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Growing Soybean commercially in Nigeria

a training manual

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...a training manual

Specific objectives

The specific objectives listed here are the specific ideas and skills being taught on the associated page. The trainer should strive to ensure that the objectives for each lesson are met.

Discussion questions

The discussion questions are intended to link the traditional knowledge held by the participants to the 'new knowledge' passed in each lesson. It is also intended to create a participatory atmosphere where farmers' histories are respected. Finally it is believed that the knowledge and experience an individual farmer possesses is beneficial to the learning of the entire group.

Note to trainer: how to use this trainer's guide.

Each page of this guide presents new ideas on how to grow Soybean productively. After page 3 this guide treats every page as a distinct lesson with distinct objectives. All information for trainers is only a suggestion and can be used as is, omitted or refined. Not every activity can be carried out or every discussion question asked, therefore it is up to the trainer to use his or her own discretion. This guide assumes that some of the participants will have previously farmed soybean. The course should take place outside in an available field.

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Training method

For each page a suggested lesson is given. Each suggested training method makes use of all the discussion questions, activities and review questions and meets all the specific objectives.

Activity

Almost all lessons include at least one activity. Activities are intended to help farmers understand the information concretely and practice the skills and knowledge of the course. Not all activities can be carried out and they will depend on available materials and time.

Materials

Containers
clayey soil, stony soil, loamy soil
Hoes (one for each participant)
Pencil or pens for farmers
Variety of soybean
Cutting knife
Basket
Chemicals or substitutes
Protective equipment
Inter-row weeder
Knapsack sprayer
Measuring equipment
Soybean seeds+
Flip charts & pictorials on soybean

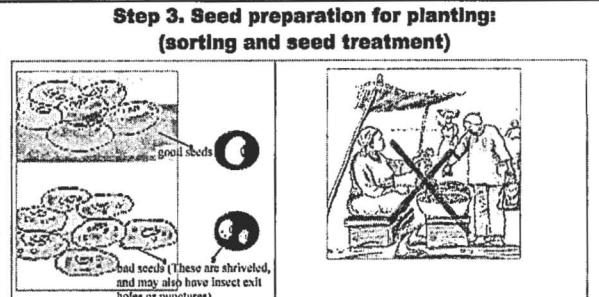
Review question

The review questions are intended to reaffirm the information presented in each lesson or to connect the lesson to the farmers' individual practices.

