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Strengthening Partnerships, Results,  
and Innovations in Nutrition Globally

# Farmer Field School Curriculum: Good Agronomic Practices for Groundnut Production

SPRING/Ghana



August 2017

## **ABOUT SPRING**

The Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project is a seven-year USAID-funded cooperative agreement to strengthen global and country efforts to scale up high-impact nutrition practices and policies and improve maternal and child nutrition outcomes. The project is managed by JSI Research & Training Institute, Inc., with partners Helen Keller International, The Manoff Group, Save the Children, and the International Food Policy Research Institute.

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## **SPRING**

JSI Research & Training Institute, Inc.  
1616 Fort Myer Drive, 16th Floor  
Arlington, VA 22209 USA  
Phone: 703-528-7474  
Fax: 703-528-7480

[info@spring-nutrition.org](mailto:info@spring-nutrition.org)

[www.spring-nutrition.org](http://www.spring-nutrition.org)

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# INTRODUCTION TO THE CURRICULUM

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The SPRING project developed this farmer field school (FFS) curriculum to improve farming practices and increase aflatoxin-safe groundnut crops for better household nutrition. It was originally developed for the Ghana Ministry of Food and Agriculture’s agricultural extension agents to work with groundnut farmers in Northern Ghana supported by SPRING. We trained agents to use the curriculum before they began facilitating their sessions with local farmers. While the content of the curriculum was designed to train farmers in the Northern and Upper East Regions where SPRING has been operating, it can be used for groundnut farmers throughout Ghana.

This curriculum was designed to fit the FFS training model, in which sessions are conducted “on the farm,” following an experiential learning model in an environment that allows for demonstration, practice, and application of the material on the farmers’ own groundnut plots. Each session outlined in the curriculum includes a variety of activities to accomplish the session’s objectives, along with detailed instructions for trainers.

The majority of groundnut farmers in SPRING’s farmer field schools are women living in 1,000-day households – those that include pregnant or lactating women or children under the age of two. By engaging farmers with using optimal agricultural practices, the curriculum seeks to improve these households’ nutrition outcomes.

Much of the curriculum focuses on the reduction of aflatoxin contamination in groundnuts and other staple crops in northern Ghana. *Aflatoxins* are toxic compounds produced by certain moulds, and they are common contaminants in groundnuts. Exposure to aflatoxins can cause serious health problems, such as cancer, stunting, and anaemia. The SPRING team is focused on promoting good agronomic practices to reduce aflatoxin contamination in groundnuts as a way of improving the overall health of Ghanaian farmers and their families. Further, the curriculum integrates messages about water, sanitation, and hygiene, as well as nutrition, which are important for 1,000-day households.

When planning and facilitating the training sessions with the farmer groups, Ministry of Food and Agriculture trainers using these materials are encouraged to use SPRING’s Aflatoxin Photo-Aid and Aflatoxin Awareness Drama alongside this curriculum. Trainers are also encouraged to collaborate with environmental health officers, community development officers, community health nurses, and nutrition officers when facilitating sessions that draw on their expertise regarding hygiene and early childhood nutrition.



# SESSION 1: INTRODUCTION

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## Session Objectives:

By the end of this session, the farmers should:

1. Have built relationships with others in their group based their experiences as farmers and as members of the WASH 1,000 community;
2. Be able to describe the goals of the training session series – *Farmer Field School Curriculum: Good Agronomic Practices for Groundnut Production*;
3. Know how to follow the farmer field school (FFS) norms set at the start of the session;
4. Understand the causes and effects of Aflatoxin and its impact on crops, livestock, and humans; and
5. Be capable of listing the critical behaviours that make up healthy practices in 1,000-day households.

## Agenda Items:

- Welcome, introductions, and icebreaker activity
- Format of the field school and group norms that will foster a successful session
- Goals and objectives of the training
- Aflatoxin and its negative effects on the health of families and the income of farmers
- Importance of water, sanitation, and hygiene (WASH) and nutrition for a 1,000-day household

## Duration:

90 minutes

## Materials:

- WASH 1,000 Photo-Aid
- Aflatoxin Management Photo-Aid
- Flip chart
- Markers
- Nail on which to hang the flip chart

## Training Method:

Participatory discussion, icebreaker activity, and role-play

## Activity 1: Welcome, Introductions, and Icebreaker – 15 minutes

Welcome and greet the participants.

**If this is not the first FFS session for the participants** (i.e., they have recently completed a previous FFS course), summarize previously learned lessons.

- What did you learn in the last session (if applicable)?
- Were you able to use the learning and experiences? How did that go?
- Did you face any particular challenges?
- How did you overcome the challenges? (If a participant was not able to overcome a challenge, refer the issue to the members of the group and invite them to offer suggestions.)

Continue to **activity 2**.

**If this is the first FFS session for the participants**, the following questions and optional icebreaker activity can help create a positive learning environment and prepare participants for the day's session as well as future sessions.

- Ministry of Food and Agriculture staff trainers should introduce themselves to the group.
- An icebreaker activity can help participants become active and ready to participate.

### **Icebreaker:**

Have participants assemble and reassemble themselves in groups based on the answers of the following questions:

- How many siblings do you have (fewer than 2, 3, 4, 5, or 6 or more)?
- How many children do you have (fewer than 2, 3, 4, 5, or 6 or more)?
- How long have you been cultivating groundnuts  
(first season, 1 year, 2–3 years, 4–6 years, 7–10 years, or over 10 years)?
- What is your favorite available farming tool? (Facilitator should create the different categories.)

Members of the groups should introduce themselves to one other and share answers to the following:

- Other than farming, what is your favorite activity?
- Where is the farthest place you have travelled away from home?  
Have each group share their "winner."

Thank everyone for their participation.

## Activity 2: Group Norms – 10 minutes

Explain that, as when other groups of people work together, our FFS will be more successful and more beneficial to participants if we can agree on key norms about how we will work together. Ask volunteers to suggest some norms to consider based on their experiences of what has worked well in the past. Provide an example or two to help ignite the brainstorming session. List the norms on a flip chart.

Examples of suggested norms include:

- Sessions should be 60–90 minutes;
- We should listen carefully to the ideas of everyone else – no side conversations;
- At the appropriate time, everyone is encouraged to interact, reflect, discuss, and ask questions about the ideas that the trainers present;
- We can all learn from the rich practical experiences of all group members;
- All participants are encouraged to test the new agriculture ideas and techniques at the FFS demonstration plot or at your own farms and to observe the results;
- Everyone is encouraged to share lessons learned about nutrition, WASH, and agriculture during these sessions with family members;
- All participants are invited to share their experiences and observations about agriculture, nutrition, and WASH in the FFS, which will help enrich our discussion and learning about best practices; and
- Participants should attend sessions regularly and on time.

## Activity 3: Goal and Objectives of the Training – 5 minutes

During this training, we will cover three key technical areas of importance to groundnut farmers and 1,000-day households in this area. Ask the group:

- Who knows what a 1,000-day household is?

1,000-day households include pregnant and/or lactating women and/or children under two years old.

Ask three or four participants to describe how their family meets the definition of a 1,000-day household.

- Why do you think it makes sense to distinguish a 1,000-day household from other households?

List their replies on the flip chart.

The three technical areas covered in this FFS session are:

1. Negative effects of aflatoxin on groundnuts, farmers, their families, and the community;
2. WASH behaviours for better child and family health; and
3. Good nutrition practices that improve the health of mother and child.

## Activity 4: Introduction to Aflatoxin Management – 10 minutes

Ask participants why they engage in farming. List their responses on a flip chart. Likely reasons include:

- More food for their household; and
- Increased income that allows them to purchase other food, clothes, education for their children, health services, and social activities.

Note that all of these activities are important for ensuring the health and happiness of our families.

Ask participants why they farm groundnuts. List their answers on the flip chart and elaborate on answers that relate to nutrition.

Stress the fact that regardless of our motivations, we all want our efforts rewarded with the best crop possible.

Next, pass around samples of groundnuts that are mouldy or that exhibit other quality problems, then pass around groundnuts of good quality; or show photos from the Aflatoxin Management Photo-Aid.

Ask participants if they are familiar with these problems in groundnuts. What causes these problems and what can we do to prevent them?

Allow farmers time to discuss causes and prevention. Note their answers on the flip chart.

Ask participants if they know what aflatoxins are, and then have one volunteer explain it to the group. Add further details as necessary.

### **What are aflatoxins?**

*Aflatoxins* are toxic substances produced by certain types of mould found in food crops. They are predominantly found in warm and humid climates, as well as very hot climates. Aflatoxins can contaminate crops such as groundnuts, maize, millet, sorghum, and rice in the field during harvest or at home during storage. They can be invisible to the naked eye.

What are the negative effects of aflatoxins on **crops and trade**?

- Crop yields decrease;
- Groundnut quality declines, such as discolouring, which can lead to lower prices;
- Shelf life is reduced, leading to potential loss of product; and
- Nutrition outcomes and incomes diminish due to direct food losses.

What are the negative effects of aflatoxins on **humans**?

- Long-term consumption can lead to diseases such as jaundice and liver cancer, with potentially fatal consequences;
- Small intestines cannot absorb all of the nutrients from the food eaten;
- Chances of anaemia increase, particularly during the first 1,000 days;
- Growth of children is impaired, including being underweight or stunted; and
- Because aflatoxins can be in mother's milk, breastfed babies are at risk if the mother eats infected groundnuts.

Can aflatoxins affect **livestock**? Allow farmers time to discuss the matter and then solicit answers from the group.

Yes. The following can result from animals being exposed to aflatoxin-infected plants:

- Death of animals;
- Reduction in productivity;
- Reduction in fertility and an inability to resist diseases; and
- Decrease in both the quantity and quality of meat, milk, and egg production.

Conclude by highlighting that during the FFS sessions, we will be discussing how to manage aflatoxin to reduce the chances of infection and to maximize groundnut quality during preparation, cultivation, harvesting, and storage.

Stress that our health and that of our families is worth making the effort.

## Activity 5: Healthy Practices in 1,000-day Households – 20 minutes

Why is the health of a child important to the mother and the household? Potential answers include that a healthy child:

- Needs less attention from the parents or siblings,
- Grows more quickly,
- More fully develops their body and mind,
- Does not make others in the family sick,
- Needs fewer resources and trips to the doctor, and
- Is happier.

### **Healthy children maximize a family's productivity, leading to healthier and happier lives for all.**

We are going to discuss a number of critical behaviours that everyone – but particularly 1,000-day households – should follow to help prevent many diseases and keep babies and toddlers healthy.

Ask farmers to propose examples of the critical behaviours, listed below:

1. Breastfeed exclusively for babies up to six months of age. No other food or water.
2. Feed child uncontaminated food by:
  - Washing hands with soap or ash before feeding (have tippy tap near kitchen),
  - Serving warm food,
  - Using a clean and dry plate,
  - Avoiding contaminating food with faeces,
  - Keeping flies away, and
  - Having children play in areas that are clean.
3. Introduce boiled water only after six months of age.

