Republic of Zambia

IFAD
Investing in rural people

MINISTRY OF AGRICULTURE

ENHANCED SMALLHOLDER AGRIBUSINESS PROMOTION PROGRAMME

SOYA BEANS PRODUCTION MANUAL

For Field Extension Facilitators

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CONTENTS

1. INTRODUCTION

Soybean (Glycine max) is an important food legume crop cultivated widely in Zambia at both large and small-scale levels. Soybean is the richest in terms of concentration and protein content among food legumes. Soya bean are also rich in oil. Soya beans is also used as a component of supplementary human food to address severe malnutrition. The remaining cake after industrial oil extraction, known as Soya bean Cake is widely used as a protein and oil source in livestock feed. In soybean production, it is not enough to just plant the seed, wait for rains, and finally expect a good yield. You have to know when to plant, which varieties to plants, which fertilizers to apply, how to manage pests and diseases and indeed many other factors to look at when growing soya beans to make a profit from it.

2. NUTRITIONAL VALUE

NUTRIENT	FUNCTION
Energy	• Supports body processes as the body produces work for normal physical, mental and psychological functioning
Carbohydrate	• Major source of energy for the body
Fats	• They act as an energy reserve • They transport and assist in the absorption of fat-soluble vitamins such as A, D, E and K in the intestines
Protein	• Formation and maintenance of body cells and tissues • Production of antibodies (defense against infection) and enzymes • Formation of hemoglobin, part of blood that carries oxygen
Vitamin C	• Improves body immune system-strengthens body's ability to fight diseases and infection
B vitamins	• Facilitates energy production • Necessary for body growth • Important in the maintenance of nervous system
Vitamin A	• Prevents eye related diseases such as night blindness • Important in fighting infections • Affects growth and development
Vitamin D	• Aids the absorption of calcium, phosphorous and other minerals by the body • Needed for proper bone and teeth development especially in children • Has some anti-cancer properties
Vitamin K	• Prevents excessive bleeding • Stimulates hemoglobin and blood cell production
Calcium	• Involved in bone and tooth formation, muscular contractions, transmission of nerve impulses and blood coagulation
Iron	• Formation of hemoglobin of the red blood cells and cellular respiration
Magnesium	• Involved in formation of bones and teeth • Speeds up energy production in the body • Facilitates movement of nerve impulses and relaxation of muscles
Phosphorus	• Involved in the formation of bones and teeth • Supports release of energy for body functions • It forms part of material that carries genetic information (rna and dna)
Potassium	• Supports normal functioning of body processes by maintaining an acid-base balance • Involved in muscular relaxation • Secretion of insulin in pancreas and hence reduces diabetes
Sodium	• Helps in keeping body fluids at proper levels
Zinc	• Maintains skin, hair and nails in good condition • Development and function of the reproductive organs

3. CROP PRODUCTION

3.1. Land Preparation

3.1.1 Site Selection

Soybean can be grown in a wide range of altitudes ranging from 600m in the valleys to 1,600m on the plateau and highlands as long as adequate moisture is available during the growing season. Optimal temperatures of 20-35^0 C are considered adequate. Germination will fail if temperatures are below 10^0 C and above 40^{0}C. Extremely low temperatures during flowering will not only reduce yield but also the oil content and hence the value of the crop.

Although the amount of rainfall in most areas of Zambia is adequate to support soya bean production, it is the distribution which is most critical. Soya bean yields are adversely affected when moisture is limiting during the reproductive stage.

Soya beans is best suited to soils with a relatively high clay soils and does not do well in weak sands. sensitive to soil acidity and grows well in a close to neutral PH range of 5.5-6.5. it is recommended to test your soils for acidity. Where it is not feasible to have your soils sampled and tested by an expert, there are some simple ways you can test your soil for acidity:

Simple Soil pH test

Requirements:

