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**Climate Change,
Agriculture and
Food Security**

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**Participatory Integrated Climate
Services for Agriculture (PICSA):
Field Manual**

A step-by-step guide to using PICSA
with farmers

Peter Dorward, Graham Clarkson,
Roger Stern

University of
Reading

Authors

[1]**Peter Dorward, [1]Graham Clarkson and [2]Roger Stern**

[1]Walker Institute and School of Agriculture, Policy and Development, University of Reading
[2] Walker Institute and Statistical Services Centre, University of Reading

With contributions by

Dr John Gathenya, Jomo Kenyatta University of Agriculture and Technology , Kenya
Mr Elirehema Swai, Agricultural Research Institute, Hombolo, Tanzania

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Contact for enquiries

Peter Dorward (p.t.dorward@reading.ac.uk)

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Field Manual: A step-by-step guide to using PICSA with farmers

Introduction

Smallholder farmers are key to food security in sub-Saharan Africa where two thirds of the population depend on small-scale, rain-fed farming as their main source of food and income. Critical farming and household decisions depend upon the weather, for example, how much rain falls, the length and start date of the rainfall season and the timing of dry spells. Such aspects of the weather vary considerably from year to year.

The Participatory Integrated Climate Services for Agriculture (PICSA) approach aims to facilitate farmers to make informed decisions based on accurate, location specific, climate and weather information; locally relevant crop, livestock and livelihood options; and with the use of participatory tools to aid their decision making.

Considering farming and livelihood options in the context of climate is crucial for making good decisions. A farmer in Matumba village in central Tanzania expressed this notion perfectly when he said, *"We should select crops that look like the climate"*.

The PISCA approach has been designed with field staff in mind, and aims to support you to do your job better by providing you with improved resources and information.

This field manual is a step by step guide to working though the PICSA approach with farmer groups. It is primarily for the use of facilitators (e.g. NGO and extension field staff who have received training in the use of the PICSA approach). The PICSA approach is divided into twelve steps to be carried out with groups of farmers. Due to the location specific nature of PICSA there are a number of preparatory activities that need to be completed before field staff are trained in the approach. The details of these activities can be found in the document 'Preparing for PICSA' on the PICSA website (http://www.walker-institute.ac.uk/research/PICSA).

The key components of PICSA

1. Providing and considering climate and weather information with farmers – including historical records and forecasts

2. The joint analysis of information on crop, livelihood and livestock options and their risks, by field staff and farmers

3. A set of participatory tools to enable farmers to use this information in planning and decision making for their circumstances

How to use this field manual

In this field manual the activities are broken down into clear and logical steps. Each step builds on what has been covered in the previous steps. The first steps focus on what farmers are doing now and how climate and weather influence this. The following steps then enable you to help farmers to use a range of sources of climate, weather, crop, livestock and livelihood information for their planning and decision making.

This process can be divided into 12 steps (see below and the activity flowchart on page 7):

- Step A: What does the farmer currently do?
- Step B: Is the climate changing?
- Step C: What are the opportunities and risks?
- Step D: What are the options for the farmer?
- Step E: Options by context.
- Step F: Compare different options and plan.
- Step G: The farmer decides.
- Step H: Seasonal forecast.
- Step I: Identify and select possible responses to the forecast.
- Step J: Short-term forecasts and warnings.
- Step K: Identify and select possible responses to short-term forecasts and warnings.
- Step L: Learn from experience and improve process

Each step has a set of activities that you, as the facilitator, implement with a group of farmers through a series of meetings. The activities for each step will be explained in more detail in the associated activity sheets throughout this field manual. The names of the activity sheets correspond to the step they belong to, e.g. Step A, activity sheets A1 and A2. Steps B, D, H and J require location specific information, which is provided in the appendices[1].