4. Give child mixed food (coloured food). Improve porridge by adding groundnuts, green vegetables, beans, carrots, orange-fleshed sweet potato, small fish, meat pieces or meat soup, and eggs.
5. Enrich food with oil, shea butter, or palm oil.
6. To prevent anaemia, give child 20 grams of cooked liver (boiled or roasted) every two weeks.

As we discuss how to reduce aflatoxin infection in our groundnut crop, we will also talk about these six critical behaviours.

## Activity 6: Bringing It All Together – 30 minutes

Ask participants: why, if trying to kill a dangerous snake, would you hit it *repeatedly* and possibly from multiple directions? The answer is: you want to make certain that you have killed the snake.

We must deal with the problem of poor nutrition just as aggressively as we would a dangerous snake. We must do whatever is necessary to ensure good nutrition for our children. An integrated approach to nutrition includes the topics of health, agriculture, and WASH. We will discuss nutrition issues as they relate to 1,000-day households because nutrition affects personal health and productivity.

Explain to the group that we will now engage in role-playing and then discuss the lessons learned.

### **Role Play: The Farming Mother's Choice**

In this scenario, a farmer chooses to delay taking care of her sick child, who is under two years old, and instead sets off for a day of work in the field.

Ask volunteers to play each of the following four roles in front of the group: mother/farmer; husband; another child; and a role of their choosing, such as mother-in-law, doctor, sibling, neighbor, or grandparent.

Instruct the players to depict the choice that the mother makes, the negative consequences of that choice on the child, and its eventual impact on the mother and the family finances.

Give the participants five minutes to prepare and five minutes to perform the scene.

Discuss the audience's impressions regarding the role-play and lessons learned, and convey any additional unaddressed points. Leading questions include:

- Why is the mother ready to ignore her sick child and leave for the day's work?
- How much time do you think should be devoted to farming and other activities compared with childcare? Do some children require more care than others do?
- How many among us give equal attention to farming and the care and healthy development of our children under two years old?

- How much time do men devote to support childcare and the needs of their 1,000-day household compared with the time they devote to farming and other activities? Can men help in providing childcare?
- How can all household members providing quality childcare ultimately benefit farm-related activities?

Lead the group in thanking the role-playing participants with a round of applause.

### **Role Play: The Nursing Mother's Choice**

In this exercise, a nursing mother gives her sick child attention and observes proper sanitation and good farming practices. The role-play should portray the advantages of her actions.

Invite four volunteers to play out this scenario for the group. If desired, roles can be the same as in the last role-play activity. Participants have five minutes to prepare and five minutes to present their scene.

Discuss the lessons learned from the exercise:

- What are the benefits of investing and showing interest in a 1,000-day household? Can you think of any other benefits?
- How do we ensure that we properly balance the various needs and the responsibilities we have as caregivers and farmers in our day-to-day activities?

Thank the role-play participants.

Conclude by explaining to farmers that the FFS model allows them to identify problems and gaps in their actions; explore alternatives; discover the best practices for the aflatoxin management and sanitation; and learn about the benefits of good nutrition for improving the health of children and pregnant women in 1,000-day households. The goals of farming and family health are not in conflict with one another – they are mutually supporting.

Answer any outstanding questions.

### **Application/Preparation:**

Instruct participants to bring samples of each type of soil available on their farms for the next session, when we will be looking at soil and site selection in aflatoxin management.



# SESSION 2: GROUNDNUT SITE SELECTION AND LAND PREPARATION

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## Session Objectives:

By the end of this session, the farmers should be able to:

1. Discuss the importance of good hygiene and nutrition for the mother during pregnancy, and identify the types of food recommended for the health of mother and baby;
2. Discuss the primary characteristics of the soil of their farms as it relates to groundnut cultivation;
3. Discuss steps in land cultivation and preparation of seedbeds; and
4. List four critical times for handwashing and the benefits of using a tippy-tap.

## Agenda Items:

- Review of topic 1
- Importance of good hygiene and nutrition in pregnancy
- Groundnut farming site-selection factors
- Land preparation
- Critical times for handwashing with soap

## Duration:

90 minutes

## Materials:

- At least four empty clear plastic bottles (such as water bottles), each with same number of holes in bottom (the same tool should be used to create the holes, and the number of holes depends on the size of the containers)
- Container with water, and a way to measure equal quantities of water
- A-frame
- One tippy-tap
- Soap and water
- WASH 1,000 Photo-Aid
- Nutrition Photo cards from "The Community Infant and Young Child Feeding Counselling Package," prepared by UNICEF (September 2012)
- Flip chart
- Markers
- Nail on which to hang the flip chart

## Training Method:

Discussion, observation, demonstration, and experimentation

### **Trainer Notes:**

Hold this session at the FFS location or another site that allows participants to observe and for you to demonstrate proper land preparation for cultivation and how to use a tippy-tap.

Invite a WASH team member to join you to conduct a tippy-tap presentation and to support discussions around hygiene.

## Activity 1: Review of Topic – 1–10 minutes

Ask participants the key points they remember from the last session. Remind them that it focused on the dangers of aflatoxin to crops, livestock, and human health – especially among children. We also discussed key healthy practices in a 1,000-day household. Guide the review with the following questions:

1. Why do we farm?
2. What are aflatoxins?
3. Why are aflatoxins bad for humans? Children?
4. What are the negative effects of aflatoxins on livestock production?
5. What are examples of healthy behaviours in a 1,000-day household?

Then transition into an introduction of today's session.

There are many parallels between what a farm needs for a healthy crop yield and what a mother needs while pregnant to give birth to a healthy baby.

A successful crop of groundnuts – free of aflatoxin – begins at sowing. Likewise, the birth of a healthy child begins with pregnancy.

## Activity 2: Importance of Good Nutrition in Pregnancy – 10 minutes

Ask farmers who have previously been pregnant to raise their hands.

Ask farmers who hope to become pregnant in the future to raise their hands.

Explain to the group that we are going to talk about the importance of good nutrition during pregnancy to help ensure the birth of a healthy, well-developed baby who will start life as strong as possible.

Ask participants to list the kinds of food should a pregnant woman should eat. Record their replies on a flip chart.

Potential answers include:

- The best diet includes a variety of foods, such as:
  - Milk (for protein and calcium);
  - Fresh fruits and vegetables (rich in vitamins and iron);
  - Fish, meat, eggs, beans, and nuts (rich in protein); and
  - Grains (provide energy and other nutrients).
- To meet needs of mother and developing baby, eat an extra small meal or snack per day.
- It is important to drink enough clean water and to stay hydrated.

Ask participants: where should a woman go to seek advice about her pregnancy? List correct replies on the flip chart, emphasizing *the importance of visiting an antenatal clinic at least four times during a pregnancy, even if everything seems to be going well.*

Note that, as farmers, we have the opportunity to combine our experiences and learn from one other about farming, which leads to the next activity about where to plant groundnuts.

### Activity 3: Groundnut Farming: Soil and Site Selection – 20 minutes

Ask participants if they were able to bring soil from their farms. Instruct them to look carefully at their sample of soil. What does it look like? Do they see sand? Is it hard? Can they see little twigs and pieces of leaves? Did it dry out? Is it still wet?

Explain that soil can range from sandy to clayey. Both sandy and clayey can have differing amounts of organic matter, which makes it loamy. We classify soil based on these three key properties determined by observation and water retention capacity. Ask participants:

- Who thinks their soil is sandy? Why?
- Who thinks their soil is loamy? Why?
- Who thinks their soil is clayey? Why?

Introduce the simple soil-holding capacity test. Note that this demonstration will help them better understand the differences in water retention between various types of soil.

#### Soil Holding Capacity Test – 10 minutes

*Objective:* To observe the differences in water retention between sandy, sandy loam, clayey loam, and clay soils.

*Preparation:* Take four identical plastic water bottles, such as water bottles, and poke with a nail or pin the same number of holes in the bottom of each bottle.

Prepare soil samples and have them ready for step #3.

*Instructions:*

1. Fill each bottle with the same amount of each of the four types of soil.
2. Pour the same amount of water through the top of each bottle, and note how quickly the water pours through each type of soil.
3. Mould each of the four soil samples into balls, and pass them around to demonstrate the different characteristics.
4. Invite farmers to mould their samples into balls.

Highlight the following characteristics of each soil type:

- *Sandy* soil does not retain water after rain and can expose plants to drought;
- *Loam* soil has a loose structure, retains moisture, drains well, and is rich in organic matter;
- *Clay* soil is prone to water logging and crusts and cracks when dry;
- *Sandy loam* soil is loamy with a high proportion of sand; and
- *Clay loam* soil is loamy with a high proportion of clay.

Ask the farmers to identify the type of soil they think each sample represents.

## Discussion:

What type of soil is best for planting groundnuts?

- Lightly sandy or sandy loam soils are the most suitable.
- Well-drained, loose, well-aerated soil is preferable to compacted land, which requires a lot of cultivation.
- Very sandy soil does not hold water after rain and can expose plants to drought. It is also prone to calcium deficiency, which leads to higher rates of aborted seed (empty pods or “pops”), hampering the crop's viability.

What are the disadvantages of clayey soil?

- It does not drain well, leading to conditions that promote development of aflatoxin and other diseases in crops.
- It impedes pegging during podding and harvesting.

How much soil variety is available to farmers for planting?

How can we improve soil quality? We can add organic material or biomass, such as compost and animal manure.

Other than soil, what factors and characteristics need consideration when choosing where to plant groundnuts and other crops?

- Level or gently sloping land is best.
- Avoid poor-draining, low-lying land where flooding occurs, creating conditions that can lead to aflatoxin contamination and other diseases.
- If possible, plant on land that was not cultivated with legumes the previous year. Crop rotation helps to reduce carry-over diseases, including *Aspergillus flavus*, the mould that produces aflatoxin.

Note that, as women must be healthy to deliver a healthy baby and improve her quality of life, the soil must be healthy to improve a farmer's production and income.

## Activity 4: Land Preparation – 20 minutes

Explain to participants that after choosing the best place on their land for cultivating their next groundnut crop, it is important to prepare the soil. We are going to discuss practices for improving the health of the soil to prepare it for a more successful groundnut production season.

**Proper land preparation is critical to achieving maximum water retention, fast and uniform seed germination, and improved weed and disease control.**

Ask participants what they do every season to prepare their land for planting. Why?

Focus the farmer's attention on the plot of land that demonstrates the preparation method under discussion.

