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Republic of Uganda

Adaptation for Smallholder Agriculture Programme
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Investing in rural people

PRELNOR

Groundnuts

Curriculum and Technical Guide for Farmer Field and Business School Facilitators








2018

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GROUNDNUTS

INTRODUCTION

Groundnut (*Arachis hypogaea* L) is an important staple legume food grown on nearly 413,000ha representing 4.0% of the total arable land in Uganda (Deom and Okello, 2018; Okello et al., 2010). On-farm dry pod yields are low, averaging 320 kg/acre, compared to on-station yields of 1,200kg/ acre. The yield gaps are attributed to biotic (pests and diseases), abiotic (drought, flood), Limited information on available technologies, cultural and political factors. Sales from raw produce could potentially generate $440 million to the producers who are largely resource poor small-scale farmers. Since the 1920s, research efforts have released 24 varieties with their technology dissemination packages, the most recent commercial varieties being the Serenut 1-14 series. These varieties and their technology dissemination packages have alleviated some of the production problems. However, diversed agroecologies, land tenure systems, diverse market preferences, and emerging stresses call for continuous research leading to release of new varieties (Deom and Okello, 2018). Slow adoption of current technologies and limited information flow in the research and development chain calls for an innovative approach to address this issue. This guide provides information about the available technologies and their dissemination packages to be used by Extension agents as they bridge the gap between research and farmers.

Contents of the curriculum

The curriculum consists of training modules divided into units indicating the topics, objectives, contents, methods of delivery and training materials required. A time schedule is allocated for each topic to enable the facilitator to plan appropriately for each session.

Course content

TIME (HOURS)		TOPIC	OBJECTIVE	CONTENT	METHOD	MATERIAL
THEORY	PRACTICAL					
30 min	1hr	Introduction	To appreciate groundnut production	The importance of groundnut	• Sharing • Group discussion • Practical • Demonstration	• Flip chart • Markers • Print out • Brochures
30 mins	45 mins	Record keeping	To be able to keep proper records	Importance of record keeping	• Brainstorming • Group discussion • Demonstration	• Samples of records
15 mins	45 mins	Constraints in groundnut production	To be able to identify constraints in groundnut production	Constraints in groundnut production	• Brain storming • Sharing • Group discussion	• Flip chart • Markers • Pens • Notebooks

15 min	15 min	Varieties of groundnut	To be able to identify different groundnut varieties with their attributes	Identification of groundnut varieties and their attributes	• Brainstorming • Group discussion • Practical • Demonstration	• Variety samples • Note books • Pens
15 mins	20 mins	Seed selection	To be able to select good quality groundnut seeds for planting.	Attributes of good groundnut seeds for planting	• Discovery • Group discussion • Practical • Demonstration	• Demo plot • Different groundnut seed samples
20 min	30 mins	Seed rates	To be able to determine appropriate seed rates and spacing for groundnut.	Determining the quality of seed and plant population for groundnut by plot size	• Discovery • Practical • Demonstration	• Demo plot • Groundnut seeds • Note books • Strings • Measuring tape • Farm tools

30 min	15 min	Site selection	To be able to select suitable sites for planting groundnut	Selection of suitable sites for groundnut production	• Brainstorming • Practical • Demonstration	• Demo plot • Farm tools • Note books • Pens
15 min	40 mins	Crop rotation	To be able to design a crop rotation programme for groundnut	Planning crop rotation for groundnut	• Discovery • Practical • Demonstration • Group discussion	• Demo plot • Note books • Pens • Flip chart • Markers
30 min	1hr	Land preparation	To be able to prepare land suitable for planting groundnut	Different methods of land preparation for groundnut	• Brainstorming • Practical • Group discussion • Demonstration • Group discussion • Sharing	• Hand tools, • Ox plough • Tractors • Demo plot • Note books • Pens

15 mins	30 mins	Planting groundnut	To be able to plant groundnut using different methods at recommended depth	Different methods of planting groundnut.	• Discovery • Practical • Demonstration	• Demo plot • Groundnut seeds • Strings • Rhizobium
40 mins	1 hr 15 mins	Soil fertility management and fertilizer requirements for groundnut	To be able to manage soil fertility in groundnut field To be able to identify suitable fertilizers for planting groundnut	Soil fertility requirements for groundnut Types of fertilizers and rates required in groundnut production	• Brainstorming • Group discussion • Practical • Demonstration	• Demo plot • Soil conditioners • Demo plot • Organic and inorganic fertilizer samples • AESA sheet • Pens • Notebooks