One of your first duties as a facilitator will be to decide on a timetable for the meetings. When planning your timetable you need to consider at what time of year each step needs to take place. Ideally, steps A to G need to happen at least 8 to 12 weeks before the rainy season starts. Steps H & I need to be implemented when the seasonal forecast is available. Steps J and K should take place just before and during the growing season and Step L at the end of the season. If you already hold regular meetings with farmers then many of these activities can be included in the existing meetings.

A possible timetable for the meetings is:

- Meeting 1 (3 hours): Steps A and B (well before the rainy season)
- Meeting 2 (3 hours): Steps C to E (well before the rainy season)
- Meeting 3 (3 hours): Steps F and G (well before the rainy season)
- Meeting 4 (2 hours): Steps H and I (after the seasonal forecast)
- Meeting 5 (1 hour): Steps J and K (during the season)
- Meeting 6 (2 hours): Step L (after the season)

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[1] Location specific appendices need to be prepared in advance of training.

This is only a suggested timetable and should be adapted to meet farmers' needs. For example, Steps A to G could be split over 2 longer sessions if you and your groups prefer.

It is important to note that each of the steps in the PICSA approach are potentially useful to farmers. Following this step-by-step progression provides a practical and logical process to help planning and decision making. However, for some management options identified it may not be necessary to follow all of the steps that are laid out in this manual.

Activity Flow Chart

This activity flow chart provides an overview of the whole PICSA process.

Long before the season

Step A: What does the farmer currently do?

> Seasonal calendar   Resource Allocation Map (RAM)

Step B: Is the climate changing?

> Historical climate information and farmers' perceptions

Step C: What are the probabilities and risks?

> Probabilities and risks

Step D: What are the options for the farmer?

> Crop info/options   Livestock info/options   Livelihood options

Step E: Options by context

> Farmers choose options to consider

Step F: Compare different options and plans

> Participatory budgets

Step G: The farmer decides

> Select and amend RAMs and seasonal calendars

Just before the season

Step H: Seasonal forecast

Step I: Identify and select possible responses to forecast

> Revisit crop, livestock and livelihood options, RAMs and calendars

During the season

Step J: Short-term forecasts and warnings

Step K: Identify and select possible responses to short-term forecasts and warnings

> Revisit crop, livestock and livelihood options, RAMs and calendars

After the season

Step L: Learn from experience and improve process

> Review season and PICSA approach

Tips for successful facilitation:

As a facilitator it is important to always be thinking about your role, which is to enable shared analysis and learning by participants. As a facilitator you should:

- Be prepared

Make sure that you are familiar with the materials for the session and that you have a strong understanding of the related background materials. It is also useful to spend some time thinking about what questions the participants might ask, and how you would answer them.

- Define and discuss the structure and objective of the meeting

It is important that the group works together towards a common goal. Spend some time at the beginning of the meeting explaining the plan and intended outcomes of the session, and addressing any questions that the participants might have.

- Guide your group to do the work, but do not do the work for them

When you explain an activity it is often useful to provide an example. After introducing some examples, it is important to remember that in all participatory methods it is the participants (farmers) that complete the activities. The facilitator facilitates the process, supports the farmers and asks questions. For example, if the activity involves drawing diagrams then after providing an example to the farmers they should be doing their own drawing.

- Ensure easy understanding

When creating Seasonal Calendars, Livelihood Options Matrices or Participatory Budgets, try to use symbols instead of words.

- Ensure that all group members are heard

It is important that the opinions of all group members are taken into account. As a facilitator you will have to make sure this is happening by asking questions.

If a participant is being very quiet you could try occasionally asking them an easy or opinion based question ("e.g.: how do you feel about this?"). This can help to reduce their fear of answering wrongly and thus build up their confidence.

If you have a very dominant participant who talks too much, you can try pulling out interesting points from what they are saying to further the group discussion. To do this, thank them for bringing up the topic, rephrase the point you have chosen and ask the other group members for their thoughts on the topic.

- Bring a positive attitude

It is important to be friendly and honest with participants and to be respectful of participants' cultures, community standing and their level of knowledge.