Discuss the farmer's observations while making the following points:

- Soils in northern Ghana are generally low in organic matter, which leads to loamy soil. Leaving (healthy) vegetation – organic material or biomass – in the field after slashing increases the soil's organic matter after decomposition.
- It is important to incorporate organic material, manure, and compost into the soil during land preparation to improve its nutrients, texture, and structure.
- Farmers should avoid burning the bush and using chemicals during land preparation:
  - Burning makes poor soil poorer over the long term.
  - When a farmer leaves dead vegetation on the soil, it acts as mulch and helps to protect against soil erosion and weeds.
  - This mulch also maintains a better temperature for seedling growth.
  - Before using any agrochemicals on your land, contact your community agricultural extension agent, who can provide proper advice.
- When and how should you cultivate your land to prepare your seedbeds?
  - Begin cultivation at the early onset of the rainy season.
  - Turn your soil over to remove weeds using a tractor, an animal-drawn plough, or a hoe. Let weeds sit for a week and die. Cultivate again, and pull out clumps of weeds. Pile dead weeds out of the way.
  - Cultivate the ground to 20–30 centimetres.
  - If you have a plough, deeply plough your fields.
  - Plough across slopes to prevent soil run off.
  - Groundnut yield is best on a deeply cultivated plot. Deep cultivation, tilling, and ploughing encourage a deeper root system, which helps the plant access water during short dry spells.
  - Prepare even seedbeds so you can achieve a uniform planting depth and spacing and increase your soil's moisture retention capacity.
  - A proper seedbed provides a healthy environment for seed germination.

Ask participants to raise their hands if their land has some slope. Have they had problems with runoff? What did they do to mitigate the problem?

Ask participants to raise their hands if they have ever heard of the simple tool called the A-frame.

Ask them to raise their hands if they have ever seen an A-frame (point to it).

Ask if someone can explain why A-frames are helpful when preparing land.

Demonstrate or have a volunteer demonstrate the way to use an A-frame to determine the contours of the slope to control run-off and soil erosion during the rainy season.

Explain that knowing the contour of the land allows ploughing and seedbeds to follow the contour of the slope, control run-off, minimize erosion, and maximise water retention in sandy soil.

Explain where farmers can obtain an A-frame or how they can construct one.

Note that choosing the right soil is like choosing the right food for a pregnant woman.

Clearing weeds and preparing the land for planting seeds is like a pregnant woman exercising proper hygiene.

## Activity 5: Handwashing with Soap at Critical Times – 15 minutes

Set up a tippy-tap for a handwashing demonstration. If you do not have a tippy-tap available and cannot make one, refer to the WASH 1,000 Photo-Aid for images that you can show the farmers.

Discuss the importance of handwashing to help stop the spread of disease and keep people healthy.

Ask who among the participants has implemented a tippy-tap at their home.

- Why did they adopt that practice?
- What do they like about it?
- Who in their family uses it?

Ask participants if they know about the four critical times for handwashing. The images in the WASH 1,000 Photo-Aid can help reinforce the information. The four critical times for handwashing in the WASH 1,000 approach are:

1. After cleaning a child's bottom,
2. After using the latrine or disposing of faeces,
3. Before preparing food, and
4. Before feeding a child or eating.

Ask the participants if there is a recommended way to wash hands. During the discussion, make the following points:

- Using water alone does not guarantee clean hands.
- To clear germs from hands and remove dirt completely, you must wash hands with any type of soap or with ash.
- Wet hands, rub soap on hands to form lather, rub palms together, and wash between fingers. Rub fingertips inside palms to remove dirt under nails, wash up to the wrists, and then rinse with running water.
- A tippy-tap provides running water.

Ask tippy-tap users if they have had any trouble using them.

Ask participants if they can share any clever ways they have to remind themselves to practice handwashing during the four critical times.

Ask the group if they can remember the four critical times to wash hands.

## Activity 6: Summary and Conclusion – 15 minutes

Invite three or four participants to cite one useful thing that they learned about soil types during the session and to explain why it was useful. Encourage each participant to choose a different lesson.

Ask three or four volunteers to describe a positive characteristic for a groundnut planting site and why it is important.

Ask three or four farmer to advise the group on how to prepare soil for groundnut planting.

Ask three or four volunteers to offer reasons why this effort is important. If no one mentions aflatoxins, make sure to emphasize that aflatoxin contamination can happen as early as during planting and that selecting the most ideal site helps ensure a disease-free crop.

Stress the following key message about farming: *Proper soil preparation is critical for maximum retention of water, fast and uniform seed germination, and better weed and disease control.*

Ask four volunteers to each state one of the four critical times for washing hands.

Ask one participant to describe the proper steps for handwashing and then ask if anyone else in the group has something to add.

Ask three or four volunteers to explain what types of food a pregnant woman should eat.

Ask three or four volunteers to describe other advice for pregnant woman that we discussed during this session.

Conclude with the following key message: *Good hygiene and nutrition during pregnancy are key to a healthy pregnancy and baby at birth.*

# SESSION 3: SEED SELECTION AND GERMINATION

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## Session Objectives:

By the end of this session, farmers should be able to:

1. Identify groundnut varieties recommended for their agro-ecological area and describe their basic attributes,
2. Conduct a seed germination test to determine the viability of a seed intended for planting, and
3. Discuss the benefits of exclusive breastfeeding for children under six months of age and the hygiene behaviours that a new mother should observe.

## Agenda Items:

- Selecting the most appropriate groundnut seed for planting
- Conducting a germination test
- Exclusive breastfeeding for infants under six months of age

## Duration:

70 minutes

## Materials:

- Samples of different varieties of groundnut seeds, with enough of each variety to allow for a germination test
- Chart or guide on seed varieties
- Samples of proper labelling of certified groundnut seed

## Training Method:

Group discussion, role-play, demonstration, and practice

## Trainer Notes:

Invite a community midwife, trained traditional birth attendant, or other health professional to be present at this session to serve as a resource on exclusive breastfeeding. Request that they bring any appropriate counselling cards or photo aids they use, such as UNICEF's "Community Infant and Young Child Feeding Counselling Package" (September 2012).

## Activity 1: Welcome and Review – 10 minutes

Greet the participants.

To begin the conversation, ask a few volunteers to each name one topic discussed in the last session.

Ask if anyone got a tippy-tap to try out at home. If so, ask them how their family members received it and the difference they hope it will make.

Ask participants if they have started paying more attention to when and how they wash their hands. Have they started teaching their family members, including children, to do the same? How is that going?

Ask participants about their farms. Have they started preparing their lands for planting?

Ask participants to raise their hands if they are following the land preparation steps discussed during the last session. Invite one farmer to explain the steps. Ask others to note if there are any other recommendations gleaned from the last session. Congratulate them for the work they have done to prepare their farms for planting.

Reinforce the following points:

- Do not burn healthy biomass – instead, plough and turn it back into the soil;
- Create even seedbeds to ensure uniform planting depth and spacing, successful germination, and increased moisture-holding capacity in the soil;
- Deeply ploughed fields give the best groundnut yield;
- If the land is not tilled deeply enough, groundnuts develop shallow root systems, grow poorly, and are prone to drought after short dry spells; and
- Proper seedbeds provide a healthy environment for seed germination.

Explain that we are going to talk about groundnut seed selection and how to make sure that our seeds are viable. The seeds will germinate after the seedbeds have been prepared properly.

## Activity 2: Groundnut Varieties Appropriate for Northern Ghana – 20 minutes

Pass around a sample of each type of groundnut seed variety for the group to examine.

Ask participants to note the visual differences between the seeds. Can they describe these differences in terms of size and colour?

Ask if it is possible to identify a specific variety of groundnut seed just by looking at it. If the variety is unknown, can a farmer determine the seed's suitability for growing well under certain conditions by its appearance?

Note that there are also invisible properties unique to every seed variety. All of these visual and invisible properties determine the variety of the groundnut and if the seed will germinate and thrive in particular conditions.

Ask the farmers if they know the names of the groundnut varieties that they previously planted. Ask them to describe the positive and negative aspects of each variety.

Point out some important criteria that farmers should consider when choosing the variety of groundnut seed to plant:

- Select a variety suited for the agro-ecological zone and climatic conditions of their farms;
- Choose varieties known to be resistant to common pests and diseases in their areas, especially the growth of moulds that produce aflatoxins; and
- Note that drought-tolerant varieties of groundnuts can greatly reduce rates of aflatoxin contamination.

Ask the farmers if they have already selected the variety of groundnuts that they will plant this year.

Explain that, today, we are going to talk about three varieties of groundnuts and some of their invisible properties. Discuss the various potential invisible properties groundnuts might have, such as resistance to a specific disease, potential yield, and resistance to drought. Explain that we have selected these specific varieties because they are the most appropriate for the environment of northern Ghana.

Lead an interactive discussion about a variety of groundnuts. Referring to Table 1, which lists the most highly recommended varieties of groundnut seeds for the area, ask farmers who have planted multiple varieties if they can describe some of their properties. Ask them which seeds they plan to plant for the coming season.

Use the information in Table 1 to discuss the following properties of seeds:

- Planting space requirements,
- Days to harvest,
- Yield potential,
- Resistance to specific diseases or conditions, and
- Suitability for the agro-ecological zone.

**Table 1. Commonly Cultivated Groundnut Varieties in the Northern and Upper East Regions of Ghana**

No.	Variety	Days to maturity	Planting distances (centimetres)	Growth characteristics	Yield/ha (tons)
1.	Chinese	90–95	40 x 15	Semi-erect	1.8
2.	Samnut 22	100–110	40 x 15	Erect bunch	2.6
3.	Samnut 23	90–95	40 x 15	Semi-erect	2.2–2.8
4.	Mani pinta	120+	40 x 15 50 x 10	Erect	2.2–2.5
5.	Nkatiesari	100–110	30 x 15 40 x 15	Erect bunch	2.0–2.2
6.	Yenyawoso	85–90	40 x 15	Semi-erect	2.0–2.7

Ask the participants where they acquire their seeds.

Advise farmers to make sure that when purchase seeds, they:

- Buy certified seed, which includes the following information on the label:
  - Variety,
  - Germination rate (percentage),
  - Purity (percentage free from debris),
  - Date of packaging,
  - Net weight, and
  - Name of producer.

Pass around examples of labels with the information listed properly.

- Visually verify the quality of the seeds to ensure they are free from cracks, deformities, moulds, and signs of disease, and they are not shrivelled.

### Activity 3: Germination Test – 15 minutes

Ask participants to raise their hands if they save their groundnut seeds. Why?

Ask them to raise their hands if they always buy new seed every year. Why?

Ask them if they try to save seed, but sometimes buy new seed. Why?

Point out that the viability of groundnut seeds decreases rapidly when shelled from the pod. Therefore, even when buying seed that lists the germination percentage information, as time passes, that information become less and less accurate.

How should farmers deal with this situation? They should perform a germination test.

Explain that because the viability of a seed cannot be determined with a physical examination alone, it is important to test its ability to sprout. Seeds should be tested 8–10 days before planting.

Lead the farmers through the steps required to set up a germination test. Involve volunteers as assistants in performing the germination test for each of the three types of seeds at the FFS demonstration site plot. Be sure to mark or label each row to identify the seed varieties.