<p>General objectives of the course: By the end of the course farmers will:</p> <ol style="list-style-type: none"> 1. gain knowledge and productive skills of growing soybean in Nigeria. 2. commercially grow profitable soybean. <p>Discussion questions</p> <ol style="list-style-type: none"> 1. Where do you presently farm? 2. How many participants here have ever grown soybean? 3. Where do you presently find information on farming? 4. What are your major limitations to production? 	<p>Soybean production in Nigeria</p> <h1>Soybean</h1> <p>Training method</p> <ol style="list-style-type: none"> 1. Introduce yourself. Provide your name and farming background. 2. Ask participants for names and years of farming experience. 3. Explain purpose of course: The purpose of the course is to familiarize participants with productive methods of growing soybean as well as to share traditional knowledge amongst farmers. The goal of this course is to increase the yields of participants and to convert sustenance farming into commercial farming. 4. Read story; explain potential of increasing profits by using improved production technologies. 5. Ask <u>discussion questions 1-4</u>. 6. Proceed to activity 1 7. Explain the Nutritional, Industrial, and economic importance of soybean. Thus, justify the need for commercial production of soybean. 	<p>Activity 1 1 let 2 or 3 say why they grow soybean</p>
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<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <ol style="list-style-type: none"> judge their current methods of land preparation against taught methods for strengths and weaknesses. understand the benefits of minimal tillage and ridge preparation. <p>Discussion questions</p> <ol style="list-style-type: none"> What happens to crops if farmers fail to properly prepare land before planting? What are good land preparation techniques? 	<p>Step 1. Prepare your land properly</p> <div style="display: flex; justify-content: space-around;">   </div> <p><i>Clear all existing vegetation during land preparation. Good scalded preparation is important for a good crop of any bean. Plough the soil and harrow properly into flat scaldbeds.</i></p> <p>Training method</p> <ol style="list-style-type: none"> Explain that land for soybean production should be well drained and not waterlogged; also, fallow weeds, trees and shrubs on the site should be cut down and cleared manually or slashed with a tractor during land preparation Ask <u>discussion questions 1 + 2</u>. Describe the benefits of minimum tillage to conserve soil, organic matter, moisture, and to reduce soil erosion. Judging from the response of the 2nd question proceed with <u>activity 1</u>. <p>Explain that land clearing should be followed by plowing and harrowing with 4-6 days in between operations to enhance good soil tilt for good seed germination and destruction of newly emerged weeds. The land may be ridged or left as flat seedbeds after harrowing</p>	<p>Activity</p> <ol style="list-style-type: none"> Ask two or three farmers to physically demonstrate their land preparation methods, comment on all positive characteristics then, if any, note areas which may need improvement. <p>Materials</p> <ul style="list-style-type: none"> 1 or 2 hoes 1 or 2 cutlasses <p>Review questions</p> <ol style="list-style-type: none"> In what ways is it possible to reduce weed competition and increase production? What are some methods of reducing water logging?
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<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <ol style="list-style-type: none"> 1. understand the methods of marking or laying out plots. 2. be able to divide field into blocks with alleyways between blocks. <p>Discussion questions</p> <ol style="list-style-type: none"> 1. What are the Indigenous ways of plot layout used in your areas? varieties? 2. What are some advantages or disadvantages (if any) of marking or plot layout? 	<p>Step 2. Marking or plot layout</p> <p>ridged land Plough and harrow the seedbeds prior to marking and plot layout.</p> <p>flat seedbeds Mark the land in rows 60-75 cm apart. Layout the marked flat seedbeds into plots of rectangular blocks with alleyways between blocks to ease the movement of materials during farm operations.</p> <p>Training method</p> <ol style="list-style-type: none"> 1. Explain that after land preparation, the field should be marked into blocks of known areas with alleyways between blocks 2. Ask <u>discussion question 1 + 2</u>. 3. In addition to responses provided by farmers, explain advantages and disadvantages of marking or plot layout of soybean field. Advantages: enhanced movement of materials and agronomic operations. Disadvantages: marking plots may cost money, may not be suitable for your environment, and may require increased inputs. In using their plots as models and by making mounds explain how method increases soil contact with seeds (Increase topsoil volume per plant) and leads to better plant establishment and reduced weed competition. Explain, using models, how (making ridges or mounds if necessary) ridges and mounds prevent water logging. 	<p>Activity</p> <ol style="list-style-type: none"> 1. Ask 2 or 3 farmers to say what they do after land clearing either manually or using tractors. <p>Materials</p> <ul style="list-style-type: none"> • Pencil or pens for farmers. • Board to demonstrate plot layout.
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<p>Specific objectives <i>By end of lesson farmer will:</i></p> <ol style="list-style-type: none"> 1. be able to select good seeds from bad seeds. 2. Be able to treat seeds for planting. <p>Discussion questions</p> <ol style="list-style-type: none"> 1. How do you differentiate good seeds from bad seeds? 2. What are some problems you may face if unsuitable seeds are planted? 3. What are the advantages of treated seeds 	<p>Step 3. Seed preparation for planting: (sorting and seed treatment)</p>  <p>Good seeds are essential for a good crop. Sort the good seeds for planting to ensure that they are free from insect and disease attack. Remove all bad seeds.</p> <p>Do not purchase seeds from the open market as the cleanliness and germination potential of such seeds are not certain. Plant soybean varieties that are high yielding and pest resistant.</p> <p>Training method</p> <ol style="list-style-type: none"> 1. First ask <u>discussion question 1 + 2</u>. 2. Explain the need for sorting seeds before planting. 3. Proceed with <u>activity 1+2</u> 4. Explain that bad seeds have insect holes or punctures. Pick seeds from the container to demonstrate your point 5. Explain the importance of seed treatment before planting to include good germination and protection of seedling from insect and fungal infection after emergence. 6. Proceed with <u>activity 3</u>. 7. Explain that seeds for planting should not be bought in open markets as the cleanliness and viability can not be guaranteed 8. Ask <u>review questions 1 + 2</u>. 9. Explain the benefits of planting recommended varieties such as Samsoy2 and TGX536-02D and sources of good seeds. 	<p>Activities</p> <ol style="list-style-type: none"> 1. Display examples of healthy and unhealthy seeds. Have farmers pass around examples and identify good and negative features of soybean seeds. 2. Allow farmers to sort seeds in the container 3. Using the already sorted seeds, measure 4 kg of it to demonstrate how seeds are treated with 10 g of Apron Plus. <p>Materials</p> <ol style="list-style-type: none"> 1. A container of good and bad seeds of soybean 2. Sachet of Apron Plus 3. Measuring bowls or cups <p>Review questions</p> <ol style="list-style-type: none"> 1. Why should seeds be sorted before planting? 2. How do you differentiate good seeds from bad seeds?
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<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <ol style="list-style-type: none"> 1. know the correct planting time for farmers in the North and South 2. be able to plant their seeds accurately. <p>Discussion questions</p> <ol style="list-style-type: none"> 1. When do you plant soybean in your area and why? 2. What plant spacing do you use for soybean? 3. How many agroecologies do we have in Nigeria? At what time should soybean be planted in the different agroecologies? 	<p>Step 4. Planting</p> <p>Plant soybean in rows. A spacing of 60-75 cm between rows and drilling of seeds at 5 cm along the rows is recommended. This requires about 50 kg of seed per hectare. Thus to ensure one plant per hill.</p> <p>Training method</p> <ol style="list-style-type: none"> 1. Explain that soybean is planted in rows at a spacing of 60-75 cm between rows. Drilling of seeds at 5 cm along the rows is recommended. This will require about 50 kg of seed per hectare. 2. Proceed with <u>activity 1</u>. 3. Explain that since seeds are drilled, thinning may be required to ensure one seed per hole 4. Proceed with <u>activity 2</u>. 5. Ask discussion <u>questions 1 + 2 + 3</u> 6. Ask review <u>questions 1 + 2</u>. 7. Explain that planting of insect pests free and disease resistant and high yielding varieties is one way to reduce dependence on pesticides. Resistant varieties are available at the International Institute of Tropical Agriculture (IITA) 8. Explain that soybean should be planted alone. Avoid intercropping and mixed cropping. Crop rotation is however useful for soybean production. <p>Explain the best time of planting across the different agroecologies in Nigeria.</p>	<p>Activities (demonstrations)</p> <ol style="list-style-type: none"> 1. Demonstrate method of planting soybean. 2. 2 or 3 farmers should plant to demonstrate the spacing and drilling technique <p>Materials</p> <ol style="list-style-type: none"> 1. seeds 2. hoe or cutlass <p>Review questions</p> <ol style="list-style-type: none"> 1. At what level of concentration is the Apron Plus used for treating soybean seeds? 2. What precautions should be taken when using chemical?
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Specific objectives