- Hoe
- Shovel
- Plastic container
- Baking Soda
- Vinegar

Procedure

1. Uniformly divide field based on colour and texture differences of the soil
2. Dig up about 15 – 20cm in each divided section and in a zigzag manner collect soil samples from different parts of your field.
3. Carefully mix the soils collected from the different portions of your field with a shovel.
4. Put some soils into a container and add half cup of vinegar. If the soil bubbles or fizzes, it's alkaline. The chemical reaction that you're seeing occurs when an acid (vinegar) comes into contact with something alkaline (soil).
5. If no reaction occurs, scoop a fresh soil sample into a second container. Add half a cup of water, and mix. Then, add half cup of baking soda. If the soil bubbles or fizzes, the soil is highly acidic. The reaction you're seeing is the result of acidic soil coming into contact with an alkaline substance (baking soda).
6. If your soil doesn't react to either test, it has a neutral pH and does not need any liming.

To correct soil acidity, you may need to apply lime at a rate of 500-1000Kg per hectare or as recommended by an expert.

3.1.2 Land cultivation

Early land cultivation, as soon as the previous crop in the field has been harvested, is recommended to conserve soil moisture. Winter or early ploughing will also minimize labour and mechanical resource demand during the prime crop planting period of November to January. Apart from ploughing, minimum tillage, such as ripping, can also be used in soya beans production and this will aid in the retention of soil nutrition and moisture but entails use of herbicides in weed control. The land should be cultivated to a fine tilth.

Land preparation generally should be completed by the middle of December.

3.2 Planting

Planting should be done between the middle to the end of December. Extended planting up to first week of January is possible in high rainfall areas such as Luapula, Northern, Muchinga, Copperbelt and Northwestern Provinces. However, further delayed planting even if moisture is available leads to yield loss in Soybean and ultimately reduced profitability. This is because soya beans are photosensitive and so flowering is affected by the day-length.

The recommended seed rate is 80-110kg/ha depending on varieties.

The optimum inter row spacing of 50-75cm and seed drilled within the rows is recommended. In drilling ensure that there are about 14 seeds in 50 cm or 28 to 30 seeds in one meter within the row.

3.2.1 Recommended varieties

There are a number of varieties of soybean available on the Zambian market. The choice of the variety is critical in successful soybean production. Choice of the variety depend on different characteristics inherent in the variety. These are yield potential, days to maturity, resistance to pests and diseases, logging and days to shattering. Another important characteristic is whether or not the variety is promiscuous. Promiscuous varieties are those that do not require artificial inoculation. The Non-promiscuous are those varieties that require specific rhizobium inoculum.

Variety	Days to Maturity	Days to Shattering	Yield/ha
Lukanga	130		4.0
Magoye	130	7	2.0
Mwembeshi	125		4.0
Hernon 147	120	10	2.0
Kaleya	115	18	3.0
Kafue	110		4.0
Dina			4.0

3.2.2 Soybean Inoculation

Like most leguminous plants, soya beans form nodules on its roots which house bacteria known as Rhizobium. It is this bacterium which is responsible for nitrogen fixation in the soybean roots. This nitrogen is useful for the soybean growth. Different soils contain different levels of rhizobium bacteria species. Some soybean varieties are able to use different species of rhizobium bacteria to nodulate their roots. These varieties which do not choose the bacteria species in order for them to nodulate are hence called Promiscuous varieties. Those which will nodulate only when a specific species is present in the soil are called Non-promiscuous. Prior to planting, the Non-promiscuous varieties are seed dressed with artificial rhizobium bacteria to enable them nodulate. When this is not done poor yields can result. When nodulation is properly done, little or no top dressing of nitrogenous fertilizers is required in Soybean production. This will not only reduce the costs of your inputs but also increase yields and ultimately your returns from the crop.

3.3 Fertilizer Application

On average, 1 x 50kg D Compound is applied per Lima or 4 x 50kg/ha. Since soya beans are able to fix their own nitrogen, little or no top dressing may be required. However, ensure that the non-promiscuous varieties such as Kaleya and Santa Rosa are inoculated. In northern Zambia, the soils are generally acidic and therefore lime application is imperative. The rate of lime application will depend on results of soil analysis.

