WHAT IS THIS USER’S GUIDE?

This module provides farmers with a foundational understanding of mixing cover crops and provides an overview of a cover crop mix calculator tool, which can help farmers in understanding how much to seed.

While there are many resources available on mixing cover crops, the breadth of information is often too comprehensive. This session is intended to support farmers in understanding how to experiment with cover crops and reflect on their experiences. This module expands on farmers’ basic knowledge of cover crops by increasing their knowledge about how to mix cover crops.
Who made this guide?

ACKNOWLEDGMENTS: This teaching resource was developed by Lauren Bailey of The Nashville Food Project in Nashville, TN in partnership with the Institute for Social and Economic Development (ISED Solutions). This material is funded by USDA, Risk Management Agency, under award number RM18RMEPP522C018: “Producing and Using Risk Management Educational Resources and Methods for Refugee Farmers.”

VARIATION: Throughout this guide, boxes (like this one) contain variations and adaptations that serve varying programs and farmers. They are suggestions and reflections from other programs based on how they made this workshop work for them.

ICONS: You will find the icons below throughout this guidebook. They are there so you are prepared for the activity and can get an idea of what it will bring at a glance.
Is this guide right for you?

AUDIENCE:

- **Who:** Refugee farmers and growers
- **Language / Literacy:** Most materials in this module can be used with farmers of any language with beginning literacy. Farmers without advanced literacy will require assistance with the Cover Crop Mix Seeding Calculator.
- **Farming Experience:** This module would be most suitable for advanced farmers who have a couple of years of growing experience in the U.S.
- **Prerequisites: Skills, experience, and knowledge:**
  - Though not necessary, it may be beneficial if farmers have previously learned the definitions for cover crop, soil erosion, pest pressure, and beneficial insects.
  - Farmers need to recognize that Nitrogen is a component of fertilizer.
  - It would be helpful if farmers had experience reading a grid.
- **Region/Climate:** The specific content of this module was designed for the southeast region.
- **Program Structure:** Any
- **Season:** Designed for off-season

RESOURCES NEEDED:

- **Time:** 1 hour 45 minutes - 2 hours 15 minutes (depending on the last activity)
- **Staff/Interpreters:** One staff with interpretation
- **Location:** Classroom or in field
- **Resources and Materials Needed to Complete this Module:**
  - ‘Mixing Cover Crops’ PowerPoint
  - ‘Cover Crop Mixes Seeding Calculator’ Excel Spreadsheet

References:

5 OBJECTIVES AND SKILLS
- Vocabulary
- Objectives
- Proof of Learning

6 LESSON 1 / INTRODUCTION
5 - 7 MINUTES
- Farmers begin to think about mixing cover crops through analogies of mixing ingredients for different purposes.

8 LESSON 2 / REVIEW OF COVER CROP GROUPS & BENEFITS
25 MINUTES
- This lesson provides a review of the different groups of cover crops and the benefits of cover crops through creating a table and interacting with it. It offers opportunity to test farmers’ knowledge of the information through conversation and a matching activity.

12 LESSON 3 / COST AND BENEFITS OF MIXING COVER CROPS
15 MINUTES
- This lesson is a review of the benefits and challenges associated with mixing cover crops, as opposed to just using one cover crop.

14 LESSON 4 / COVER CROP RECIPES
30 MINUTES
- This activity introduces basic knowledge about mixing cover crops and shares cover crop recipes for cool season and fall season.

19 LESSON 5 / HOW MUCH SEED WILL I NEED?
30 - 60 MINUTES
- This activity reviews the information needed to determine how much seed farmers will need to plant using the Cover Crop Mix Calculator Spreadsheet and gives them practice in measuring out the seed.
Objectives and Skills

VOCABULARY:  
• Recipe  
• Brassica  
• Legume  
• Seeding rate  
• Pounds (lbs)  
• Ounce (oz)  
• Square feet (sq ft)  
• Ratio

OBJECTIVES: By the end of this module, farmers will be able to:  
• Name at least three benefits of planting cover crops.  
• Name three groups of cover crops.  
• Match specific benefits with appropriate cover crop or group(s) of cover crops.  
• Understand the challenges and benefits of mixing cover crops.  
• Name which groups of cover crops are commonly mixed together.  
• Name at least one example of a cover crop recipe for cool season and one for warm season.  
• Know how to calculate the area that they want to cover crop.  
• Understand what a seeding rate is.  
• Know what information is needed for the Cover Crop Mixes Seeding Calculator.  
• Practice measuring cover crop seed using a scale.