#### **Conducting a Seed Germination Test**

A seed germination test can be conducted with 100 seeds or with 20 seeds. We recommend 20 seeds to conserve some for planting.

1. Randomly select 20 (or 100) seeds from the planting seed stock.
2. Evenly place selected seeds in a 1 to 2-meter-long trench; cover with 3–5 cm of soil.
3. Water the seeds, keeping the soil damp, and observe for 5–7 days.
4. The number of seeds that will sprout after seven days indicates the percentage viability of the seeds.

Thank the farmers who assisted with setting up the test. Conclude the discussion by answering these and any other final questions:

- Do the seeds need sunshine to germinate? No, they are under the earth. They sprout in the dark.
- What do the seeds underground need to germinate? Water – they must not go dry.
- If you are conducting the germination test in a hot and sunny place, what should you do? Provide some shade so the soil stays damp.

Imagine that it is seven days later. We have been providing water to our test seedbed to maintain sufficient dampness, and we now see baby plants sprouting. How exciting! With our help, life awoke in the seeds! Now it is time to evaluate how viable our seeds are.

**Table 2. Seed Viability Results**

<b>If you planted 20 seeds and sprouted:</b>	<b>If you planted 100 seeds and sprouted:</b>	<b>Percent:</b>	<b>Then plant:</b>
<b>17 or more</b>	80 or more	80	1 seed per hill
<b>14–16</b>	70–80	70–80	2 seeds per hill
<b>Fewer than 14</b>	Fewer than 70	70	3 seeds per hill or obtain new seed

Ask farmers if they have any questions regarding seed selection and conducting a germination test. Provide any needed clarification.

### Activity 4: Exclusive Breastfeeding – 25 minutes

Transition the group to the next activity by drawing parallels between a germinating plant and the birth of a baby. Both the plant and the baby come from a dark, protected place (under the earth/in the mother’s womb) and enter into the world, the sun, the air, and the elements.

Are they both fragile? Yes!

Do they both need special care? Yes!

Explain that we are now going to talk about what newborns and babies up to 6 months of age need to thrive. If you have invited a community midwife, nurse, or traditional birth attendant (TBA) to join you, introduce them to the group. Explain that we will hold a discussion first and then conclude with a short role-play activity that will give us the chance to demonstrate our understanding of exclusive breastfeeding.

Together with the community midwife, TBA, or nurse, conduct the following discussion, inviting the guest to add additional information and to answer questions from the group. Make sure that all of the important points are covered.

Ask participants who have an infant six months old or younger to raise their hands.

Ask them: what is the only thing that a newborn should eat?

- Breast milk – note that the very first milk produced by a mother is thick and yellowish, called “colostrum.”
- Colostrum helps protect babies from illness and helps remove the first dark stool.
- Mothers should initiate breastfeeding in the first hour after birth.
- Mothers should breastfeed frequently to help the breast milk “come in” and to ensure a plenty supply.
- Water and other liquids are dangerous for a newborn.

What is the only thing that a baby younger than six months old should eat?

- It is important that during the first six months of life, babies be given breast milk **only**.
- Breast milk provides all the food and water the baby needs.
- The baby should be allowed to breastfeed “on demand” both day and night (eight to twelve times per day).
- Breast milk protects babies from many illnesses.
- Mixed feeding (giving other foods or liquids) can damage your baby’s stomach.

Should an infant under six months of age drink clean boiled water?

- No, breast milk provides all the liquid the baby needs. If the baby is thirsty, it should get mother’s milk.

What should the mother do if she has concerns about breastfeeding her baby?

- Get immediate assistance from a community health worker, a mid-wife, or nurse at the closest health facility for help with breastfeeding positions, good attachment, feeding a low-birthweight baby, hand expressing breast milk and cup feeding, and feeding a sick baby.

In addition to exclusive breastfeeding, what hygiene behaviours should the new mother follow?

- Wash her hands with soap and running water after the four critical times:
  - After cleaning a child’s bottom,
  - After using the latrine or disposing of faeces,
  - Before preparing food, and
  - Before feeding her child or eating.
- Where should the mother dispose of her baby’s faeces?
  - In the latrine.

**Breastfeeding Mother's Role Play – 10 minutes**

Invite five volunteers to play the roles of mother #1, her husband, mother #2, her grandmother, and a midwife.

Explain to the role players that mother #1 initiated exclusive breast-feeding after delivery and ensured her baby got all the colostrum needed despite the fact that her husband bought formula and other things that the mother will not give the baby because she knows better. Explain that mother #2 expressed all of the colostrum, claiming it is dirty, and she and the grandmother then give water to the baby. The midwife visits both families to provide them feedback and give them advice regarding their baby's next six months of life. The midwife should include guidance about attending regular growth monitoring and promotion sessions to make sure the baby is growing well.

Thank the volunteers for participating in the role-play. Using the following questions, invite the nurse, midwife, or TBA to conduct a brief discussion about the activity, highlighting the actions of the mother, father, and grandmother that were either good or dangerous for the baby.

Time permitting, invite farmers to take advantage of having the special guest (nurse, midwife, or TBA) for any other questions they may have.

Conclude the session by encouraging the farmers to conduct seed germination tests to determine the viability of their seed stocks and if it needs to be replaced.



# SESSION 4: SOWING GROUNDNUTS AND TENDING THE CROP

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## Session Objectives:

By the end of this session, the farmers should be able to:

1. Use the results of a germination test to determine the right number of seeds to plant per space;
2. Follow best practices in sowing and tending groundnut crops, including environmentally friendly practices for soil improvement;
3. Discuss nutrition and hygiene recommendations for children six months of age and older;
4. Understand the role of weeding in pest control and the prevention of aflatoxin; and
5. Discuss WASH 1,000 hygiene practices for the prevention of worms and diarrhoea in children.

## Agenda Items:

- Welcome, review, and introductions
- Sowing seeds
- Feeding the earth to feed the plants: environmentally friendly fertilizer
- Nutrition for children six months of age and older
- Caring for your crop: weeds, disease, and pest control
- Preventing worm infestations and diarrhoeal diseases in children

## Duration:

90 minutes

## Materials:

- Groundnut seeds for bunching as well as semi-erect varieties
- Dibbler
- Marker
- Rope
- Poles/pegs
- Compost or farmyard manure
- Flip chart
- Nail on which to hang the flip chart

## Training Method:

Interactive discussion, brainstorming, and scenarios

## Trainer Notes:

If possible, invite a trained nutrition officer to join you as a co-facilitator for this session. Encourage the officer to bring along any counselling cards and other visual aids at their disposal about nutrition in babies older than six months and the prevention of worm infestations and diarrhoeal diseases.

## Activity 1: Welcome, Review, and Introduction – 10 minutes

Welcome everyone.

If the timing is right, begin by observing and evaluating the germination test results.

- Ask a few volunteer farmers to count and report to the group the number sprouts that germinated. Depending on whether the total sample was 20 or 100, calculate the percentage of seeds that germinated (refer to the table in the previous session). Based on the results, ask how many seeds of each type of groundnut seed would need to be planted in each hole to ensure that the farmer's efforts of preparing the soil and sowing seed are well-rewarded.

If it is not possible to observe the germination test results, begin by discussing the personal experiences of the farmers.

- Ask who implemented their own germination tests and request that they share their results with the group. Follow up by inquiring how many seeds per hole they plan to use or if they plan to buy new seeds.
- If a farmer is going to buy new seeds, should she test them?

Explain that after testing the groundnut seeds, it is time to plant as soon as there is consistent moisture in the soil to ensure successful germination.

Ask a volunteer to remind everyone about what aflatoxins are and why they are bad. Make sure the following points are covered:

- They are dangerous to children, adults, and livestock;
- They lead to stunting, cancer, and other diseases; and
- They can infect groundnuts and other crops.

After thanking the volunteer, introduce the topic of sowing seeds by explaining the following:

- The timing of the sowing is important in terms of protecting the groundnut crop from developing aflatoxins,
- Farmers should take advantage of periods of high rainfall, and
- Maturation of the groundnut crop will vary between 85–100 days for early varieties and 110–120 days for late varieties.

Ask participants to share how they keep track of the number of days that have elapsed since sowing.

## Activity 2: Sowing Seeds – 20 minutes

Ask the participants if they have heard about the practice of treating seeds before sowing them. Encourage the farmers to contact their agricultural extension agents before using any such products – which are essentially poisons – so they can take the necessary precautionary measures.

### Sowing Groundnuts

Ask farmers to form groups of five people each and to spend two minutes discussing the following questions among themselves.

When is the best time this season to plant groundnuts so that germination occurs under the best moisture and podding conditions and before drought sets in?

Note if there seems to be agreement or disagreement regarding the issue, and make sure to:

- Emphasize that because groundnuts can grow to maturity in 3–4 months, it is important to plant seeds as soon as there is adequate and consistent moisture in the soil at the onset of the rainy season so that farmers can take full advantage of periods of higher rainfall;
- Explain that drought-stressed groundnut plants produce poor quality pods, which are more likely to become infected by the moulds that produce aflatoxin, *Aspergillus flavus* and *Aspergillus parasiticus*. It is essential to take full advantage of the rainy season and to avoid planting during a prolonged dry season.
- Remember that the optimum planting date depends on the chosen variety, the agro-ecological zone, and observations made at the start of the rainy season.

If the rainy season is already underway by the time this session starts, take advantage of the opportunity and provide the farmers with concrete information regarding the best time to plant their chosen varieties based on their agro-ecological zone and recommended strategies for minimizing risk.

Ask the farmers to share their answers to the discussion questions. Write down any strategies they use for minimizing their risks.

Point out that it is ideal to stagger planting in large acreages to minimize risks of flowering during dry periods and to reduce the pressure of undertaking certain activities over a large area at one time.

Invite a few farmers to explain how they plant groundnuts. Then ask a volunteer to help you demonstrate each of the steps involved in planting groundnuts (see box below). Reinforce any accurate information provided by the farmers and clarify misinformation as necessary.

### **Planting groundnuts in rows**

It is important to plant groundnuts in rows to ensure adequate plant population is maintained. Other farm operations, such as weed control, insect management, and harvesting are easier when plants are in straight rows.

- Use a rope or sighting poles to mark the rows to enable planting in straight lines.
- If planting on a slope, plough along contours to reduce the speed of run-off and minimize soil erosion. The rows should follow the contour.
- Groundnuts should be planted on ridges.
- Plant seeds at about 5 cm deep.
- If you are planting the semi-erect types, provide 40 or 50 cm between rows and 10 cm between seeds. This spacing gives an optimum plant population of 200,000 plants per hectare, or 100,000 plants per 0.5 hectares.
- If you are planting the spreading types, provide 50 cm between rows and 20 cm between seeds. This spacing gives an optimum plant population of 100,000 plants per hectare.

Help the farmers to practice sowing in rows using the rope-and-sighting-pole method, using at least one spreading and one semi-erect type of groundnut.