3.4. Rotation

The cereal/legume rotation type has shown to be very successful in soybean production. This is because:

- It reduces the incidences of pests and diseases through breaking the life cycles of causal organisms and thus reduce expenditure on agrochemical for control and treatment of pests and diseases;
- The soybean benefits from the residual Basal fertilizers from the previous cereal crop and;
- The cereal benefits from the nitrogen fixed by the soybean, thereby contributing to increase in the marketable volume of the cereal through increased yields.

3.5. Weed management

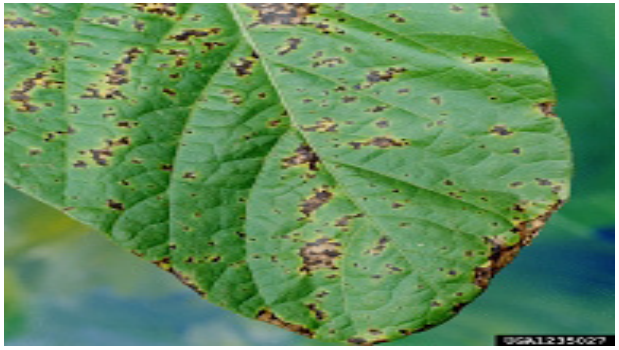
During the first 7 weeds, the soybean field need to be kept free of weeds. Hand hoeing, rogueing and chemical weed control are the methods used to control weeds. In short, an integrated approach towards weed management is recommended. This entails the use of optimal row spacing of not more than 60cm which will make soybean plants suppress weeds. In addition, correct plant population arising from the correct seed rate indicated earlier and crop rotation will constitute a good cultural practice programme to manage weeds.

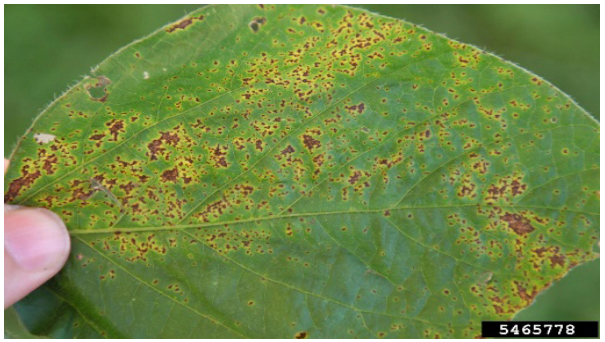
Chemical control measures used either as Pre-plant or pre-emergency using broad-spectrum (non-selective) herbicides such as glyphosate can be done. This can later be followed by a selective herbicide. Always read labels before using agricultural chemicals. Therefore, use the application rates as indicated on the product label. Factors affecting choice of herbicide are:

1. Type of weeds present in the field
2. Stage of crop growth
3. Stage of weed growth
4. Herbicide residual effect and crop rotation considerations
5. Herbicide costs

3.6. Crop Protection

PEST/DISEASE	SYMPTOM	MANAGEMENT
 Frog eye	-caused by a fungus called Cercospora sojina is primarily a foliar disease of soybean. -The lesions are circular to angular. Lesions on the leaf upper surface appear as brown spots surrounded by a narrow red or dark reddish-brown margin.	-Management of this disease is primarily by avoidance. Thus, the use of tolerant varieties, the use of clean certified seed (since disease is also seed borne) - Crop rotation with non-bean crop. It is also important to destroy or bury under crop residues where the causal fungal organism may over winter. -You can also spray with fungicides at a rate indicated on the label.
 **Red Leaf Blotch**	-Caused by a fungus Pyrenochaeta glycines responsible for severe leaf blotching and defoliation of up to more than 50%. It causes lesions on the leaf, petioles, stems and pods throughout the growing season i.e. from December to April. Lesions appear on the primary veins. At first, they appear reddish to brown, circular and then angular along the veins. Diseased plants may drop leaves and eventually die back few days before maturity. .	Control is by use of tolerant varieties and the use of copper-based fungicides.