By the end of the lesson farmers will:

1. be able to demonstrate how to construct scare-crows on soybean farms.
2. understand necessity of bird scaring

Discussion questions

1. At what stage in the production of soybean is it more susceptible to bird attacks?
2. What will happen if bird scaring is not done.

Step 5. Bird scaring

Birds can damage soybean seedlings during the first two weeks of growth. Therefore scare the birds away. Scare the birds at the early and late hours of the day.

Make scarecrows such as hanging human cloths on a framed stick depicting a human figure. Children can also be used on the farm to scare the birds away.

Activities (demonstrations)

1. Demonstrate techniques of scare-crows using human cloths hung on trees or by using stones

Materials

1. Scarecrows
2. Stones and pebbles

Training method

1. Ask discussion questions 1,2
2. Explain that birds can damage soybean seedling during the first 2 weeks of emergence.
3. Explain the different ways including scarecrows we can scare birds away.
4. Inform farmers that it is important to scare away birds at the early and late hours of the day.

Specific objectives

By the end of lesson farmers will:

1. understand how yields are reduced from weed competition.
2. be able to use the different weeding techniques discussed.

Discussion question

1. Ask farmers to share any negative experiences they have encountered from weed competition.

Step 6. Weeds control



Weeds can be controlled using herbicides.
Pre-emergent herbicide
* Apply Galex or Dual at 3-4 litres per hectare immediately after planting.
* Apply a combination of Fusilade and Scepter at 3-4 litres per hectare of each 3 weeks after planting.

Hoe the field 2-3 times for a good crop.