PROOF OF LEARNING: I will know that farmers have achieved learning objectives because:  
• Farmers will be able to plan for and plant a mix of cover crops.
LESSON STEPS

1. Recipes
   • Before getting into the specifics of cover crops, start by asking farmers about a dish commonly made in their culture. (If this is an indoor classroom training and you are using a PowerPoint: A sambusa/samosa is pictured in the PowerPoint on Slide 2, but another dish may be more suitable for the farmers you work with.) The point of this dialogue is to encourage farmers to think about how mixing different ingredients yields different results.
• How do you make this dish? What ingredients are essential? Are there variations in what spices you can use? How does your recipe differ from your friend’s recipe?

2. **Objective of the module**
   • State the purpose of the module (Slide 3): The main objective of today’s lesson is to discuss what kind of cover crop recipes you can use to yield results you desire. Like any food recipe, there’s often a common starting place and lots of room for experimentation!

By the end of the lesson, you’ll have learned:
   • Costs and benefits of cover crop mixes,
   • 3 commonly used cover crop mixes, and
   • How to calculate cover crop recipes.
TIME: 25 Minutes

OVERVIEW:
This lesson provides a review of the different groups of cover crops and the benefits of cover crops through creating a table and interacting with it. It offers opportunity to test farmers’ knowledge of the information through conversation and a matching activity.

MATERIALS NEEDED:
• ‘Mixing Cover Crops’ PowerPoint
• Pictures representing each of the three groups of cover crops in this module: Mustards, Beans/Legumes, and Others (Note: These are found in the PowerPoint, or if not using the PowerPoint, can be printed ahead)
• Flip chart paper or poster board
• Blue painters’ tape
• Pictures representing each of the benefits of cover crops mentioned in this module. (Note: You can print from the PowerPoint slides- extra pictures of each benefit may be needed to create a visual)
  1. Erosion Fighter
  2. Weed Fighter
  3. Pest Fighter
  4. Beneficial Insect Attractor
  5. Soil Builder
  6. Nitrogen Source
  7. Nitrogen Scavenger
  8. Moisture Conservation

OBJECTIVES / LEARNING:
By the end of this activity, participants will:
• Know how to calculate the area that they want to cover crop.
• Calculate how much cover crop seed they will need for their plot.
• Practice measuring cover crop seed using a scale.

VOCABULARY:
• Brassica
• Legume
1. **Review of Cover Crop Groups**

**Discussion:** Ask farmers if they remember the different groups of cover crops. Review these together as you look at the PowerPoint (Slides 4-6)

- **Mustards (Brassicas),** Examples: mustard greens, daikon radish
- **Beans (Legumes),** Examples: clovers, vetch, cow peas, snap peas
- **Others,** Examples: winter rye, barley, oats, wheat, sorghum sudan, buckwheat

Review the three main groups of cover crops and the typical benefits associated with that crop group using the slide show.

*Note: You may want to create a visual in the room for folks to see the benefits associated with each cover crop group. If you want to do this, you will need flip chart paper or poster board, extra copies of the pictures representing the benefits and blue painters’ tape so that you can easily attach the photos.*
## Cover Crop Group