PEST/DISEASE	SYMPTOM	MANAGEMENT
 Soya beans Rusts	The disease is caused by a fungus and affects soybean and other leguminous crops. In the early stages yellowish mosaic discoloration appear on the upper surfaces of older leaves. As the disease progresses the leaves turn yellow on the under surfaces with petioles, stems and pods also being affected. Premature defoliation later follows. Soybean rusts are usually confused with other diseases particularly bacterial pustules. The difference is that soybean rusts have pustules which are not surrounded by a yellow halo as is the case with bacterial pustules. In addition, soybean rust pustules are raised and usually found on the underside of the leaves. The disease is favored by a warm and humid environment as is the case in northern Zambia especially during the rainy season.	Management of the disease using cultural practices like crop rotations and row spacing is very limited. Disease tolerant varieties are also not available. The major option is the use of fungicides applied as both preventive and curative.
 Bacterial Blight	-Characterized by small angular lesions which appear water-soaked at the centre and surrounded by a greenish-yellow halo. -Lesions or spots joint or coalesce to form bigger dark-brown necrotic areas with yellow margins. -The spots are usually scattered over the whole leaf blade or are grouped, resulting in irregular lesions. When the disease advances, spots dry out and fall out. The disease also affects stems, petioles and pods. If infected, Seedlings can become stunted and die.	The disease can be managed by cultural practices through the use of clean certified seed, rotation with non-legume crop and spraying with copper-based fungicides such as Copper oxy chloride and metalaxyl.

PEST/DISEASE	SYMPTOM	MANAGEMENT
 Bacterial Pustule	The symptoms begin as small light green spots on both surfaces of leaves. Light-coloured pustules (or blisters) form in the lesion centres particularly of leaf undersurfaces. Pods are also affected showing small raised spots. - form tiny tan bumps on the undersides of leaves. .	Plant resistant varieties and use pathogen-free seed to help manage bacterial pustule. Rotate soybeans with non-host crops. Plowing may be beneficial in fields where bacterial pustule is common. Avoid field cultivation when the foliage is wet
 Soyabean Stem Rot	-Characterised by wilting and eventual death of upper leaves at reproductive stage. -Leaves become brown but still remain attached to the stem. Symptoms appear 50cm above ground, with water-soaked lesions at the nodes which change from tan brown to white showing mycelial growth hence also known as white mould disease. -These white moulds may also attack the pods.	1. Use of clean certified seed 2. Avoiding high plant population which favour disease transmission 3. Deep burying crop residues to over 15cm 4. Field sanitation by keeping field free of weeds 5. Encouraging the soya bean – cereal rotation 6. Combining herbicides with fungicides during weed chemical control.

PEST/DISEASE	SYMPTOM	MANAGEMENT
 Stink Bugs	Stink bugs are brown to blackish in colour. The shield like body is characteristic of other stink bug species. It is an agricultural pest attacking apart from soya beans, fruits and vegetables. It is a sucking pest which uses its mouth parts to pierce the host plant. This results in leaf damage, seed loss and transmission of diseases. It derives its name from the strong odour it emits.	Fastac insecticide is able to control it.
 Soyabean leaf looper caterpillars.	Leaf looper caterpillars are 2-4 cm, green caterpillars which arch themselves as they move. They feed on the leaves leaving small to big windows and frass or droppings. When scouting search for larvae underneath leaves. Concern should be raised once 2-4 caterpillars per 5 plants are observed.	To manage the loopers, conserve natural enemies by providing them with energy source such as nectar, avoiding indiscriminate use of broad-spectrum insecticides. Such natural enemies include parasitic wasps. Plough the field to expose larvae to predators. Clear surrounding of weeds which might harbor the pest. A soapy solution can kill the caterpillars. In this regard dissolve 7g bar soap in 1-liter water. The resulting solution can be used to sprayer on the loopers. Cypermethrin, deltamethrin and lambda-cyhalothrin can be used with restrictions. All these are WHO class II i.e. moderately hazardous and with 2 days post-harvest interval.

PEST/DISEASE	SYMPTOM	MANAGEMENT
 Cutworms	Cutworms are 2-4cm in length and normally appear C-shaped. These are thick, soft larva found around damaged plants. Control measures should immediately commence once 3% or more of plants are damaged.	Control can be done by chopping 30-40 hot pepper and immersing in 10 litre of warm water. The liquid is left to sleep for 1 day. Sieving is then done and diluted in 10-liter cold water. Hand washing soap is added (as a sticker). The resulting liquid is then put in a sprayer and sprayed around the plant basins until soil is wet. Synthetic chemicals such as Dursban can also be used as per product label instructions.