30 mins	1 hr	Weed management	To be able to manage weed infestations in groundnut.	Methods of weed management in groundnut	• Brainstorming • Practical • Demonstration	• Demo plot • Weed specimens • AESA sheet • Pens • Notebooks
20 mins	1 hr	Disease management in groundnuts	To be able to manage the different diseases in groundnut field.	Methods of disease management in groundnut	• Brainstorming • Practical • Demonstration	• Demo plot • Diseased samples in the field • Fungicides • Pesticides for aphid control • Spray pump • Protective gear • AESA sheet • Pens • Notebooks

20 mins	1 hr	Pest management in groundnut field.	To be able to identify and control different pests of groundnut.	Identification of different pests of groundnut Methods of pest management in groundnut	• Brainstorming • Practical • Demonstration	• Demo plot • Insect box • Spray pumps • Protective gear • Samples of chemicals for pest control • Pens • Note books • Flip charts • Attendance sheets • AESA sheet
20 mins	1 hr	Harvesting groundnut	To be able to determine time of harvesting groundnut.	Time of harvesting groundnut	• Discovery • Sharing • Practical • Demonstration	• Demo plot • Markers • Pens • Notebooks • AESA sheet • Tarpaulin • Bags • Transport

30 mins	1 hr	Plucking groundnuts	To be able to pluck groundnut appropriately.	Methods of plucking groundnuts	• Discussion • Practical • Demonstration	• Physiologically mature groundnut plants • Tarpaulin • Mats • Bags
15 mins	30 mins	Post-harvest handling	To be able to handle groundnut after harvesting.	Post-harvest handling methods of groundnut	• Discussion • Practical • Demonstration	• Demo plot • Tarpaulin • Transport
20 mins	1 hr	Drying groundnut	To be able to determine the appropriate moisture content for groundnut.	Methods of drying groundnut Determination of the required moisture content of groundnut	• Brainstorming • Practical • Demonstration	• Drying yard • Tarpaulins • Moisture meter

25 mins	30 mins	Packaging	To be able to package groundnut appropriately.	Suitable methods of packaging groundnut	• Discussion • Practical • Demonstration	• Samples of packaging materials
30 mins	1 hr	Storage	To be able to store groundnut appropriately.	Different methods of storing groundnut	• Discussion • Practical • Demonstration	• Stores • Silos • Groundnut • Pallets • Bags
30 mins	1 hr	Shelling of groundnuts Marketing groundnut	To be able to market groundnut profitably.	Marketing groundnut Profitability analysis for groundnut	• Discussion • Practical • Demonstration	• Flip charts • Markers • Pens • Notebooks

SUMMARY INFORMATION ON GROUNDNUT TECHNOLOGIES

Importance of groundnuts

- Source of food and food security(oil, Vitamins, Minerals and protein)
- Household income when sold
- Fodder (cake)
- Green manure and cover crop
- Groundnuts improve soil fertility by fixing nitrogen

Challenges in groundnut production

- Pests and diseases
- Climatic changes
- Declining soil fertility
- Knowledge gaps in production
- Post-harvest losses
- Accessing quality seeds

Groundnut varieties

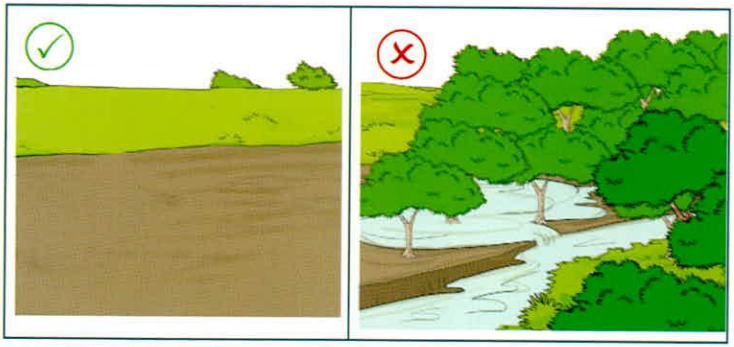
	Brief Attributes			
	Serenut 5R		**Serenut 6T**	
Yield (kg/ha)	2500 - 3000		2500 - 3000	
Maturity Days	100 - 110		90 - 100	
Others	• Short dormancy period (30 days), • Good attractive red colours, • Confectionery type, • Serenut 3R replacement, • Shelling 65 %, • Fat 42%. Protein 32%, • Resistant to rosette, spreading type, short plant		• Very tall bunchy, • Easy to harvest and shell, • Shelling percentage 66%, • Seed size medium to large, • GRD resistant, • Serenut 4T replacement, • Fat 41%, Protein 32%	