### **Activity 3: Feeding the Earth to Feed the Plants: Environmentally Friendly Fertilizer – 20 minutes**

Begin this activity by telling participants the following story about a farmer named Ziba. Ask them to listen carefully because at the end, you are going to ask them to help identify good advice for Ziba.

Ziba wanted to grow maize on his one acre of land. He bought quality seed in the market and then conducted a germination test. The result was 95%. He consulted his agriculture extension agent about the right time for sowing and planted his crop accordingly. Within a week, the seeds had sprouted up quality plants. Ziba felt very happy and proud. But three weeks later, Ziba visited his land to check on his crop and discovered that the plants were not growing properly. He thought his maize should be twice as tall as it was by this time – it appeared to be stunted. Ziba was concerned.

Help the group brainstorm about factors that potentially could have affected the growth of Ziba's maize.

Sort the identified factors into four categories:

- Water,
- Care,
- Treatment of disease, and

- Nutrients (or food).

Introduce the idea that, like humans, plants also need nutrition to develop properly. Just as people need protein for strong muscles, calcium for strong bones and teeth, and vitamins and minerals to help our bodies function well and fight disease, plants need a variety of things in order to develop strong roots and stems, good foliage, plenty of fruit, and the ability to fight off disease. Plants require a combination of three main nutrients – potassium, phosphorous, and nitrogen – in addition to others to develop their root systems (search for water) and their stems and foliage, and to produce fruit (and healthy seeds).

Farmers in northern Ghana must feed the soil so that it can produce the crops on which we depend. There must be a reasonable level of organic matter be maintained in the light, weakly structured, tropical soils where groundnuts (and other crops) are grown. Essential nutrients must be present in the soil from which plants absorb their food.

Brainstorm with the farmers about the various practices they are aware of to help improve soil structure and build up the nutrients needed for a healthy crop yield. Then review the following information regarding the various practices that help improve the soil on their farms.

- Healthy biomass should be tilled into the soil, allowing it to decompose instead of being burned.
- Practice crop rotation – some crops fix certain nutrients into the soil that are beneficial to other crops. Legumes, including groundnuts, fix nitrogen into the soil and can be rotated with cereals such as maize to minimize pests and disease build-up.
- Use compost.
- Apply farmyard manure, which helps increase the organic matter content of the soil and improve its structure and water retention capacity.
- Discuss the best times to apply organic fertilizers.

## Activity 4: Nutrition for Children Six Months and Older – 20 minutes

Ask farmers who have a child between the age of six months and two years to raise their hands.

**Beginning at six months of age, babies need other foods in addition to breast milk. Should the baby continue to breastfeed on demand?** Yes. Breast milk continues to be the most important part of your baby's diet. Babies should be breastfeed **before** offering them other foods.

Tell the participants a short story. Explain that they should listen with the aim of identifying advice for the person in question.

### Scenario

Ten months ago, Rashida delivered a strong baby boy. The delivery was fine and the child born healthy. Rashida ate well and practiced exclusive breastfeeding for six months. She was happy that her child's growth card showed a healthy growth pattern. After introducing complementary food for four months, she was disappointed to find that her child was no longer growing well, and the nurse at the clinic expressed concern over his very low weight. Rashida does not know what to do. What questions should the nurse ask Rashida?

Encourage participants to discuss among themselves what questions the nurse should ask Rashida, and after a couple of minutes, invite volunteers to propose questions:

- How often do you feed your child?
- What do you feed him?
- How much do you give him at one time?
- Do you ever feed him colourful fruits and vegetables?
- Do you ever give him high-protein foods, like eggs, small fish, and pieces of meat or chicken?
- What type of water do you give him to drink?
- Do you still breastfeed him? Do you do so before offering him the solid food?

This can lead the nurse to provide important information about the following questions.

#### **What else should a child older than six months old eat?**

- At first, feed your baby complementary food twice a day.
- Begin with two to three tablespoons at each feeding.
- Start with staple foods such as porridge (corn, wheat, rice, millet, potatoes, and sorghum) and mashed banana.
- Enrich porridge with groundnut, green vegetables, beans, carrots, orange-fleshed sweet potato, "dawadawa" powder, small fish, pieces of meat or meat soup, eggs, oil, shea butter, or palm oil.
- Introduce a variety of foods over a period of time (flesh meats, eggs, dairy products, legumes and seeds, and fruits and vegetables).
- Give your baby 20 grams of boiled or roasted liver every two weeks, or whenever possible, to provide iron and prevent or address an anaemia problem.
- Exercise proper hygiene (cleanliness) to avoid diarrhoea and other illnesses.

#### **Should babies six months of age and older drink water?**

- Yes, but only if it is boiled and from a clean container.

#### **What else can mothers do to ensure that their baby thrives?**

- Mothers who breastfeed should continue to eat healthy diets. They pass their own good nutrition onto their babies through the breast milk.
- Take babies to growth monitoring and promotion sessions on a regular basis to make sure they are growing well and so that mothers can ask for any needed help.
- Follow good hygiene when preparing food and feeding your child.

Children suffer the most from bouts of acute diarrhoea, worm infestation, and environmental enteric dysfunction. These conditions are dangerous for children, especially under two years old. Good hygiene helps prevent these conditions.

#### **What behaviours promote good hygiene?**

- Wash hands with soap or ash at critical times.
- Safely dispose of adult, child, infant, and animal faeces.
- Create clean spaces for children that separate them from soil, animals and their faeces, or other unclean objects.

- Boil household drinking water just before drinking it.

## Activity 5: Caring for Your Crop: Weeds, Disease, and Pest Control – 10 minutes

Ask farmers to divide into small groups and brainstorm about the activities a farmer needs to perform to protect crops from insects and disease.

Lead an interactive discussion that covers the following topics:

- Weeding
  - We control weeds in the field because groundnuts cannot compete effectively with weeds for sun, water, and nutrients, especially at the early stages of development (three to six weeks after germination).
  - The best technique to control weeds is to pull them out by hand or with the aid of a hoe. If they are healthy, leave young weeds on the ground to decompose.
  - Practicing crop rotation can also help to reduce certain types of weeds, pests, and diseases. Maize is a good crop to rotate with groundnuts.
  - Timeliness in weed control is important. Weed at least twice.
    - Weed a new crop thoroughly within the first 14 days, 1–2 weeks after sowing.
    - Weed again before the initiation of pegs at about five to six weeks after sowing. Do not wait until the crops are overcrowded.
    - Weeding loosens the soil to facilitate pegging, thus increasing pod yield.
    - Once pegging is underway, avoid or keep to a minimum any disturbances to the soil so they do not interfere with the developing pods. In the event of high weed pressure after pegging, control weeds through hand pulling.
  - Weeds lead to crowding, which gives insects a place to hide and which can make it more difficult to manage diseases.
- Ensure proper spacing between plants. If germination results in crowding, thin out the plants to ensure enough space, allowing the remaining plants access to adequate nutrients and water to grow properly.
- Remove all “off-types” during weeding in order to maintain the genetic purity of the variety.

Wrap up by checking if there any questions on this topic. Point out that just as plants and crops need the right nutrients in the soil to thrive, babies also need the right nutrients to thrive. At some point, the mother’s breast milk will not be enough for the baby, whose body will be ready and will need new food to provide the necessary elements and energy needed for healthy development.

## Activity 6: Preventing Worm Infestations and Diarrhoeal Diseases in Children – 10 minutes

Ask participants to consider what might have the same effect on babies that weeds have on crops. What competes with babies for the good nutrition you have provided them, taking away nutrients and energy, which can lead to malnutrition and even death? Worms.

A worm infestation competes with a baby's growing body for the nutrients and energy that you work so hard to make sure they have. Worms rob your child of the good things they need to grow, resulting in retarded growth.

What might cause to a child to become completely dehydrated and in danger – just as a plant is at risk during a drought? Diarrhoea.

We have spoken about how farmers must weed to protect their plants. What effort must parents make to protect their infants and small children from worms and diarrhoea so that they can grow well?

Lead a brainstorming discussion around hygiene that prevents diarrhoea and worms:

- Follow the WASH 1,000 approach to washing hands (review).
  - Wash hands at four critical times with soap or ash and running water:
    - After cleaning a child's bottom,
    - After using the latrine or disposing of faeces,
    - Before preparing food, and
    - Before feeding a child and before eating – always wash the child's hands as well.
- Dispose of human faeces in a household latrine.
- After children use a chamber pot, safely dispose of the faeces in a latrine – and remember to wash the chamber pot with soap and water after each use.
- Keep animals safely away from child play areas by constructing pens or coops and have a closing gate. Animal droppings (poultry, goats, and sheep) are also a source of contamination and infections.
- Eat food that is well cooked.
- Drink safe (boiled) water. Using the WASH cards, walk participants through the five steps for preparing safe drinking water for children:
  - Sieve the water to remove all particles,
  - Boil the water,
  - Wash and air-dry a container, and
  - Pour the cooled water into the container and cover it with a lid before storing it in a cool area.

Ask participants to summarize the three things we have discussed so far that can help to prevent worms and diarrhoea in children: (1) handwashing with soap and running water during four key times, (2) safe drinking water, and (3) safe disposal of human and animal faeces.

Ask the participants if they know what the fourth behaviour is that completes WASH 1,000 approach. Where do children spend their time? Where do they play?

The fourth behaviour is to provide clean spaces for children to play. Why is this necessary?

- While playing, children under two years of age will put their hands and other things in their mouths.
- A dirty play space means they will probably pick up dirt – which contains faeces – and put it in their mouths, which will lead to infections and diseases.

How do you ensure children have a clean play space?

- Regularly sweep compound and gather the dirt,
- Keep animals away from child play areas to prevent them from littering where a child may crawl, and
- Place children on a clean cloth or mat in the compound.

Conclude by reviewing the four WASH 1,000 behaviours that will help prevent worms and diarrhoea. Point out that, even with the best prevention, some children will still get worms and can get sick.

Explain that, like weeding, which happens periodically, parents are encouraged to take their children for periodic deworming. Invite parents who have done this before to explain to the others what deworming entails. Deworming involves administering a dose of medicine provided by a health facility to the child.

Ask farmers to describe what they would advise someone whose child is underweight or seems to be getting dehydrated. Encourage the farmers to recommend that they do not delay in taking them to the nearest health centre or clinic. Like a plant during drought, small children are fragile, and if they are ill, they need care as soon as possible.



# SESSION 5: COMMON DISEASES AND PESTS AFFECTING GROUNDNUTS IN GHANA

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## Session Objectives:

By the end of this session, the farmers should be able to:

1. Identify different types of groundnut pests and diseases,
2. Identify ways to minimize groundnut pests and diseases through prevention and management, and
3. Identify the elements of an integrated plan to ensure that children grow up healthy and disease-free.