<table>
<thead>
<tr>
<th>Cover Crop Group</th>
<th>General Benefits</th>
</tr>
</thead>
</table>
| Mustards (Brassicas)| • Erosion Fighter: Reduce and prevent soil erosion  
• Weed Fighter  
• Pest Fighter  
• Soil Builder: Reduce soil compaction  
• Keep moisture in the soil |
| Examples: mustard greens, daikon radish |                                                                                                                                                  |
| Beans (Legumes)     | • Nitrogen source: Fix atmospheric nitrogen which can be used for subsequent crops  
• Soil Builder: Increase organic matter  
• Erosion Fighter: Reduce and prevent soil erosion  
• Attract beneficial insects  
• Keep moisture in the soil |
| Examples: clovers, vetch, cow peas, snap peas |                                                                                                                                                  |
| Others (Non-Legumes)| • Nitrogen Scavenger: scavenges the nitrogen that is left over from a previous crop  
• Soil Builder: Increase organic matter  
• Erosion Fighter: Reduce and prevent soil erosion  
• Weed Fighter  
• Keep moisture in the soil |
| Examples: winter rye, barley, oats, wheat, sorghum sudan, buckwheat |                                                                                                                                                  |
2. Matching Activity

After reviewing, engage farmers in another activity to match benefit to cover crop group.

- Make sure that farmers know that benefits may be associated with multiple cover crops groups.
- If you previously constructed a visual, remove the benefits from the visual and hand those out among farmers. If not, hand out pictures of benefits and create a framework for the visual with flipchart paper and markers.

You’ll want to produce something along the lines of the chart below:

<table>
<thead>
<tr>
<th>Cover Crop Group</th>
<th>Examples: mustard greens, daikon radish</th>
<th>Example Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustards (Brassicas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beans (Legumes)</td>
<td>Examples: clovers, vetch, cow peas, snap peas</td>
<td>Example Images</td>
</tr>
<tr>
<td>Others (Non-Legumes)</td>
<td>Examples: winter rye, barley, oats, wheat, sorghum, sudan, buckwheat</td>
<td>Example Images</td>
</tr>
</tbody>
</table>

- Give farmers a picture of a benefit and ask them to place this picture in which ever group they think it belongs.
- Once everyone has placed their benefit in a group, discuss the results. Review the benefits of each group and make adjustments if need be.
TIME: 15 Minutes

OVERVIEW:
This lesson is a review of the benefits and challenges associated with mixing cover crops, as opposed to just using one cover crop.

MATERIALS NEEDED:
• ‘Mixing Cover Crops’ PowerPoint
• Whiteboard or Flipchart
• Markers

OBJECTIVES / LEARNING:
By the end of this activity, participants will be able to:
• Understand the challenges and benefits of mixing cover crops.

VOCABULARY:
None

LESSON STEPS

1. Why mix cover crops?

• Ask farmers to brainstorm what benefits/advantages there might be to mixing cover crops. Write what information is shared. If farmers do not share the following, add these to the list:

  o Slide 20: Some examples from “Managing Your Cover Crops Profitably”: 
LESSON STEPS, CONTINUED

▪ Improve the likelihood that your cover crops will survive the winter

▪ Improve the ground cover

▪ Control weeds more efficiently

▪ Attract a broader range of beneficial insects

▪ Improve the ability of the crops to tolerate adverse conditions

▪ Different cover crops might respond better to different soil traits

▪ Different crops provide different benefits, so by mixing the crops you can gain multiple benefits (Clark, 2007).

• Another way to describe the benefits of mixing cover crop seed is that it mimics what happens naturally in an ecosystem – that there the ecosystem (insects, soil, other plants) are often supported by the diversity.

2. Challenges of mixing cover crops

• Slide 21: Do the same thing for the costs of mixing cover crop seed. What are some costs of mixing cover crops?

  o Requires more complicated management

  o May cost more money

  o Sometimes difficult to seed
TIME: 30 - 45 Minutes

OVERVIEW:
This activity introduces basic knowledge about mixing cover crops and shares cover crop recipes for cool season and fall season.

MATERIALS NEEDED:
• ‘Mixing Cover Crops’ PowerPoint
• Whiteboard or Flipchart
• Pictures found on Slides (25-29) ‘Mixing Cover Crops’ PowerPoint
(Note: You may want multiple copies of the cover crop pictures, depending on how you approach the lesson)
• Winter Rye
• Hairy Vetch
• Crimson Clover
• Oats
• Sorghum-Sudan Grass
• Cowpeas
• Japanese Millet
• Soybeans

OBJECTIVES / LEARNING:
By the end of this activity, participants will be able to:
• Name which groups of cover crops are commonly mixed together.
• Name at least one example of a cover crop recipe for cool season and one for warm season.