	Serenut 8R		Serenut 9T	
Others	• Bunchy, easy to harvest, deep red attractive market colour, with dark strips on the seed, oval, uniform seed lots, drought tolerant, good for butter, Resistant to rosette		• Oval, big seeded, very sweet, tolerant to thrips attack, leaves bend downwards, flag leaves yellow, Aflatoxin tolerant, venation on seed more pronounced/ dark, slightly oval, Resistant to rosette	
Yield (kg/ha)	2500 3700		2500 3700	
Maturity Days	100 110		100 110	

	Serenut 11T		Serenut 14R	
Others	• Rounded, giant pods/ seeds, very sweet, confectionery type, leaves parallel, flag leaves green, venation on seed less pronounced, short and spreading, Resistant to rosette		• Tall, erect plant, easy to harvest and shell, confectionery type, sharp seed tip, round/ less oval, stripes on seed light red, Resistant to rosette	
Yield (kg/ha)	2500 3700		2500 3700	
Maturity Days	100 110		100 110	

SITE SELECTION

- The best soils are deep well drained sandy loams or loamy sandy soils and moist throughout the growing season, and with reasonable fertility levels.



- Avoid soils in areas that are water logged.
- Avoid virgin land, they promote mould growth.
- Follow correct rotation. Groundnuts should follow cereal/ grass type crops. Groundnuts should not follow legumes.
- A rotation of 3 years or longer is recommended. It breaks build up of pests and diseases.

LAND PREPARATION

- Start by bush clearing, removing trees and shrubs
- Plough land twice and if still necessary disc to get fine seed bed for good germination and pod development.



First ploughing



Second ploughing

- Land preparation should lead to a fine seed bed for easy pegging. Three ploughing operations, for example, first, second ploughs and harrowing followed by leveling gives a fine seed bed which leads to optimum yields.

ROTATION

- Do not follow groundnut after groundnut or other legume crops such as cowpeas or beans to avoid buildup of pests and diseases.
- A rotation of 3 years or longer is recommended.

SEED SELECTION

- Select the preferred variety; hand shell 1-2 weeks before planting; Select only good quality seeds of the desired variety; Observe for dormancy e.g Serenut 5R has a dormancy of about 30 days.
- Groundnuts should be shelled 1-2 weeks before sowing and select only good quality seed for sowing.
- Plant after the recommended days from research e.g Serenut 5R allow for 30 days post drying.

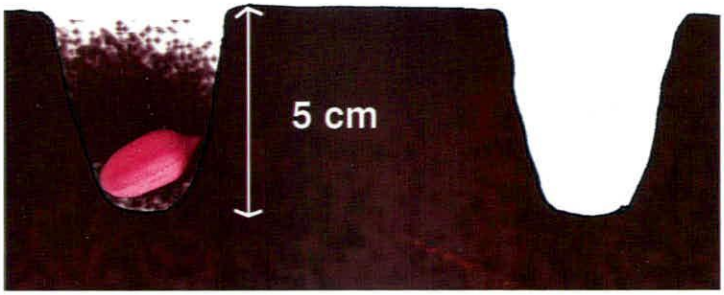
TIME OF PLANTING

- Groundnuts are planted between 15th February and 15th April during the first rainy season and July to early August for second rainy seasons.

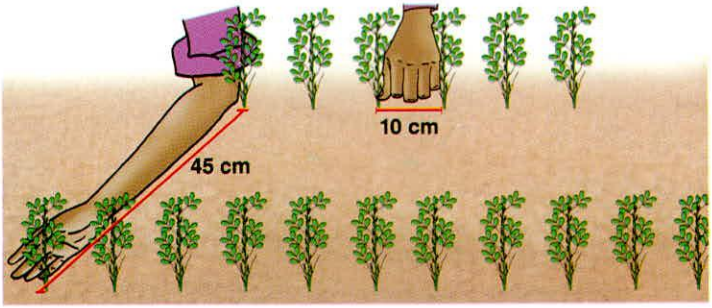
With the current weather changes globally, the planting date is difficult to standardize. However, farmers should plant as soon as there is adequate and consistent moisture in the ground to ensure good germination and the subsequent plant growth.