## Agenda Items:

- Welcome and review
- Identifying groundnut pests
- Identifying groundnut diseases
- Integrated pest management
- Integrated health management in children

## Duration:

70 minutes

## Materials:

- Aflatoxin Management Photo-Aid
- Flip chart
- Markers
- Nail on which to hang the flip chart

## Training Method:

Interactive large and small group discussion and demonstration

## Trainer Notes:

In the previous session, ask farmers who think they have a pest or disease, to bring a sample to the next FFS meeting.

Think of fun “prize” for the winning team of Activity 1. While you could always just do a round of applause, it might be more fun for the group to perform a victory song, cheer, or hand clapping routine for the winners.

## Activity 1: Welcome and Review – 10 minutes

Divide the farmers into five or six teams and have them spread out so they can stand together in groups and talk without the other groups overhearing them. Explain that you are going to hold a small competition with review questions. Each team chooses a spokesperson. After the trainer asks a question, team members discuss it among themselves and raise their hands if they come up with the answer. The first team to raise their hands gets to answer first. The trainer then asks the other teams if they agree with the answer or if anyone has more information to add. The team that provides the final complementary information receives a point.

Questions:

1. What is aflatoxin and why is it bad?
2. How soon can aflatoxin begin to infect a crop?
3. What is essential for a seed to germinate?
4. What is the only thing an infant younger than 6 months old needs for food?
5. How do you prepare safe drinking water for children?
6. What are the four critical times for handwashing?
7. Why must you use soap for handwashing? What is an acceptable substitute?
8. Why are weeds bad? What should farmers do about them?
9. How do children get worms? How can we prevent it?

Once finished, congratulate the teams for their participation and knowledge and conclude with a big round of applause.

## Activity 2: Identifying Groundnut Pests – 10 minutes

Begin the discussion by asking farmers to identify the types of pests (insects, not diseases) they have encountered in their groundnut crops. Note the various replies and then explain which are in fact pests.

- Pests are insects,
- They can attack foliage,
- They can suck plant sap,
- They can feed on roots and pods, and
- They can spread diseases from plant to plant.

Explain that most of the pests that damage groundnuts spend most of their lives in the soil and feed directly on the groundnut pods and/or pegs.

Using the photo cards, help participants in identify some of the major pests, and lead a discussion about how they can damage groundnut crops in Ghana.

1. Foliage Feeders:
  - a. Hairy caterpillars,
  - b. Grasshoppers, and

- c. Crickets.
2. Piercing and sucking insects:
  - a. Leaf hoppers,
  - b. Thrips,
  - c. Aphids, and
  - d. Pod sucking bugs.
3. Pests that attack the roots and pods by tunnelling into them, which can lead to the death of the plant:
  - a. Millipedes (feed on developing pegs, pods, and the grain in the field),
  - b. Wireworms (feed on developing pegs, pods, and the grain in the field),
  - c. White grubs (in wet conditions),
  - d. Mealybugs,
  - e. Earwigs,
  - f. Termites, and
  - g. Symphylids.

Ask farmers to observe the groundnut field on the FFS. Can they identify any pests or diseases?

Explain that, as these pests move around from plant to plant, they can also spread diseases caused by different bacteria and fungi.

### Activity 3: Identifying Groundnut Diseases – 20 minutes

Among the diseases that groundnuts can get are funguses, viruses, and bacterial diseases.

Show the farmers picture cards of some common groundnut diseases. As you hold up each card, ask them:

- Have you ever observed what you see in this picture in your fields?
- What do you see?
- If you cannot stop it, what is likely to happen?
- How do you prevent it?
- If it appears, how do you control it?

Table 3 includes information about the management of the major groundnut diseases in Ghana portrayed in the pictures. Most diseases and pests predispose crops to aflatoxin infection. It is therefore critical to identify and deal with them immediately.

**Table 3. Major Groundnut Diseases**

Disease	Symptoms	When it Occurs	Management
<b>Early leaf spot</b>	Dark spots surrounded by yellow halo	Flowering to maturity	Plant resistant varieties. Plant early to escape disease. Rotate with non-leguminous crops.
<b>Late leaf spot</b>	Dark spots on leaf	Flowering to maturity	Plant resistant varieties. Plant early to escape disease.
<b>Rust</b>	Rust-like (dead) spots on leaves	4–13 weeks after planting; prominent at podding	
<b>Rosette – caused by an aphid is one of the worse</b>	Leaf curls	3–13 weeks after planting	Combine these three control measures: <ol style="list-style-type: none"> <li>1. Follow recommended spacing,</li> <li>2. Use resistant varieties, and</li> <li>3. Practice early planting.</li> </ol>
<b>Groundnut mould</b>	Seeds become mouldy, leading to aflatoxin development	Before harvest; during processing and storage	Harvest when soil is moist and groundnuts are mature. Dry harvested pods well before storing them.
<b>Stem and pod rot</b>	Wilting of lateral branches, leaves become chlorotic (pale, yellow, and yellow white) and turn brown	All stages of growth	Uproot and burn affected plants. Keep groundnut debris away from fields.

*Note:* Practice prevention to avoid using chemicals to control pests and crop diseases – they can affect human health and pollute the environment and bodies of water. If you choose to use them, first speak to your agricultural extension agent for advice. Be sure to follow the manufacturer’s safety precautions. Use proper protective equipment, such as nose guards or respirators, glasses, gloves, trousers, and a long-sleeved shirt. Safety dispose of containers and clean equipment properly to avoid environmental pollution. Follow all safety guidelines and directions for use. Always wash your hands and change your clothes after handling chemical products.

### Activity 4: Integrated Pest Management – 20 minutes

What can we do to minimize pests and disease? Ask farmers to think about prevention. What can they do to not invite pests and disease? Then ask them what they should do to manage them if they have already appeared.

- Do not give pests a good place to hide. Keep the farm and its immediate vicinity free of weeds.

- Plant early to avoid peak population of pests.
- Regularly monitor and observe your farm for evidence of pests.
- Remove rogue crops and weed out hosts.
- Plant according to recommended spacing guidelines to reduce aphid infestation and therefore also reduce the incidence of rosette.
- Use cover cropping when farm is not in cultivation.
- Rotate crops.
- Use “trap crops,” which are also known as a *sacrificial crops*. These are plants that you add to your planting to attract pests away from the main crops you are growing.
- Practice companion planting. Some plants act as a repellent to some pests. If planted adjacent to a food crop, the companion plant can help control such pests.

Can farmers share any successful examples of cover crops, trap crops, or companion plants they have used?

What else have the farmers tried that worked?

Explain that all of the valid possible solutions mentioned are just one part of the solution. Some are preventive, others curative. Some do not take much time or effort, some save time and effort, and some may be expensive. Recommend to the farmers that they combine a variety of approaches and integrate them into a strategy for managing pests and disease.

Ask the participants if they have ever heard of integrated pest management (IPM). Explain that IPM is an ecosystem-based strategy focused on the long-term prevention of pests and their damage through a combination of techniques, including biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

Lead farmers in jointly creating an IPM plan for their groundnut crop that includes recommendations regarding the most effective of the various techniques in their context regarding:

1. Biological control,
2. Habitat manipulation,
3. Modification of cultural practices,
4. Use of resistant varieties,
5. Rotate crops and introduce cover cropping
6. Use trap crops and companion plants.

After developing the plan, ask farmers to voluntarily implement it, observe and document the results, and report them to the other FFS participants.

## Activity 5: Integrated Health Management for Children – 10 minutes

Explain to the participants that, like IPM for farming, we can as parents take an integrated approach to ensuring the health of our children.

Ask farmers to work in groups of six to eight. Ask them to discuss among themselves what elements they would include in an integrated plan to help ensure that their children have the best chance of being healthy and growing disease-free.

After three to five minutes, invite each group to describe one element of an integrated health plan for their children; then ask the other groups for their ideas until they have mentioned all of the best practices. Likely elements include:

- Pregnant mothers should eat well during their pregnancy and stay healthy.
- Children under six months of age should be exclusively breastfeed.
- After six months, in addition to breast milk, introduce baby to solid foods, including carbs, fruits, vegetables, and animal protein.
- Wash your hands with soap at critical times.
- Appropriately dispose of adult, child, infant, and animal faeces (latrine).
- Create clean spaces for children.
- Boil drinking water.
- Take child to health facility for weighing, vaccinations, and other health concerns.
- Closely observe your child for signs of issues that might require medical attention.
- De-worm your child.

# SESSION 6: GROWTH MONITORING AND HARVESTING

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## Session Objectives:

By the end of this session, the farmers should be able to:

1. Explain why timely harvesting is important and identify the disadvantages of delaying the harvest,
2. State the observable signs of groundnut maturity and demonstrate correct harvesting techniques,
3. Discuss the management of healthy crop residue, and
4. State the benefits of taking their baby to growth monitoring sessions.

## Agenda Items:

- Welcome, review, and introductions
- Correct timing of the harvest
- Best harvesting techniques
- Growth monitoring and promotion in children

## Duration:

90 minutes

## Materials:

- Growth monitoring card
- Flip chart
- Marker
- Nail on which to hang the flip chart

## Training Method:

Interactive discussion, demonstration, and practice of proper harvesting techniques

## Trainer Notes:

Be sure to conduct this session on either the FFS site or another location where the farm has both semi-erect and spreading varieties planted, has been under an IPM approach, and where plants are healthy and ready for harvest. This will allow for a good demonstration and practice of the harvesting techniques to be covered.

## Activity 1: Welcome, Review, and Introduction – 10 minutes

After welcoming participants, begin with a discussion of the farmer's experiences with implementing an IPM approach during this year's groundnut crop.

Invite farmers to come forward who during the last session had volunteered to implement IPM. Lead a discussion with them contributing their experiences, including:

- Describe their IPM plans. Are they mostly the same?
- What did the various farmers observe? Were their observations consistent?
- Did following an IPM approach result in an observable difference in weed, insect, or pest control?

Ask participants to observe the groundnut crops in the field nearby, which have been under an IPM approach this season.

Describe the IPM approach used and highlight any differences from what the participants reported regarding approach and result.

Remind participants that until now, their efforts have all been aimed towards harvesting the healthiest, most productive yield possible for the nutritional and economic well-being of their families.

It is important that we continue to protect the quality of our groundnut crop during and after harvesting. If we have managed to minimize the danger of aflatoxin during sowing and growing, we certainly do not want to waste all that hard effort by not following best practices during harvesting, drying, and storage.

## Activity 2: Correct Timing of the Harvest – 20 minutes

Begin by asking the farmers:

Why is it important to harvest groundnuts at the right time?

What are the benefits of timely harvesting?

What are the disadvantages of delaying the harvesting of the groundnut until after maturity?

Timely harvesting ensures the following:

- Reduced chance of pests, diseases, and aflatoxin infection;
- Minimized loss of crop to theft and destruction by animals; and
- Good quality seed and improved economic returns.

Ask farmers to take a minute to discuss with the person standing beside them how to know when a groundnut plant is ready to harvest.

Invite five volunteers to share their answers.

Confirm correct answers. For incorrect answers, establish how many others believe the same information by asking people who agree to raise their hands.

