of seed production are observed. The selected farmers have been provided with breeder seed on an annual basis to ensure that the seed qualities are maintained and gene purity is kept throughout all phases of production. A team of experts closely monitors all stages of crop growth to correct any deviations from the known characteristics observed. The inspections are carried out to allow a learning process to the seed growers and also allow timely correction of malpractices in seed production. Among the most important aspect of seed production is isolation distance between crops of different varieties as closer planting may result in contamination. The minimum distance for maize fields ranges from 300– 500 meters.

### Value addition

The essence of Seed Quality Assurance is to ensure that the project delivers the best quality seed to all the Basotho farmers having in view the presence of other competitors in the seed trade in the sub-region, especially existing companies from the Republic of South Africa. To this end all quality assured seeds are packaged in suitable, attractive and durable packaging materials. The packaging protocols also aim at meeting the demands of a broad spectrum of farmers and other seed users.



### Labels:

For ease of identification of the varieties and for purposes of being fully assured of quality of the products, the packages are labeled with all the relevant information on the label. A tag should always accompany certified packaged seed with germination and purity percentage, as well as date of packaging, variety name and net weight.

### Perceived Benefits:

- Basotho farmer is guaranteed of high crop yields
- Improved nutrition
- High domestic income for farmers, growers and seed traders.
- Establishment of good environment for community development
- Seed security, translated into food security
- Reduction in seed and food imports
- Increase in GDP
- Conservation of foreign exchange through reduced imports of food and seed.
- Stable political climate leading to good governance

## Achievements



An open pollinated ZM variety showing its yielding potential

- More than 100 tones of maize seed.
- 4 tones of bean seed.
- Completed seed policy to guide the sector.
- 73 seed growers (farmers) and 55 extension officers trained in principles of seed production.

A fully fledged pilot project managed by the GOL which eventually emerges as a private seed producing and marketing enterprise, marketing improved high quality seed competitively, locally and exporting to other needy countries.