PLANTING AND SPACING

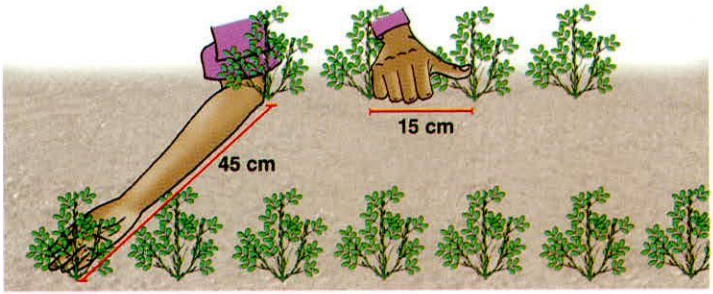
- Seed rate of 40 kg/acre or 80-100kgs/ha depending on the variety and seed size. Smaller seeds use less kgs.
- For planting shell 2-3 weeks before sowing and only good quality seeds should be selected
- Sow seeds at a depth of 5-6 cm in furrow.



- Seed is covered with soil and pressed down to ensure good contact with the seeds.
- Erect types are spaced at (45 x 10) cm.



- Spreading types(45 x15) cm
- Plant one seed per hill.

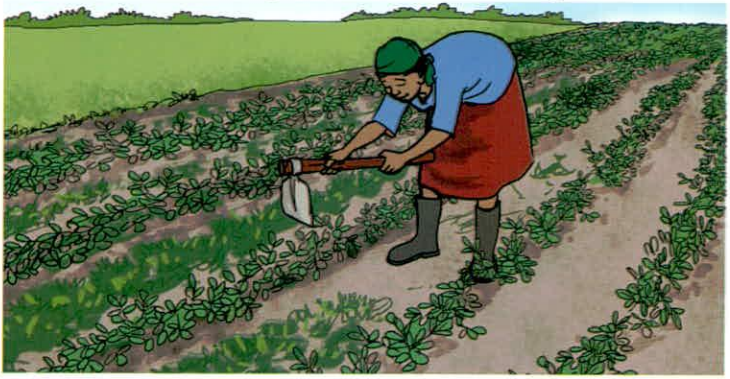


FERTILIZERS

- First do a soil test. Soil tests to determine the nutrient status. Groundnuts do not respond to direct fertilization but utilizes residual fertilizer more like in cereal-groundnut rotation. For blanket application NPK kg /ha: 25 kg of N - 50 kg of P2O5 - 100 kg of K2O.
- Basal application of SSP fertilizer (Single Super Phosphate) at the rate of 40 - 50 kg/acre or Triple Super Phosphate at 80-90 kg /ha will boost yields. SSP or TSP is incorporated in the soil during final land preparation, just before planting.

WEED MANAGEMENT

- Keep groundnut crop free of weeds
- Do first weeding 2-3 weeks after sowing.



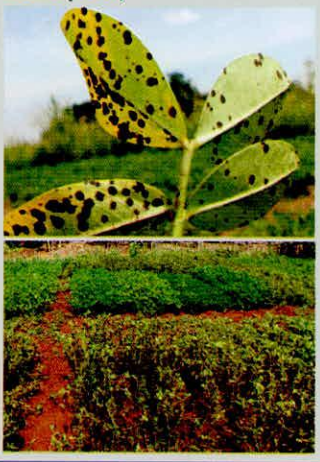
- Weeding past 50% flowering and pegging needs to be done by hand. Avoid earthing up and injuring pegs and pods
- Second weeding at flowering.

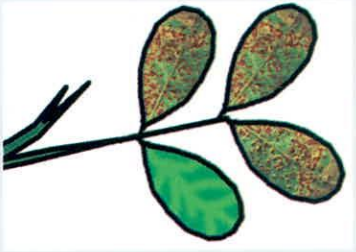


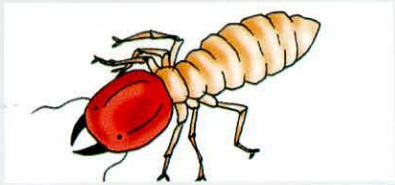
- Early weeding suppresses later weeds.