- Manage your time well

Good time keeping is important to keep participants engaged and happy in the exercises that they are doing. Be clear at the beginning of the meeting how long you estimate the exercises will take; be realistic and stick to it.

- Respect the decisions of participants

In some of the exercises, farmers will be considering options and are likely to plan ahead for their own farms and livelihoods. Everyone is different – not just in terms of their resources like soil type, how rich or poor they are, or what opportunities they have – but also regarding what they want to achieve and how much risk they want to take. Your role is to support individuals to decide for themselves what they want to do and to respect their decisions.

Photo Cecilia Schubert (CCAFS)

Step A - What does the farmer currently do?

By the end of this step, you as the facilitator together with the farmers should clearly understand the main activities that the farmers currently undertake; their timing and how climate and weather affects those activities. This will be the starting point from which the farmers can use climate and other information to make decisions.

> Because this is the first step in PICSA make sure that you take the time to explain the overall PICSA process and discuss what you will be doing over the series of meetings that you have planned.

Aims of this step:

1. To better understand what livelihood activities a household undertakes, what resources it has, how they use them and what they produce (using a Resource Allocation Map).
2. To understand what main activities a farmer has for different crops and/or livestock, the timing of these activities, and how they are affected by weather and climate (using a Seasonal Calendar).
3. To create a starting point from which to explore ways of using climate and other information.
4. To enable you as the facilitator to better understand the differences between farmers in the group regarding their activities and access to resources.

During this step you should facilitate farmers to:

- Construct a Resource Allocation Map (see activity sheet A1).
- Construct a Seasonal Calendar (see activity sheet A2).

Activity sheet A1 - How to construct a Resource Allocation Map

What are Resource Allocation Maps used for?

A Resource Allocation Map is a participatory mapping tool that describes the main livelihood activities of a household, including the farm. The approach enables the farmer and you to understand the household's main uses and production of resources and how these may be affected by weather and climate.

In this step Resource Allocation Maps are used to describe the main livelihood activities and resource uses of the household for the next season. In steps G, I and K the farmers will revisit their Resource Allocation Maps to reconsider and revise their plans, taking the new climate and weather information into account.

Materials

You will need a flip chart and pens to draw the Resource Allocation Maps. Alternatively, they can be drawn on the ground using leaves, stones or other objects.

Preparation

- Discuss what the purpose of drawing the Resource Allocation Maps is with the farmers.

Example Resource Allocation Map
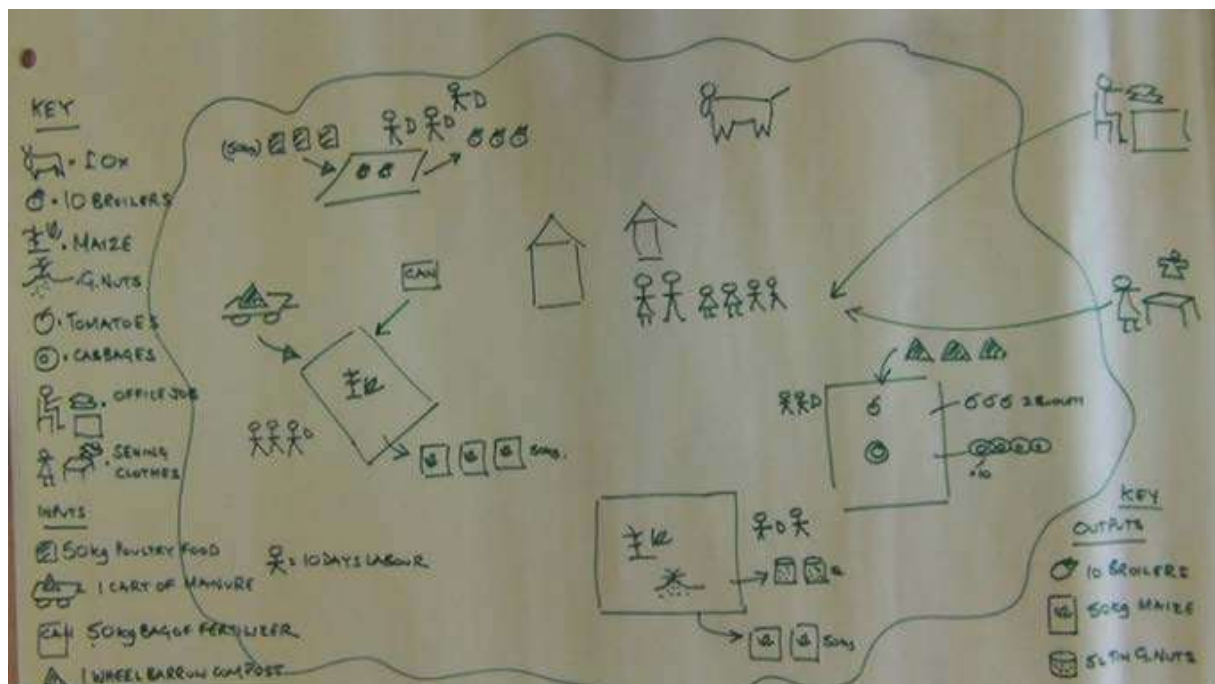
Procedure