Reinforce the correct information while conducting a demonstration on the harvesting technique from the nearby field. Some points to highlight are;

- Groundnut's maturity period. The number of days to maturity varies by variety, and keeping track helps farmers know when to start checking for observable signs.
- Identify the variety (or varieties) of groundnuts growing in the field and their theoretical number of days to maturity.
- Review the observable signs of groundnut maturity below.

### **Observable Signs of Groundnut Maturity**

1. The leaves begin turning yellow and shedding.
2. Seeds are plump; they become hard in the pod and can be felt moving when the pods are shaken or pressed. When shelled, the seed's colour is consistent with what is expected for mature seeds of that variety.
3. The inside of the pod turns a brown or black colour.

Immature pods have a fresh, white, appearance.

- Using a hoe and modelling the correct technique, pull three to five plants.
  - Invite volunteers to strip the pods and share them so each is holding one pod.
  - Demonstrate the "hull and scrape" technique. Ask farmers to shell and examine the insides of the shells. If they are mature, they have dark markings inside the shell, and the seeds are plump and have the true colour of that variety.
  - Invite them to share their observations with others and to pass the pods around for everyone to observe.
  - Ask those holding pods with observable signs of maturity to stand on one side, and those with immature pods on the other.
- Evaluate the percentage of mature pods in the pulled sample. What percentage of participants is standing on the immature side? If there are 50 farmers in the FFS session – 10 holding immature seeds and 40 holding mature seeds – then 20 per cent of the pods are immature and 80 per cent are mature. Explain that if 70 per cent or more are mature, then the groundnut crop is ready for harvest.
- Emphasize that premature or delayed harvesting will decrease oil content of the seed and increase the chance of mould growth and aflatoxin development.

### Activity 3: Best Harvesting Techniques – 30 minutes

Most of the FFS farmers use manual harvesting techniques. They need to determine whether their crop will be harvested by digging with the help of a hoe or just using their hands to pull up whole plants with kernels/pods attached.

- Hand harvesting (without a hoe) works best with erect/semi-erect groundnut varieties growing in well-drained, sandy, loam soils. It is easiest when the soil is moist and loose.
- Hoe harvesting is used to spread or semi-spread groundnut types. These produce pods all along the running stem, and the hoe helps loosen the pods from the earth, before pulling the plant up by hand. The hoe helps to avoid losing some pods. When using the hoe, be careful to avoid damaging the pods or losing them. Hand harvesting can work too if the soil is sandy/loamy and well drained.

Explain that it is important when harvesting not to damage the pods because any damage can open the door to mould and a probable aflatoxin contamination.

Ask farmers what techniques have worked best for them.

Demonstrate the proper techniques for harvesting erect/semi-erect groundnut varieties and spreading or semi-spreading them on the FFS groundnut plantation.

After pulling the plants from the earth, demonstrate how to loosen or shake off the soil and correctly expose the kernels/pods to the sun. Point out the following:

- Be sure to turn the entire crop upside down so that it is not in contact with the soil.
- Exposing pods to the sun eases drying, helps prevent mould, and prepares the pods for stripping or plucking.
- Avoid a prolonged stay of overturned groundnuts in the field because aflatoxin increases with delays of produce in the field. It is possible to pluck the same day you harvest the crop.
- Avoid field drying of groundnuts with pods still attached to haulms. This slows drying and can expose pods to fungus and aflatoxin infection.
- Separate the pods from the plants after exposure to sun, called *stripping* or *plucking*.
- Stripping or plucking can be done by hand or using mechanical strippers.
- Remove and discard mouldy and damaged shells encountered while plucking.

Have farmers practice correct manual harvesting technique in the FFS field. Make sure that they expose the nuts to sunlight by turning the crop upside down correctly.

Ask them what they think they should do with the healthy crop residue after harvesting it. Points to emphasize include:

- Increase the biomass of the soil by either ploughing it under or incorporating it into the soil once it is dry.
- Do not burn crop residues after harvesting, unless they are diseased.
- Make a fire belt around the farm to prevent crop residue from burning.

Ask farmers if any have experience with planting a cover crop or practicing crop rotation following a groundnut harvest. Lead a short discussion about these practices as well as alternating groundnut plantings with cereals, such as maize, sorghum, and sweet millet, or root and tuber crops, such as cassava, yam, and sweet potato.

Conclude by emphasizing the importance of immediately harvesting a mature crop of groundnuts, as described above, to decrease chances of an aflatoxin contamination.

### **Activity 4: Growth Monitoring and Promotion in Children – 15 minutes**

Begin this activity by asking farmers if they can think of any parallels between growth monitoring their groundnut crop and how parents monitor the growth of their children.

Review the following recommendations on regular growth monitoring and promotion.

- Take your baby to regular growth monitoring and promotion sessions during the first year of life to make sure your baby is growing well.
- A healthy child who is growing well should gain weight every month. If your child is not gaining weight or is losing weight, there is a problem.
- Attending growth monitoring and promotion sessions can help identify nutrition problems your child may have, such as severe thinness or swelling. Nutrition problems may need urgent treatment with special (therapeutic) foods.
- You should also ask about your baby's immunization schedule. Immunizations protect babies against several diseases.

### **Activity 5: Review and Conclusion – 15 minutes**

Conduct a review of the key concepts from today's session with the following questions, reinforcing the correct answers.

- Why it is important to harvest groundnuts at the right time?
- What are the benefits of timely harvesting?
- What are the disadvantages of delaying the harvesting the groundnut until after maturity?
- What are the observable signs of groundnut maturity?
- What is the minimum percentage of mature pods in a sample that signals harvest time?
- Whether harvesting by hand or with the aid of a hoe, what should farmers avoid to decrease the chances of aflatoxin contamination?
- What is a best practice after pulling the plants from the earth and before stripping or plucking?
- What are the advantages of attending monthly growth monitoring and promotion sessions during your child's first year of life?

Conclude this session by wishing the farmers a successful harvest and encouraging them to attend the next session, which will be focused on preventing groundnut contamination with aflatoxins during processing and storage.



# SESSION 7: PROCESSING AND PREVENTING AFLATOXIN CONTAMINATION

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## Session Objectives:

By the end of this session, the farmers should be able to:

1. Explain importance of properly drying, storing, and processing groundnuts,
2. Describe best practices in drying, separating, and destroying bad groundnuts, and what to avoid in order to reduce aflatoxin contamination,
3. State recommended groundnut storage practices and explain how to monitor the quality of groundnuts while in storage to prevent the spread of aflatoxins,
4. Recommend best practices during shelling and processing of groundnuts, and
5. Explain how to ensure children's food and play spaces are clean and safe.

## Agenda Items:

1. Welcome, review, and introductions
2. Drying groundnuts
3. Managing bad groundnuts
4. Shelling groundnuts

## Duration:

90 minutes

## Materials:

- Samples of dry groundnuts to shell and bite for the moisture test
- Samples of jute and nylon sacks
- Samples of food storage containers
- Aflatoxin Management Photo-Aid
- WASH 1,000 Photo-Aid

## Training Method:

Interactive discussion

## Activity 1: Welcome, Review, and Introduction – 10 minutes

Review the key points that help prevent aflatoxin infection during harvesting. Ask participants if they can cite them:

- Harvest groundnuts immediately at maturity;
- Using hands or with the help of a hoe, pull whole plants from the earth, taking care not to damage the pods;
- Shake/remove as much soil from the pods and expose the pods to sunlight by placing the plants upside down; and
- After pods have dried in the sunlight, strip the groundnuts from the rest of the plant so they can dry.

Explain that during this next session we will be covering all the different activities involved in monitoring and ensuring quality of groundnuts while drying, storing, transporting, and processing groundnuts for their various uses.

Point out that aflatoxin can develop during these post-harvest activities. As farmers, they focus on ensuring the best-quality produce from the field. Another important priority is to protect the quality of their groundnuts until consumed by family members.

Ask participants to identify what happens to the groundnuts between the time they are pulled and when they are eaten.

Write down their answers on a flip chart. Participants should mention things like plucking, drying, sorting, shelling, winnowing, storing, transporting, selling, shelling, planting, transforming (into butter or oil), roasting, and boiling.

## Activity 2: Best Practices for Managing Quality When Drying Groundnuts – 20 minutes

Ask farmers how they dry their harvested groundnuts. Invite one or two explanations.

What visual changes have they observed in their harvest as it dries?

Ask farmers to describe any problems they may have experienced when drying groundnuts and what they think may have caused them.

Lead a short discussion covering the following points and best practices for drying groundnuts. Refer to photo cards or the Aflatoxin Management Photo-Aid as needed.

- The purpose of adequately drying groundnuts is to reduce moisture to an appropriate level so they can be safely stored for later use.
- Any practice that slows drying and puts groundnuts in contact with moisture during or after drying will hurt the quality of the groundnuts and invite mould and the development of aflatoxins into your groundnuts.

- Proper drying is key to avoiding aflatoxin contamination during drying and storage.
- Delayed and incomplete drying can lead to mould and aflatoxin contamination.
- Remove and discard any mouldy or damaged shells found during the drying process.

Read aloud to the participants the list of best practices in drying groundnuts as well as practices to avoid (see box below). Instruct participants to listen carefully and then say whether they think the statement is true or false. If every point is read as written, the answers will all be "true." Check to see if anyone has any questions after each statement.

### **Best Practices in Drying Groundnuts**

- Strip groundnuts from plants before drying. Do **not** dry groundnuts with their vines attached because they will be slower to dry, which increases the risk of aflatoxin infection.
- Begin drying groundnuts immediately after harvest, preferably within 48 hours after stripping or plucking.
- Dry groundnuts on clean polythene sheets, tarpaulins, mats, cemented floors, or raised structures in the sun, breaking contact with the soil.
- Spread nuts evenly on drying surface, and make sure to turn them twice a day to ensure even and fast drying.
- Use a rake or other tool with a long pole to turn groundnuts so as to avoid stepping on and crushing nuts.
- Separate out cracked, diseased, or infected produce from the healthy during drying.
- Dry groundnuts for six or seven days prior to storage.
- Dry groundnuts to a moisture content of less than 10 percent. For good storage, moisture content of between 6–8 percent is preferred.
- A practical way of testing if your groundnuts have reached the recommended moisture content is by taking some dry groundnut pods, shaking them to listen for a rattling sound. Then, shell some of the pods and bite the nuts. If they stick to your teeth, then they are not yet dry enough.

### **Avoid the following when drying groundnuts**

- Do not dry groundnuts with the vines. This causes groundnuts to retain moisture, leading to mould formation and aflatoxin growth.
- Do not dry groundnuts on a bare, uncemented floor. This practice retains moisture in the pods and can lead to mould formation and aflatoxin growth.
- Do not dry groundnuts by the roadside. This exposes the nuts to vehicles and pedestrians who can step on and destroy nuts. It also endangers road users and farmers.