PEST AND DISEASE MANAGEMENT

- Groundnut rosette is a major viral disease transmitted by aphids
- Symptoms include stunted growth, yellowing or greening of the leaves
- Pods fail to form underground
- Plant resistant varieties

Diseases	Control
Groundnut rosette virus: 	• Most important production constraint. Transmitted by aphids; Control through:1) resistant varieties e.g Serenuts 5-14 series; 2) Cropping practices: timely planting, early sowing and correct spacing, intercropping with beans, sorghum; 3)Spray against vector with insecticides like dimethoate.
Leafspots; 	• There are two types of leafspots , early and late which affect the yields and grain/seed quality: management through:1) Resistant varieties 5-14 series, 2) Crop rotation, early sowing, burying all groundnuts crop residue by deep ploughing, 3) Chemical spray using fungicides such as benomyl, captafol, mancozeb etc.

Rust: 	• Wet weather coupled with a temperature of 22-25degree C; Management: 1)Resistant/ Tolerant varieties e.g. ICGV 87160 or ICGV 86590; Cultural control using crop rotation and field sanitation, early sowing, intercropping; 3) Destroy volunteer plant and crop debris; 4) Chemical control: spray mancozeb.
Aflatoxin contamination/ Moulds:  	• Occurs both Pre and Post Harvest. Control measures: Avoid damaging the pods, timely harvesting, strip groundnuts immediately after harvest, Avoid drying on ground, dry to right moisture content of below 13%, sort only healthy pods for storage. Don't wet groundnuts before shelling and selling

Pests	
Aphids (which is a vector for rosette): 	**Major pests of groundnuts includes:** • Control: timely sowing of crop and field sanitation, crop rotation with non host crop, intercropping with Pearl Millet, destroy volunteer crops, spray with dimethoate.
Leafminer: 	• Is a serious groundnut pest attacking in both rainy and post rainy season. It is more damaging during short rainy cycle when long droughts precede rains. Management: Grow tolerant variety like Serenut 10R, rotation with cereal avoid build
Termites: 	• Damage common in light soils when rainfall is moderate. Management: 1) Destruction of ant hills and queen, 2) Use well rotten organic manure, 3)clean cultivation, 4) Thorough cultivation and frequent management, 5)Seed treatment

HARVESTING

- At right maturity when soil is moist for maximum yield.
- Harvest groundnuts when dark markings appear on the inside of shell and seeds show a correct color of the variety.



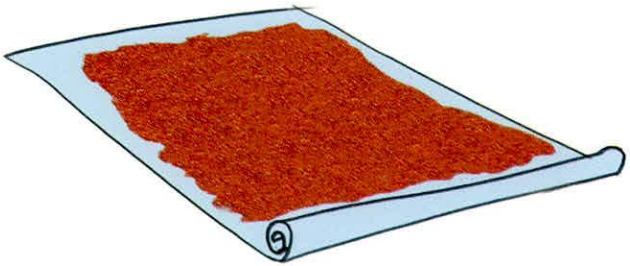
- Avoid premature harvest as it reduces quality and delayed harvest leads to rotting.
- Shake off the soils from the harvested plant. Freshly harvested groundnut should be cleaned and sorted to remove damaged nuts, mouldy ones and other foreign materials.
- Using days to maturity, Looking at harvest indicators (hull scrape, dark interior of shell, seed weight), Seed plump and correct variety colour, if defoliated; Harvesting methods include hand, hoe, ox drawn harvester.

POST-HARVEST

Drying

- Use Tarpaulins, raised platform, windrows)
- Dry the seed well until It cracks when placed between the teeth and pressure applied.





- Allow for field curing for 3-5 days; home drying for about 5 days to reduce moisture to below 13%, If using A-frame or cocks, dry for 3-4 weeks then pluck pods, Physical determination of moisture content (Rattling of the seeds when shaken, bite for crunchiness);

Packaging

- Only pack clean, well dried groundnut pods in Gunny bags, polythene bags. Unshelled Groundnuts (in pods) have long shelf life up to 6 months and above.

Storage

- Store clean, well-dried groundnuts in cool, dry, well aerated and on a raised platform.



- Store clean dry groundnuts in gunny bags on raised platforms
- Avoid any plastic or poly propylene bags.