Training method

1. Explain that to effectively control weeds in soybean fields, hand/hoe-weeding or herbicide applications should be done 2-3 times depending on how fast the weed grows.
2. Ask discussion question 1. Emphasize the importance of weeding.
3. Describe each method indicating proper technique and advantages and disadvantages.
4. Manual weeding: **Adv:** possible to fully weed plot. **Dis:** time and labor intensive.
5. Herbicide: **Adv:** Fast and highly effective. **Dis:** Associated costs, potential health risks and crop risks if used ineffectively. Perform activity 1.
6. Explain that recommended herbicides include: pre-emergent herbicides such as Galex which will be applied at 6 liters per hectare, post emergent herbicides such as fusilade or scepter applied at 8 liters per hectare.
7. Ask review question 1.

Activity

(demonstration):

1. Demonstrate the proper use of the backpack sprayer.

Materials

- Backpack sprayer
- Solution to use in sprayer (need not be a herbicide solution)
- All necessary safety equipment

Review question

1. Considering your means and farming technique what weed control method is suitable for your farm?

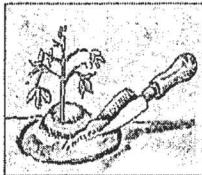
Specific objectives

By the end of the lesson farmers will:

1. understand reasoning for and benefits of fertilizer application.

2. Discussion question

1. Which farmers here are using fertilizers? Ask the relevant farmers their methods of applying fertilizer.
2. What are the prices of the different fertilizers?

Step 7. Fertilize application

Apply organic fertilizer during land preparation or immediately after planting.

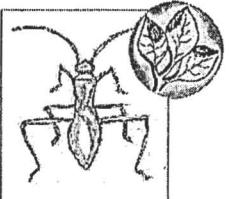
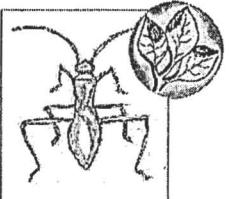
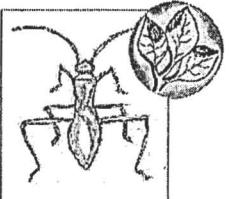
Generally, fertilizer is not used in soybean crop if the soil of the site contains sufficient organic matter content. Improve poor soil with 50 kg of NPK 15:15:15 fertilizer and 200 kg of single Super Phosphate per hectare.

Training method

1. Explain why fertilizing is important. Explain how plants take the nutrients they need from the soil worsening soil condition. Fertilizing puts the necessary nutrients back into the soil allowing future crops to prosper.
2. Explain that generally, fertilizers are not used in soybean crops if the soil is good enough with sufficient organic matter content. However, poor soil may be improved before planting with 50 kg of NPK 15:15:15 fertilizer and 200 kg of single super phosphate per hectare.
3. Describe different methods of fertilizing land: manure (cured animal dung) commercial fertilizing.
4. Describe the proper method of using commercial fertilizer, type and contact information of providers. Discuss associated prices.
5. Ask discussion questions 1 + 2.
6. Ask review questions 1 + 2.
7. Explain that organic fertilizer can be applied during land preparation or immediately after planting.

Review questions

1. Why does continuous cropping eventually reduce the yield of future crops?
2. Why does fertilizing have the potential to increase yields?