3.7 Labour Management Practices.

Labour management in soya beans production is very critical. Poor labour supervision has been known to lead to low production and productivity. Poor labour utilization can lead to poor land preparation, poor plant population, poor chemical control and poor harvesting. At harvesting, untimely and incorrect labour utilization result in shattering of soya bean pods. All these leads to poor yields.

Resource Mobilisation

This is critical because it entails timely planning so that implementation of the soya bean enterprise is successful. If this is not timely done, it may lead to:

- Late land preparation
- Late planting
- Reduced area under cultivation
- General late implementation of critical management schedules

Therefore, all necessary resources need to be in place well in advance

4. HARVESTING AND POST-HARVEST HANDLING

Timing of Harvesting

When 95% of soybean leaves turn yellow to brown harvesting should commence. If harvesting does not start in good time, the mature soybean pods may shatter thereby releasing soybean seeds on the ground causing serious yield losses.

Harvesting Techniques

Better quality seed is achieved when harvesting is done by hand, however, this can prove to be laborious especially with larger hectarage. Under bigger hectarage combine harvesters can be used. It is possible for small-holder farmers to co-own such machines for labour saving purposes and weaning for commercialization.

Threshing, shelling and winnowing

Threshing is the removal of grains from the pods. This is achieved by piling harvested plants on concrete floor or mats or tarpaulin and then beating lightly. The result is soya beans grains mixed with crop debris, soil, small stones and broken soya beans grains. Winnowing is then done to clean the grains and minimise exposure to pests and diseases

Drying

Cleaned soya beans grains are dried to up between 10-12% moisture content. This is done by exposure to sunlight for several days. If the moisture content is high, then the stored grain can easily be attacked by pests and diseases in storage.

Storage

Prior to storage, grains are packaged either in polythene or cotton fibre bags. In storage, bags are stacked on raided wooden platforms to avoid direct contact with the floor. The distance between the top of the stack and the storage roof should not be less than 1 metre. Care should also be taken to ensure that the stack does not touch the storage walls. For commercial grain, ensure that the soya beans are not attacked by storage pests. For grain seed, ensure that the seed viability is not lost by ventilating the storage structure.

Depending on variety, soybean yields range from 2 to 4 ton/ha.

5. VALUE ADDITION

Sorting and Grading

Clean and uniform soya beans grains will fetch a higher price than those that are dirt and unsorted. Therefore, sorting and grading is a must for farmers who are doing farming as a business.

Packaging

Well sorted, clean and uniform soya bean grains can be packaged and branded. This brand can be associated to a particular farmer or organization.

Processing

The soya beans grains are processed commercially to various products such as cooking oil and margarine. The processed soya beans grain residue is a by-product known as Cotton Seed Cake- an important component of livestock feed.

At community level however products such as SOYA HEPS (an important human diet supplement), Soya scones, Soya Milk and various Soya flour blends can be made.

6. MARKETING

Market Research

Before selling, it is important for farmers to find out where and at what price they will need to sell their soya beans. They will need to have good analytical skills to decide which market they will finally choose considering the prices and distances to difference market locations. In this regard, the highest price offered may not necessarily be the best option for them.

Market Linkages

Formal arrangements may be between soya beans farmers and buyers. This is important to ensure ready market and commodity marketing sustainability. These buyers may be traders or processing companies.

Bulking

Farmers can agree to collect all their soya beans for sale and put them at an agreed location. This has a number of advantages for both the traders/buyers and the farmers:

- It is easier for traders to just go to one location and buyer good quantities rather than moving from one place to another.
- The farmers bargaining powers is increased because they will speak with one voice
- It is easier to know what quantities are available in a given location.