Post harvest handling of groundnuts

- Harvesting: it is done at optimum maturity when 70% and above of the pods have dark markings inside the shell and the shells are plump with the correct colour for that variety.
- Harvesting by hand is more suitable for the erect varieties grown in sandy-loam soils.
- Harvesting by hoe digging is more suitable for spreading varieties on heavy soils and during dry conditions.
- Damage to pods at the time of harvest should be avoided as much as possible since it leads to aflatoxin contamination.



Plucking and drying groundnut

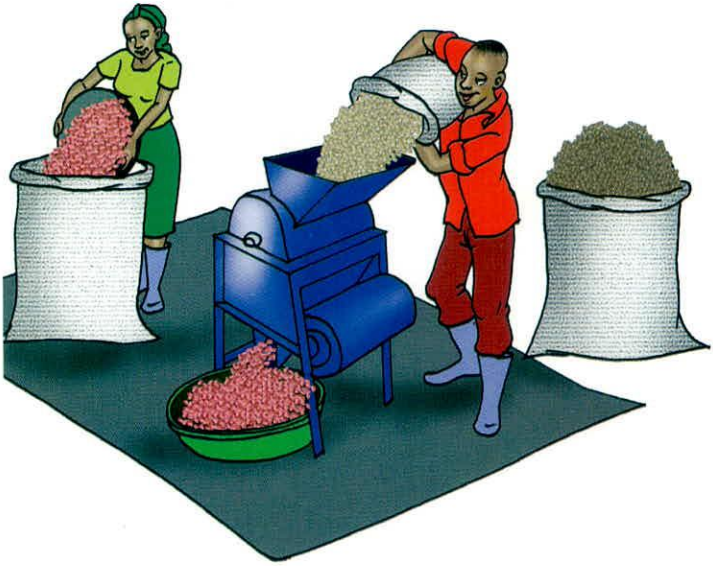
- Soon after harvesting the plants are partially dried (curing) in the field followed by plucking the pods from the mother plants.
- The best method is to separate them by hand when the M.C is 20-25%.
- Sometimes the pods are plucked using a machine.

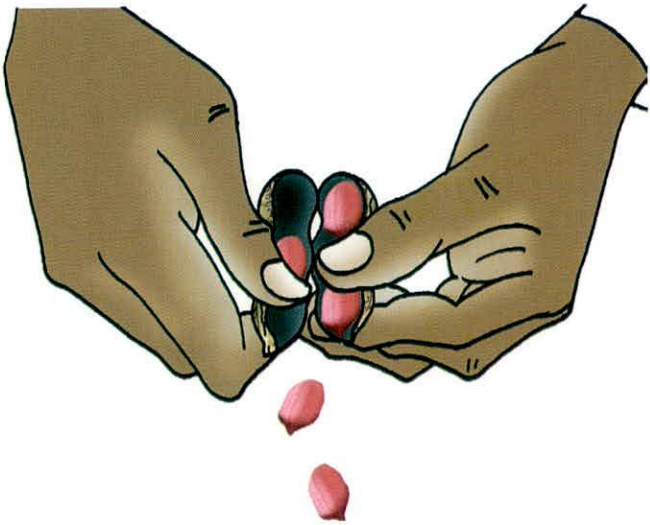
Drying groundnut

- The pods are dried under direct sunshine after threshing until they attain a moisture content of 6-7%. Delays must be avoided at all costs to reduce the risk of fungal infection.
- Under 9%, the creation of aflatoxin is retarded, but protection against storage pests, whose activities create aflatoxins, is only attained at levels of 6-7%.
- In cases of extreme sunshine and heat, it may be advisable to carry out air drying.

Shelling groundnut

- Unshelled groundnuts are packed in gunny bags and stored in water-proof conditions.
- Shelling for seed should be done by hand while shelling for other uses may be done by machine.