<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <ol style="list-style-type: none"> 1. understand the negative impact of pests and diseases on yields. 2. know the methods of controlling pests and diseases <p>Discussion question</p> <ol style="list-style-type: none"> 1. Ask farmers to share their experiences with insects pests and diseases of soybean 	<p>Step 8 Diseases, Insects pests & rodent control</p> <table border="1"> <tbody> <tr> <td data-bbox="584 151 894 358">  </td><td data-bbox="894 151 1171 358">  </td></tr> <tr> <td data-bbox="584 358 894 493"> <p>Insects (Pod-sucking bugs and defoliators</p> <p>Pod-sucking insects could cause substantial loss in some locations. In Nigeria insect pests are not a serious problem for now, but could be serious in future as hectare of soybean cultivation increases under monocropping control. Apply insecticides such as Sherpa Plus, Karate, Thiodim etc. to control insects.</p> </td><td data-bbox="894 358 1171 493"> <p>Rodent</p> <p>Rodents, especially rats and rabbits, also cause damage to soybean fields. For the rodents, keep the boundaries of the field free of weeds.</p> </td></tr> </tbody> </table> <p>Training method</p> <ol style="list-style-type: none"> 1. Ask <u>discussion question 1</u>. 2. Perform <u>activity 1</u>. Identify definite signs of disease which farmers may not have identified in activity. 3. Explain the possible methods of disease and Insect pests control: <ul style="list-style-type: none"> • selecting planting material from soybean plants showing no signs of disease damage. • burning all diseased plants to prevent spreading • communicating with other farmers about diseases and resistant varieties. • using resistant varieties. • using cultural practices such as land and crop rotation. • using correct level of insecticides/pesticides 4. Perform <u>activity 2</u>. Identify definite signs of pest Infestation that farmers may not have identified in activity 5. Explain that rodents especially rats could feed on the succulent leaves of the soybean plant, hence it is vital to keep the boundaries of the field free of dense vegetation. 6. Explain that pod sucking Insects could be found on soybean plots and can be controlled with any broad based Insecticide 			<p>Insects (Pod-sucking bugs and defoliators</p> <p>Pod-sucking insects could cause substantial loss in some locations. In Nigeria insect pests are not a serious problem for now, but could be serious in future as hectare of soybean cultivation increases under monocropping control. Apply insecticides such as Sherpa Plus, Karate, Thiodim etc. to control insects.</p>	<p>Rodent</p> <p>Rodents, especially rats and rabbits, also cause damage to soybean fields. For the rodents, keep the boundaries of the field free of weeds.</p>	<p>Activities</p> <ol style="list-style-type: none"> 1. Show farmers examples of diseased soybean leaves and stems. Ask farmers to identify signs of diseases. 2. Show farmers examples of soybean plants suffering from pest infestation. Ask farmers to identify signs of pest damage. <p>Materials</p> <ul style="list-style-type: none"> • Examples or pictures of diseased and pest infested soybean plants. <p>Charts showing insecticide use in insects pests control in soybean</p>
						
<p>Insects (Pod-sucking bugs and defoliators</p> <p>Pod-sucking insects could cause substantial loss in some locations. In Nigeria insect pests are not a serious problem for now, but could be serious in future as hectare of soybean cultivation increases under monocropping control. Apply insecticides such as Sherpa Plus, Karate, Thiodim etc. to control insects.</p>	<p>Rodent</p> <p>Rodents, especially rats and rabbits, also cause damage to soybean fields. For the rodents, keep the boundaries of the field free of weeds.</p>					

Specific objectives

By the end of the lesson farmers will:

1. Identify the best time to harvest soybean in their region considering local schedule.

Discussion question

1. what are the features you look for to show that soybean is ready for harvest?
2. How much time after planting does harvesting begin?

Step 11. Harvesting

The harvesting of soybean should coincide with dry weather especially in the case of farmers who plant in August in regions with bimodal rainfall. Use mechanical dryers for soybean harvested during the peak of rainfall. Soybean matures 3 to 4 months after planting depending on the maturity group of the variety. At pod maturity, the colour of the pod is straw-coloured. Cut or uproot the mature plants at ground level. Stack loosely for threshing.

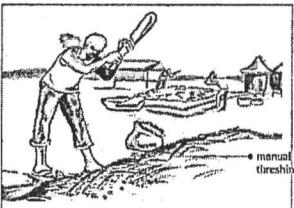
Activity

1. Farmers should demonstrate how they harvest soybean in the farm

Training method

1. Ask discussion question 1
2. Ask in this region what the normal times are for harvesting cowpea.
3. Explain that the optimum time for harvesting soybean depends on soil factors, climate and variety and that harvesting should commence when pods are dry.
4. Explain that soybeans matures between 3 to 4 months after planting depending on the variety planted.
5. Proceed with activity 1

Explain that the matured plant should be uprooted or cut at ground level. It may be loosely stacked for threshing.