VOCABULARY:
• Winter Rye
• Hairy Vetch
• Crimson Clover
• Oats
• Sorghum-Sudan Grass
• Cowpeas
• Japanese Millet
• Soybeans
LESSON STEPS

1. Creating Cover Crops Mixes

(Slides 22-23) Explain to farmers that in general, cover crop mixes typically include a crop from the bean group and a crop from the “Other” group. Most of the time the crop from the other group is a grass.

2. Categorization: Engage farmers in grouping the crops into grass or legume categories. There are a few ways you could do this:

   - Hold up a picture of each crop and ask farmers, “Is this in the grass group or the bean (legume) group?”
   - Hand out pictures to farmers and ask them to group themselves together with crops they think are in the same group as theirs (Note: if you choose to approach it this way, you may want to have multiple copies of pictures so that each farmer has one).

3. Discussion: Ask farmers what they need to think about before choosing which crops to mix together. At the very least, you need to consider:

   - When does this crop grow- in the cool season or warm season?
   - What benefits am I trying to get?

4. Common Cover Crop Recipes

   - Share five common cover crop recipes with farmers. Read aloud the different cover crop recipes, and if you’d like to make this part a more active part, have farmers stand with the picture of the crops for each recipe.
LESSON STEPS, CONTINUED

- Recipes that you’d use for the cool season (most likely fall):
  - Winter Rye + Hairy Vetch
  - Winter Rye + Hairy Vetch + Crimson Clover
  - Oats + Crimson Clover

- Recipes that you’d use for the warm season (summer):
  - Sorghum-sudangrass + Cowpeas
  - Japanese Millet + Soybeans

5. Activity: True or Not

- Have everyone keep standing together to represent each cover crop recipe.

- Tell farmers that you will read out information and they should raise their picture if it is true for their crop. Encourage people in each group to help each other. Demonstrate an example with the interpreter or a group member. *(Note: It may help to exaggerate your gestures when giving an example and invite silliness!)*

  - My crop is in the grass group.

- Depending on the literacy levels of your group, you may want to have folks who are Beginning Literate to identify the crop name

  - My crop is Winter Rye.... My crop is Hairy Vetch, etc

  - My crop grows in the Cool Season.

  - My crop grows in the Warm Season.
LESSON STEPS, CONTINUED

▪ My crop is in the bean (legume) group.

  o If you want to further demonstrate learning and have the visual of the benefits of cover crops on the wall from Lesson 2, read off some of the following statements for extra practice.

    ▪ My crop attracts beneficial insects. *(True for bean/legumes)*

    ▪ My crop is a weed fighter. *(True for grasses)*

    ▪ My crop is a soil builder. *(True for all)*

    ▪ My crop is an erosion fighter. *(True for all)*

6. Review

For a last review, invite farmers to share what they’ve learned or ask for a volunteer to answer the following:

  o Cover crop mixes are often made with?

  o One example of a cover crop recipe for the cool season is_________.

  o One example of a cover crop recipe for the warm season is_________.

▪ These are just a few examples of cover crop mixes. There are lots of different options out there! Some farmers even plant mixes that provide summer/ winter coverage (like sudangrass, hairy vetch and clover). You may want to share the information below or share the information with individuals, if they seem eager for more information.
Note: Farmers may or may not be ready to experiment with their own mixes. If they are, it is recommended to choose the top 1-3 crops to achieve the main benefits, then identify what benefits might be missing and choose another 1-2 crops to fill in the gaps.

For more information see:


In her book, Sustainable Market Farming: Intensive Vegetable Production on a Few Acres, Pam Dawlings suggests that you keep these things in mind for cover crop mixes:

- If you mix a bean and a grass, plant on the date for the grass.

- If you mix two grasses, decrease seeding rate by ⅓.

- If you use a bean in a mixture, do not decrease the seeding rate at all (Dawling, 2013).
How much seed will you need?