7. RISK MANAGEMENT

Production

There are a number production risks or hazard which if they occur may impact negatively on the farmer. These need to be considered by the farmer so that they plan for them in case of such eventualities. Examples of risks associated with production include:

- Weather- drought, floods, storm
- Source of funds – unavailability of credit, unavailability of grants,
- Unavailability/poor quality inputs

Marketing

Marketing risks are associated with price volatility arising from changes in demand and other reasons.

8. RECORD KEEPING

Farm Record keeping is a process in which data or information about your farming enterprise is systematically collected, organized and stored for use at some later date. Farm records help the farmer recall the activities done on the farm and how they were done. Farm records can also include off-farm information related to the farming enterprises such as input prices and market prices of produce.

This information found in farm records can be used to assess the productivity and profitability of the farm enterprises. They therefore help in examining the farm, planning and making decisions on how best to run the farm. Every farm being run as a business needs to have good records and should not rely on memory for decision making.

Why keep Records

Records are very important on the farm as they help in:

1. Tracking or keeping history of farm activities, production levels, farm expenditures and returns from season to season
2. Assessing and adjusting your production practices for increased productivity
3. Assessing the profitability of your farming enterprises
4. Determining the best use of available resources
5. Accessing credit for investment in farm enterprises
6. Budgeting and planning farm activities
7. Adherence of farm to legal responsibilities e.g. payment of land rentals, tax returns, loans, wages etc.
8. Giving accurate information to government or other institutions when asked such as during crop forecast surveys. This information is used in the formulation of policies that may affect agricultural production and marketing.

Tips on How to Maintain good Farm Records

Farm records can be simple and do not need to be complicated. The following points can assist in addressing some common challenges faced by farmers in record keeping:

CONSTRAINT	SOLUTION
Cannot read and write	Use pictorial illustrations Ask for assistance from literate household member or neighbor. ***Note: records can also be written in local languages***
Forgetting to record	Records should be written immediately an activity or transaction happens (extension staff to assist farmers by reminding them)
Tiredness after day's work	Record book should be carried along and written as activity is done. Where feasible, carry a literate child to help in writing.
Loss/misplacement of papers where records are kept	Have a file, folder or book where records are kept, avoid writing on pieces of paper. Have a different book for each type of record being kept for ease use of information when needed. Keep records in a secure dry place.
Discouraged by low productivity levels	Solutions to low yield challenges can only be found by extension staff by analyzing the accurate records of farm production steps and processes.

Note: Records should be kept on produce used for home consumption, given out or donated to events such as ceremonies as they information is important in assessing farm productivity and the total potential income of the farming enterprises.

Types of Records

A farm business can have many types of records. The following are the most important records to keep on the farm;

1) **Physical Records:** They contain information that directly affects the farm productivity and are meant to control specific activities. Physical records show the quantity of inputs used, timing and method of farm operations and the output obtained. These records include the farm map, crop production records, labour records, machinery and equipment records and marketing records.

    a. **Production records –** They contain information on how the enterprise or farm is performing. They contain information on inputs used and yields. They aid in decision making on whether farmer can make any changes to increase the productivity of the enterprise or farm.

    b. **Labour Records:** They provide information on how the labour is utilized on the farm such as the number of people required for each activity and the number of hours each one will spend on the activity. This helps the farmer to understand the labour requirements of each activity and how long it will take for the activity to be completed. Timely execution of activities will affect the productivity of the crop enterprise.

2) **Home Consumption Records:** These contain information on farm products that have been used for non-farm enterprise related activities such as home consumption, gifts to relatives, contribution to traditional ceremonies etc. They may also contain information on produce that has been lost or spoiled after harvest. The main purpose of these records is to ensure that produce not sold but used for other non-farm enterprises is valued as their value is important in determining the productivity and profitability of the farm.

3) **Financial Records:** They contain information on the farm's expenses, income and the value of goods and services on the farm. Financial records are used to assess the financial performance and overall profitability of an enterprise or the whole farm**.** Examples include sales records, expenditure records, cashflow statements and gross margins.

a) Cash inflow records: They provide information on the sources of income of the farm especially from the sale of farm produce.

b) Cash outflow records: they are also known as farm expenses records. They contain information on all activities that require the farmer to spend money such as buying of inputs or payments for services.

c) Profit and loss Records: They help to keep track of profits and losses over a specific period of time. For crops, this is usually for a cropping season, that is, from land preparation to marketing of a crop.

d) Fixed asset Records: They contain information on the capital or fixed items that are owned by the farm such as tractors, ploughs, hoes, oxen etc. Each item includes the date of purchase, purchase price and the life of the item.