<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <ol style="list-style-type: none"> properly process (thresh & Winnow) soybean pods before storage. <p>Discussion question</p> <ol style="list-style-type: none"> What threshing options are available to you in your locality? 	<p>Step 12. Seed processing (threshing and winnowing)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>manual threshing</p> </div> <div style="text-align: center;">  <p>The pod can be threshed manually or with the use of a threshing machine depending on the scale of production.</p> </div> </div> <p>Harvested crops must be kept dry. Spread on a platform and sun-dry. Use forced air dryers in extremely large productions. Thresh the dried pods as soon as possible. Use mechanical threshers in large-scale production; such threshers are equipped with blowers that separate the grains from the shaft. In small-scale production, pack the plants in bags and beat with sticks. Winnow the threshed materials in the air to remove the shaft from the seeds.</p>	<p>Activity 1 2 or 3 farmers should demonstrate how they carry out threshing manually.</p> <p>Material Harvested pods of soybean Threshing sticks etc.</p> <p>Review question</p> <ol style="list-style-type: none"> <i>Discuss local methods preserving soybean seeds.</i>
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Specific objectives

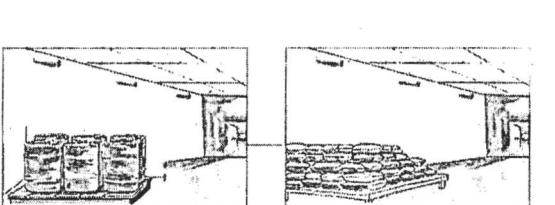
By the end of the lesson farmers will:

1. understand how best to store soybean seeds.

Discussion question

- 1 What happens if seeds are not properly dried before storing? How do farmers cope with drying pods harvested during raining seasons without dryers?
- 2 How do you know the pod is dry enough for storage

Step 13. Storage



Store grains under dry conditions (less than 10% moisture content). Test for moisture by denting a seed with your teeth. If the seed is dented then the seed is too moist to be stored. A well-dried seed will not be dented. Store the dried seeds in woven sacks, or polythene bags in a well-ventilated store, or in an air conditioned store.

Training method

1. Ask discussion question 1 & 2
 2. Explain that grains should be stored in dry condition (less than 10% moisture content).
 3. Explain that the simplest test of moisture is to dent the seed with your teeth; if the seed is dented then the seed is too moist to be stored. A well-dried seed will not be dented.
 4. Proceed with activity 1
 5. Explain that the dried seeds should be stored in woven sacks or polythene bags in a well-ventilated barn.
- Ask review question 1.

Activity

- 1 Have farmers to explain local methods of storage and why.

Review question

1. *Given situation (long/short storage, dry/wet season) ask how long soybean seeds can be stored .*

<p>Specific objectives <i>By the end of the lesson farmers will:</i></p> <p>be able to take advantage of markets opportunity to maximize profits</p> <p>Discussion questions</p> <ol style="list-style-type: none"> 1 What has your experience been in marketing your produce? 2 What markets exist for soybean seeds locally and regionally? 3 What are the existing problems related to marketing of soybean in different communities? 	<p>Step 14. Soybean markets and marketing</p> <p>Training method Explain that markets and marketing could help farmers maximize profits from produce. Proceed to Discussion question 1 & 2 Explain availability of markets for the produce and how farmers can easily access and use markets as groups rather than as individuals. Proceed to discussion question 3 Explain the growing use of IT (Internet and markets information services) by local farmers.</p> <p>End of session wrap up To end the session, restate purpose of course. Explain to farmers that the methods presented in the book are researched and proven ways of increasing yield and profit given proper conditions. Explain that in using some of these methods farmers should be able to increase their yearly profit.</p> <p>Discussion questions and feedback</p> <ol style="list-style-type: none"> 1. Ask farmers which information provided in course was new to them. 2. Ask farmers what methods they think they will be able to use in their farm. 3. What topics would you want included that are not treated now? 	
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The International Institute of Tropical Agriculture (IITA) was founded in 1967 with a mandate for improving food production in the humid tropics and to develop sustainable production systems. It became the first African link in the worldwide network of agricultural research centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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Total Development International Foundation (TODEV) is a Non governmental organization in Nigeria, that started operation in 1995 as WorldReach International. The focus of TODEV is to empower women, children and youths in the rural and urban area by making available information required for development. TODEV packages information required for setting up and managing agricultural enterprises profitably in a format easy to understand by all and sundry. Enterprise development, financing, career based guidance and social advocacy on technological issues are significant thrust of this vision.

e-mail: totaldevinternational@yahoo.com

Oke-Ogun Community Development Network (OCDN) is a grassroots organisation interested in the dissemination of information for development. OCDN has an information centre in Ago-Are and hopes to set up more information Centre in other locations in Oke-Ogun area of Oyo State in Nigeria.