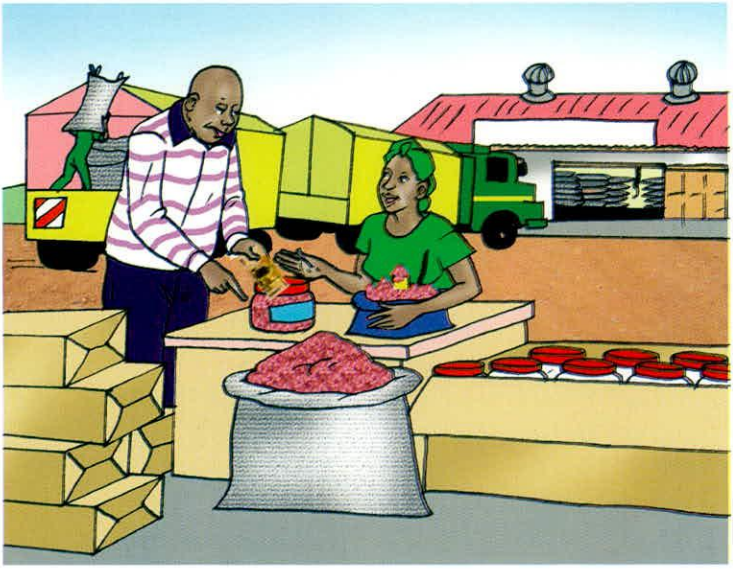


VALUE ADDED PRODUCTS FOR GROUNDNUTS

		
Boiled Ground nuts in pods	*Roasted Ground nuts*	*Pounded Ground nut*
		
Ground nuts oil	*Ground nuts butter*	*Ground nut cookies*

MARKETING

- Only shell when you want to use groundnuts as they lose viability quickly:
- Conduct market survey to establish the market requirements in terms of quality, seasonality and price.
- Provide market information and linkages.
- Promote bulk marketing.
- Encourage contract farming.



- Promote local seed business.

PROFITABILITY ANALYSIS FOR GROUNDNUTS

Risks and Sensitivity Analysis for groundnuts

Example: Gross margin per acre of groundnuts.

Assumptions: yield of groundnut-1500 kg/ acre and market price = 2,000/- per/kg.

Item	Unit	Quantity	Unit cost	Total
Cost of input				
Seeds	Kg	45	3,000	135,000
Tools (hoes)	Pieces	5	8,000	40,000
Tools (pangas)	Pieces	2	3,000	6,000
Pesticides	Litres	5	10,000	50,000
Bags	Pieces	10	1,000	10,000
Total input cost				241,000
Labour costs				
Land preparation x2	Man-day	2 x10	5,000	100,000
Planting	Man-day	10	5,000	50,000
Weeding	Man-day	2 x 10	5,000	100,000
Harvesting	Man -day	2 x 5	5,000	50,000
Drying	Man-day	4	5,000	20,000
Shelling	Man-day	20	3,000	60,000
Packaging	Man -day	4	5,000	20,000
Total labour cost				400,000
Cost of labour and input				641,00
Gross Margin				2,359,000
Gross Margin				200,000

Note: Production cost per unit (kg) = $\frac{\text{Total cost}}{\text{Total output (yield)}}$

Profit margin per kg = sale price per unit – production cost

$$= \frac{641{,}000}{1{,}500}$$

$$= 427.3/-$$

Profit margin per kg = sale per price unit-production cost per unit

$$= 2{,}000 - 427.3 = 1{,}572.7/-$$

Implication: A farmer is getting a profit of shs 1,572.7/- per kg produced

RISK AND SENSITIVITY ANALYSIS

Risk Analysis for ground Enterprise

Scenario 1: A decrease in yield of groundnuts to 1,200kg/acre and a rise in market price to shs 2,100 kg/kg

Parameter	Product	Quantity (kg)	Marketing Price (Sh.)	Total (Sh.)
Expected Revenue	Groundnuts	1 acre × 1,200	2,100	2,520,000
Total Cost				641,000
Gross Margin				1,879,000

Scenario 2: An increase in yield of groundnuts to 1,250 kg/acre and a fall in price to shs 2,000/kg

Parameter	Product	Quantity (kg)	Marketing Price (Sh.)	Total (Sh.)
Expected Revenue	Groundnuts	1 acre × 1,250	2,000	2,500,000
Total Cost				641,000
Gross Margin				1,859,000

Note: a) **In scenario 1** above, the decrease in yield accompanied by a rise in price will not significantly affect profitability of the enterprise

b) **Under scenario 2:** A fall in market price will drastically reduce profitability of the enterprise.

A fall in market price has a far reaching effect on gross margin than a fall in yield.

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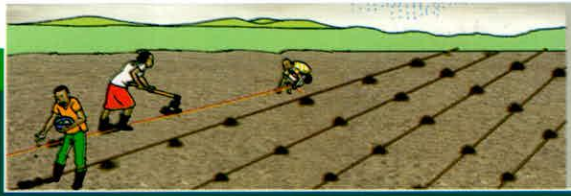



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