APPENDICES

1. SAMPLE RECORDS TEMPLATES

CROP PRODUCTION RECORD						
S/no	***Name of Crop***	***Date of Planting***	***Area planted (Ha)***	***Expected Yield/ha***	***Total Expected Harvest (tons/kgs/bags)***	***Actual Harvest (tons/kgs/bags)***
1	Rice (Supa Mg)	3rd December 2016	1.5 ha	2000Kg/ha	3000Kgs	2500Kgs
2	Soya Beans (Lukanga)	21st December 2016	2 ha	2500Kg/ha	5000Kgs	5300Kgs

LABOUR RECORD					
Enterprise: 1 ha of Cowpeas					
S/no	***Date***	***Activity***	***Number of People Working***	***Number of hours taken/ person***	***Total Number of hours taken***
1	Land preparation	2	2	1	2

Home Consumption Records

Enterprise: Beans (Mbereshi)

S/no	*Date*	*Consumed Item*	*Quantity*	*Unit Price*	*Total Value*	*Comments*
1	03-03-18	Beans	2 meda	K35/meda	K70	contribution to bana chimbusa's funeral
2	05/04/1/18	Beans	1 meda	K35/meda	K35	home consumption

CASH INFLOW RECORDS

Enterprise: Groundnuts

S/no	*Date*	*Sales/ Cash inflow*	*Total Income*	*Comments*
1	31-03-17	Sold groundnuts	K80	sold 4 medas of fresh groundnuts at price of K20/ meda at the market
2	17-05-17	money from daughter	K1000	Received money from daughter in Lusaka to purchase 300 empty grain bags

CASH OUTFLOW RECORDS

Enterprise: Groundnuts

S/no	*Date*	*Item*	*Total Expenditure*	*Comments*
1	21-11-16	Seed Purchase	K1,120	Bought 80Kg of Chalimbana seed at 140 per 10kg bag
2	05-01-17	School fees	K800	Paid school fees for son in Grade 10

PROFIT AND LOSS RECORD

Enterprise: 1 Ha of Soya beans for the period 1st October 2016-30th September 2017

S/No	Item	Quantity	Unit Price or Cost (K/unit)	Total (K)
	Income			
	Sales			
	Home Consumption			
	Other			
	Total Income (a)			
	Expenses			
	Seed			
	Inoculant			
	Fertilizer			
	Pesticide			
	Herbicide			
	Fungicides			
	Land preparation			
	Ploughing			
	Planting			
	Weeding			
	Harvesting			
	Total Costs (b)			
	Profit/loss (c=a-b)			

2. SAMPLE GROSS MARGIN BUDGET

Assumptions	
Distance to Market	75km
Producer price	K4,750/ton
yield	0.75 tons and 1.75 tons/ha
Transport	$0.20/km/ton

		Small Scale			Medium		
ITEM	**UNIT**	**RATE/ha**	**Unit Price**	**Amount /Ha**	**RATE/ha**	**Unit Price**	**Amount /Ha**
Income							
Soya grain	Tonnes	0.75	4,750	3,563	1.75	4,750	8,313
				3,563			**8,313**
Variable Cost							
Seed	Kg	70	20	1400	80	20	1,600.00
Herbicides							
Glyphosate	litres	3	90	270	3	90	270
Stellar Star	Litres						
Insecticides							
Lambda Cyhalothlin	Litres				1	140	140.00
Malathion					2	25	50.00
Fungicides							
Copper oxychloride	Kg				2	50	100
Metalaxyl	Kg	0	0	-	1	120	120.00