TIME: 30 Minutes - 1 hour

OVERVIEW:
This activity reviews the information needed to determine how much seed farmers will need to plant using the Cover Crop Mix Calculator Spreadsheet and gives them practice in measuring out the seed.

MATERIALS NEEDED:
• ‘Mixing Cover Crops’ PowerPoint
• ‘Cover Crop Mixes Seeding Calculator’ Excel Spreadsheet
• Tape Measurer
• Scales (as many as you may need for multiple farmers to practice)
• 16 oz cups (as many as you may need for multiple farmers to practice)
• Measuring cups (1 cup, ½ cup)
• Cover crop seed to demonstrate/practice how to measure
• Ziplock bags
• Whiteboard or Flipchart or Butcher Paper
• Markers

• Pictures found on Slides (25-31) ‘Mixing Cover Crops’ PowerPoint (Note: You may want copies of these pictures, if you are not using the PowerPoint)

OBJECTIVES / LEARNING:
By the end of this activity, participants will:
• Know how to calculate the area that they want to cover crop.
• Understand what a seeding rate is.
• Know what information is needed for the Cover Crop Mixes Seeding Calculator.
• Practice measuring cover crop seed using scale.

VOCABULARY:
• Seeding rate
• Pounds (lbs)
• Ounce (oz)
• Square feet (sq ft)
LESSON STEPS

1. Calculating Seeding Rate

• Slide 32: So, now that we’ve talked about the types of cover crops you can mix together, the question you might ask yourself is ‘How much seed will I need?’ And to determine that you’ll need to figure out how much space you want to cover crop.

  Note: If you are doing this lesson in the field, this is a great opportunity to demonstrate this example. Even if you are doing this in a classroom, you can use a large piece of butcher paper to act as a row and have volunteers measure the width and length.

• Slides 33-35: Your first step in determining how much seed you will need is to figure out the area of the row that you want to cover crop.

  o Invite farmers to share their experience and knowledge. What units of measurement have they used in the past? Explain that typically in the US, the common unit of measuring length and width is feet.

  o How do we measure the area? Ask for two volunteers to use the measuring tape to measure the width and length. Capture this on a whiteboard, piece of paper or on the butcher paper, if using.

    • What is the width of each row?

    • What is the length of each row?

    • When you multiply those two numbers together, you get the total number of square feet, the “area”.
• Slide 36: After that, you’ll need to know the seeding rate for each cover crop

o According to Morris J. Houck, Plant Materials Specialist of the NRCS, the seeding rate is “the amount of seed of an individual species that’s needed to achieve an adequate stand.”

o To paraphrase, the seeding rate is how much you need to seed in order to get a good planting.

o There are lots of resources that have seeding rates for cover crops and there are different rates for different ways of seeding the cover crop. We have compiled this information and created a seeding calculator to help you determine the amount of seed you will need for the space you want to cover crop.

2. (Slides 37-40) Cover Crop Mixes Seeding Calculator

Note: This tool might be best used one on one with farmers. This tool is best utilized by farmers who have Advanced Literacy Skills. It is necessary to have access to a computer and basic computer literacy skills. Alternatively, a farmer and staff member could meet individually and fill out this information. You may choose to show the PowerPoint Slides to the farmers during this activity or just review the information that they need to provide in order for the calculator to determine the amount of seed needed.
LESSON STEPS, CONTINUED

3. Spreadsheet background

- There are three different spreadsheet tabs: two information output tabs that are linked by formulas and an information tab with cover crop seeding rates.

**NOTE:** All the spreadsheets are linked, so, if you do any editing to the document, you’ll want to be sure to pay special attention to the formulas. The cells that are highlighted in blue are important for formulas. Any information that you input will go into a cell highlighted in red.

The first spreadsheet tab, Cover Crop Mixes Calculator (B) will determine the rates that the farmer needs if broadcasting seed, based off the area they are seeding and cover crop they have chosen.