Clarify any outstanding questions on drying groundnuts. Conclude by saying that the best practices they have discussed are important in helping to manage aflatoxin contamination.

## Activity 3: Managing Bad Groundnuts – 10 minutes

Ask the farmers if any of them has *never* seen a bad groundnut. The answer is: of course not! We all have experience with this issue. The key to keeping aflatoxins under control is the management of bad groundnuts.

### Separating bad nuts from good nuts

Why is it necessary to separate bad nuts from good nuts? Ask a few farmers for their answers, and then emphasize the following points:

- Separating diseased pods prevents cross-contamination, reducing aflatoxin contamination;
- The seeds you save for planting next year will have a more successful germination and a greater yield;
- Groundnuts will be of a better quality, potentially attracting higher prices;
- Groundnuts will keep longer; and
- Your efforts will improve your family's nutrition and protect their health due to the reduced risk of aflatoxin contamination.

### Destroying bad groundnuts

Ask the farmers why it is necessary to destroy bad groundnuts. Ask a few to share their answers with the group.

Explain that aflatoxin can infect bad groundnuts as well as vines. We do not want people, livestock, or chickens to eat bad nuts. Destroying the bad nuts ensures that people and animals do not consume them, which protects their health.

What is the most effective way to destroy groundnuts? *By burning them.*

How should we proceed with burning so that it is effective and safe? Ask a few farmers for their ideas. Make sure that the discussion includes the following points:

- Heap bad groundnuts and dried vines in one location where the risk of fire spreading is low;
- Add dry twigs to the heaped groundnuts to ensure that the nuts burn completely;
- Tend the fire after setting fire to the heap and;
- Before leaving the area, make certain that all of the nuts are completely burnt and the fire has gone out entirely; and
- Spread the ashes.

If burning is not possible, *burying* the nuts is another method to use if you can be sure that animals will not dig it up. How should we proceed with burying so that it is effective and safe? Make sure to cover the following:

- Dig a hole in an area where farming activity does not take place and to which children and livestock do not have access.
- Make sure the hole is deep enough to prevent animals from digging up the buried groundnuts.
- Pour the bad groundnuts into the hole, and cover with soil. Compact the soil to prevent animals from digging it up.

Emphasize that damaged groundnuts will likely be infected with aflatoxins. Farmers should never keep them because they have harmful health effects. They should destroy bad groundnuts as soon as possible.

## Activity 4: Storing Groundnuts – 15 minutes

Lead a discussion on how to bag and store groundnuts.

Confirm that all the farmers all know that groundnuts should be stored in their pods. Farmers should shell groundnuts only when they are ready to use them as seed, as food, or for processing. Ask participants:

- How do you determine when groundnuts are dry enough and ready for storage?
- How do you bag groundnuts for storage?
- What quality control practices do you follow to ensure that you only bag quality nuts?
- How do you ensure your bags and sacks protect the groundnut's quality and help prevent development of mould and aflatoxin contamination?

Note the correct responses, and prepare to respond to the incorrect ones with the information below.

### Recommended groundnut storage practices

1. Dry and sort groundnuts prior to storage.
2. Remove all rotten, mouldy, discoloured, or immature groundnuts. Destroy these nuts. If people or animals eat them, they are very likely to get sick.
3. Store groundnuts in bags or sacks.
4. Do not heap loose groundnuts in shells (pods) on the floor or ground of a storeroom or structure. This facilitates contact with moisture, which leads to mould and disease.
5. Bag only clean and sorted pods or kernels.
6. Only use jute or nylon bags or sacks that will maintain suitable conditions and prevent or greatly diminish groundnut contact with moisture and insect or rodent damage.
7. Only reuse clean sacks that are still in good condition (no holes) and after air-drying them in the sun. Do not use damp sacks or bags because the moisture creates conditions for development of moulds that lead to aflatoxin contamination.
8. Store bags or sacks of groundnuts on wooden pallets off the ground or floor and away from the wall to reduce the chances of its contacting moisture.
9. The storage space or facility should be well ventilated and dry, with low relative humidity. The space should be protected from rodents and other pests.

### Quality assurance through monitoring

Ask the farmers if a good storage facility and the right sacks protect the quality of our well-sorted groundnuts during storage. It will help, but it does not guarantee that there will be no problems.

Aflatoxin management requires vigilance during all steps, from preparing the ground and seeding through storage and all the way to consumption.

You need to monitor the quality of stored groundnuts on a regular basis. Monitoring will help identify any problems – such as insects, rodents, and mould – at an early stage so you can handle the problem before it destroys the fruit of your hard work.

Ask farmers if they have advice to share on how to monitor the quality of stored groundnuts. Invite three or four volunteers to offer some suggestions. Confirm or clarify by reinforcing points covered in the box below.

#### **Monitoring stored groundnuts to prevent the spread of aflatoxins**

- After three months of storage, pull a sample of groundnut sacks;
- Open and check for any signs of problems such as mould, fungus, holes, or insects;
- If you see any problems, open other sacks;
- Remove bad groundnuts or seed, and destroy them;
- Bag remaining good groundnuts or seed in clean sacks and return to storage; and
- Continue to monitor.

Conclude this discussion by reinforcing the following message: *good storage practices protect quality, prevent physical damage and disease, and ensure a longer shelf life for your groundnuts.*

### **Activity 5: Best Practices for Transport and Marketing – 5 minutes**

Ask participants to discuss in small groups among themselves what good transportation practices might be, which would protect the quality of the groundnuts and prevent physical damage and disease. Invite volunteers to share their ideas, and use card 14 of the Aflatoxin Management Photo-Aid to help reinforce the following points:

- Use tarpaulins to protect groundnuts from rain during transport;
- Do not stack the sacks so high that they crush the ones on the bottom or are at risk of falling out of the truck;
- Vehicles for transporting groundnuts should be clean, and have clean pallets or other raised platforms to protect groundnuts from contact with soil, water, or other things that may be on the truck bed;
- Do not use open trucks for transporting groundnuts; and
- Do not let people ride on top of groundnut sacks – they can damage the groundnuts, reducing their quality.

## Activity 6: Aflatoxin Management in Processed Groundnut Products – 20 minutes

### Shelling Groundnuts

Lead an interactive discussion with the following questions and answers:

When should a person shell groundnuts? Is it possible to shell them too early? Why?

Review the following points with the farmers.

- Groundnuts that will be stored for long periods should not be shelled because once they are, their seeds can be damaged easily.
- Groundnuts should not be shelled until they are ready to be planted or processed and consumed. Groundnuts meant for planting should be shelled by hand; groundnuts meant for consumption can be shelled with a sheller.
- The shell helps protect the quality and viability of the seed.

How do you shell groundnuts? What are the advantages of the methods you are using?

- Shelling machines exist – some are manual, and others are electric.

Ask if any farmers have used a sheller, and if so, what have been the advantages and disadvantages of using them.

Ask farmers to share information about how to have access to shellers near this community and any recommendations for their use. Review the following:

- Separate out immature pods as well as those infested with pests and mould or other diseases.
- Do not shell by beating or trampling on the groundnuts.
- Shell by hand or use motorized shellers specifically designed for groundnuts. Make sure they do not damage the seeds inside the pods.
- Do not sprinkle water on dry pods while using mechanical shellers. Instead, adjust (if possible) the space between the blades or surfaces and the sieve according to pod size to reduce breakage.
- Remove shrivelled, discoloured, mouldy, or damaged seeds from the lot, including groundnuts with damaged testa (the brown skin covering the seed), and put them in a separate polybag for storage until they can be burned or deeply buried in a non-cultivated area.
- Remove and pick out foreign materials that can contaminate groundnuts.

Conclude the discussion on shelling by emphasizing that the damage that occurs to groundnuts during shelling, threshing, and winnowing makes them much more vulnerable to mould during storage. Even under the best storage conditions, mould growth may occur several times faster in damaged nuts than in intact nuts. Cracks and breaks in groundnut pods and testa occur mainly during shelling, through trampling or inappropriate use of machines.

### What products can be made from groundnuts?

Groundnuts can be roasted. They can be processed into groundnut flour, paste, oil, biscuits (*kulikuli*) and animal feed. Groundnuts can also be used as an ingredient in chocolate, “Tombrown,” and cakes. Groundnuts are a nutritious part of a healthy diet for adults and children. Invite participants to share other examples.

### **How can we prevent aflatoxins from entering into these products and thereby being consumed?**

- Intact groundnuts last longer than processed ones. Process only small amounts for household consumption and sale.
- Always check for groundnut quality first, being sure to sort and remove any broken, shrivelled, or mouldy groundnuts and foreign material. This will reduce the chance of aflatoxin contamination in the processed product.
- Processing poor quality kernels will lead to heavy aflatoxin contamination in the final product.
- If the kernel moisture content of the delivered nuts is over 13 per cent, further dry them on a clean surface, reaching 9 per cent moisture content before processing. Shell and bite a handful of groundnuts to test the moisture content. If the nuts stick to your teeth, then they are not yet dry enough.
- After processing the groundnuts into paste, oil, or any other product, store them in clean and dry plastic or glass containers. Show participants pictures of the various types of containers used for packaging.
- It is best to use airtight covers on the containers to prevent the entry of air and moisture. Air will oxidize the oil in the groundnuts, turning them rancid. Rancid oils smell and taste bad and can lead to heart disease and cancer. Moisture encourages mould growth and aflatoxins.
- Store containers of all processed groundnut products in a cool, dry place and away from sunlight to help protect their quality and shelf life. Locally processed peanut butter and other products are not stored properly in Ghanaian retail markets, and often exposed to sunshine. The heat from the sun accelerates rancidity and encourages the growth and multiplication of moulds and other microorganisms.

## **Activity 7: Preventing Hygiene Problems During Play and Feeding – 10 minutes**

Ask participants to brainstorm about the similarities between quality assurance of groundnut crop storage and processing and the quality of food and play spaces for children.

Lead an interactive discussion with the following questions and answers.

Why do children need clean play spaces?

How do you ensure children have clean play spaces?

- Regularly sweep compounds and gather the dirt, which helps keep play spaces clean;
- Keep animals in an enclosure, which will prevent them from littering the compound;

- Provide a gate or construct the pens and coops to keep animals away from play areas, which prevents the spread of animal faeces; and
- If possible, place children on a cloth or mat in the compound.

How do you ensure that children's food is clean and safe to eat?

- Keep children's food in clean containers covered with a tight lid;
- Protect children's food from contact with houseflies and animals'
- Warm any food that has been stored before feeding to children;
- Keep food stored for children away from animals; and
- Caregivers and children should wash their hands with soap before feeding.

## SPRING

JSI Research & Training Institute, Inc.  
1616 Fort Myer Drive, 16th Floor  
Arlington, VA 22209 USA

Tel: 703-528-7474

Fax: 703-528-7480

Email: [info@spring-nutrition.org](mailto:info@spring-nutrition.org)

Web: [www.spring-nutrition.org](http://www.spring-nutrition.org)