Assumptions							
Distance to Market	75km						
Producer price	K4,750/ton						
yield	0.75 tons and 1.75 tons/ha						
Transport	$0.20/km/ton						
		Small Scale			**Medium**		
ITEM	**UNIT**	**RATE/ha**	**Unit Price**	**Amount /Ha**	**RATE/ha**	**Unit Price**	**Amount /Ha**
Land Preparation							
Fuel	litres						
oil	litres						
Ploughing	Ha	1	320	320			
Ripping	Rows			0	1	250	250.00
Labour	Man-days	70	20	1400	50	20	1,000.00
Packaging	Bags	15	3	45	35	3	105.00
Transport	ton/km	56.25	2.5	140.625	131.25	2.5	328.13
Irrigation							
Electricity	$0.98/mm applied						
Fertilizers							
D Compound	Bags				4	295	1,180.00
Inoculant	grams				80	0.08	6.40
Insurance	% of TR	0.70%					
Total Variable Costs (TVC)				**3,575.63**			**5,149.53**

Assumptions							
Distance to Market	75km						
Producer price	K4,750/ton						
yield	0.75 tons and 1.75 tons/ha						
Transport	$0.20/km/ton						
		Small Scale			**Medium**		
ITEM	**UNIT**	**RATE/ha**	**Unit Price**	**Amount /Ha**	**RATE/ha**	**Unit Price**	**Amount /Ha**
Interest	% of TVC	6%		214.5375	6%	5404.53	324.2718
TVC + Interest				3790.1625			5,473.80
Gross Margins				-228			**2,839**
Fixed Costs	**% (TVC +Interest)**	**30%**	**3790.16**	**1137.048**	**30%**	**5,728.80**	**1,642**
Total Costs	**FC +TVC + Interest**			**4927.2105**			**7,115.93584**
Return to Management				**-1,364.71**	**TI-TC**		**1,196.56**
Break-even price	**ZMK/ton**			**6,569.61**			**4,066.25**
Break even yield	**Ton/ha**			**1.04**			**1.50**

3. INDUSTRY SET SOYA BEANS STANDARDS

(Note: these are not part of the adopted Zambia Bureau of Standards (ZABS) but are agreed general guidelines by industry players. They are not mandatory but conformity to them may increase market access and price of soya beans)

QUALITY SPECIFICATIONS OF SOYA BEANS

QUALITY PARAMETERS	UOM	GRADES		
GRADES		**A**	**B**	**C**
Moisture	%	12.0 Max	12.0 Max	12.0 Max
Extraneous Matter	%	1.0 Max	2.0 Max	3.0 Max
Split Beans	%	6.0 Max	8.0 Max	10.0 Max
Total other Defective Soya Beans	%	9.0 Max	11.5 Max	14.0 Max
Soya Beans Below the 4.75mm Sieve	%	10.0 Max	10.0 Max	20.0 Max
Soya Beans Below the 3.35mm Sieve	%	6.0 Max	6.0 Max	12.0 Max
Oil	%	18.0 Max	16.0 Min	14.0 Min
Protein	%	36.0 Max	33.0 Min	30.0 Min

a) Moisture Content is determined by an approved moisture meter calibrated according to a method prescribed by the Zambian Bureau of Standard

b) (i) Extraneous Matter includes soya beans and pieces of Soya beans which passes through a 4.75mm sieve

(ii) All matter other than Soya beans and pieces of Soya beans which will not pass through 4.75mm sieve

c) Defective Soya Beans are soya beans retained on a 4.75mm sieve after sieving which fall within one or other of the following categories

1) Discoloured soya beans either by heat due to fermentation

2) Germinated soya beans are the beans in which the process of germination is visible within the embryo

3) Weather damaged soya beans is the beans in which the seed coats are discoloured by weather damage on one side or both sides

4) Infected Soya Beans is soya beans and pieces of soya which show any sign of diseases, fungus or virus infection

5) Immature Soya beans is soya beans and pieces of which are markedly shriveled over more than half their area or which in cross section show an intense green colour

6) Pest – damaged soya beans is soya beans and pieces of soya bean which are visibly damaged by insects, birds or rodents

7) Split Soya beans are beans remaining on a 4.75mm sieve after sieving, which are not defective, and include mechanically damaged soya beans that are likely to split in handling