*Figure 1: Snapshot of Cover Crop Mixes Calculator (B) used to determine seeding rates for broadcasting seed.*
LESSON STEPS, CONTINUED

The second tab, Printable Results (B), will generate a printable simplified version of the rates for broadcasting with larger font that you can print and give to the farmer.

Figure 2: Snapshot of Printable Results (B) which is a large format, easy to read, printable version to give to farmers.

The last spreadsheet, Input seeding rates, is where base data on seeding rates by cover crop and by seeding method is located.

Figure 3: Snapshot of the Input-Seeding rates; all base data are entered here.
4. Entering information into the spreadsheet

- Farmers will need to know the following information to enter information into the calculator:
  - how many rows will be cover cropped,
  - the length of those rows, and
  - the width of those rows.

- The amount of seed they will need for each cover crop option will self-calculate, and appear in the box “Cover Crop Recipes...” It will also appear on the following tab “Printable results.”

- Costs of Seed: After you walk through the seeding calculator with the farmer, you can help the farmer understand the costs of this amount of cover crop by researching together on the internet. If the farmer picked multiple crops, this is an additional way for the farmer to be able to compare the crops to determine what to plant.

- You can plug those prices into the calculator so that the farmer can get an overall sense of the cost of that recipe.

5. Measuring seed:

Slide 40: If it is possible for you to demonstrate measuring, that would be best.

- Allow farmers to practice measuring out the amounts needed. If you want farmers to mix the seed for later use, you can have them pour the mixed seed into a Ziplock bag.
LESSON STEPS, CONTINUED

• Slide 41: Ways to measure
  
  o You can use a scale like ones you use to weigh your vegetables to measure your cover crop seed.

  ▪ When we tested a few crops, it seemed that generally 1 (16oz) cup would hold 1-1.20 lbs of various crop seed.

  o Also, you may try using measuring cups for smaller amounts.

6. Alternative to the Seeding Calculator--Ratios

• Slide 42: For some people, the seeding calculator might not be the best tool. So, here is another way to approach seeding rates for cover crop seeds. A simple ratio can be used.

  a. What is a ratio? A ratio tells how much of one thing there is when compared to another thing. There are 2 blue cups to 1 green cup.

  b. By using a ratio, you need to know the amount needed for one crop and the total area of the space you want to cover crop.

• Slides 43-45: The ratios may help a farmer to generally understand how much to mix of a crop, but a staff member may still need to provide support using the Seeding Calculator to help a farmer determine the specific amount needed for the space they want to cover crop.
If we know that if we want to cover crop five rows. And those rows have a width of 3 feet and a length of 200 ft, the seeding calculator tells us the following:

- We’ll need 1 part Crimson Clover or 1 lb
- Then, we’ll need 3 parts Hairy Vetch or 3 lbs
- And, we’ll need 5 parts Cereal Winter Rye or 5 lbs

If we know that if we want to cover crop five rows. And those rows have a width of 3 feet and a length of 200 ft:

- We’ll need 1 part Oats or 3.75 lbs
- Then, we’ll need 1 part Crimson Clover or 3.75 lbs

If we know that if we want to cover crop five rows. And those rows have a width of 3 feet and a length of 200 ft:

- We’ll need 1 part Sorghum Sudan Grass or .70 lbs
- Then, we’ll need 5 parts Cowpeas or 3.5 lbs (Note: You can use the same ratio for the Japanese Millet & Soybean combination.)

7. Review

- Slide 46: Review with farmers by asking them to share what they remember. What information do you need to know to calculate how much seed you need?

- The area of the space you wish to cover crop. This includes, the number of rows, the width of those rows and the length of those rows.
LESSON STEPS, CONTINUED

- The seeding rate for the crop.

- What crops you want to mix

• What tools/ resources can you use to help you?

  - Cover crop mixes seeding calculator or another calculator

  - Scale

**Trainer Note:**
Supplementary Information that might be helpful to share with farmers:

*It can be more convenient to purchase pre-made mixes. However, you don’t get the benefit of mixing what might work best for your soil/climate and it is not as cost-effective. However, if this is the route you choose, there are companies that sell quality pre-made mixes. If this seems like an option people want to pursue, you might want to provide them with a list.*