Resource Allocation Maps should show what the farmer is planning/expecting to do in the coming season[2].

1. On your flip chart draw your example Resource Allocation Map with:
   o A home and the number of people in it (number of adults, children and their gender).
   o All of the household's fields, including vegetable gardens and fallow fields.
   o What they are planning/expecting to grow on each of their fields and the size of the plot that they will use.
   o Symbols depicting any resources that each of those plots/fields will require.
   o Symbols depicting any outputs that the farmer expects from those plots/fields.
   o The livestock that they keep on and around their farm, the type and the number.
   o Symbols depicting any resources that the livestock will require.
   o Symbols depicting any outputs that the farmer expects from her/his livestock.
   o Symbols depicting any off-farm work or remittances that bring income for the household.
   o A key which helps to identify the information on the map.

   Note: you may wish to prepare the example in advance and then talk the farmers through the process.

2. Now split the farmers into pairs or small groups to draw their own individual map for their own farms. Each farmer should draw their own map but by being in a pair or small group the farmers can help each other with the task.

3. Once the map has been finished, review each of the maps with the farmers to ensure that they are happy with the representation and the mix of enterprises that they have drawn. Clarify anything that appears to be unclear.

   Note: if you have a large group or are short on time you could select a few examples to go through as a group, instead of looking at all of them.

4. Ask the farmers to keep their copy of their Resource Allocation Map as they will be referring back to it throughout the PICSA approach.

Note: Resource Allocation Maps produced are likely to be quite different for different households, depending on how wealthy they are, gender of household heads, position in the community etc. It is important that as facilitators that we appreciate this. Different households are likely to respond to the same threats, shocks and opportunities in different ways.

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[2] Resource Allocation Maps can be useful in a number of other applications, including: looking back into last season, comparing different categories of farmer (e.g. male and female) and exploring how farmers could change their mix of activities.

Activity sheet A2 - How to construct a Seasonal Calendar

What are Seasonal Calendars used for?

In this field manual we use Seasonal Calendars to enable farmers to explore:

      a) the timing of the main activities (crop, livestock and livelihood) that they carry out on their farms,

      b) how these are influenced by weather and climate, and

      c) how extra information on the weather and climate could help.

In addition, Seasonal Calendars are used by farmers to provide a rough plan for what they intend to do in the next season.

### Materials

You will need a flip chart and pens to draw the Seasonal Calendar. Alternatively, it can be drawn on the ground using leaves, stones or other objects.

Preparation

- Discuss the purpose of drawing the Seasonal Calendar with the farmers.

Example Seasonal Calendar
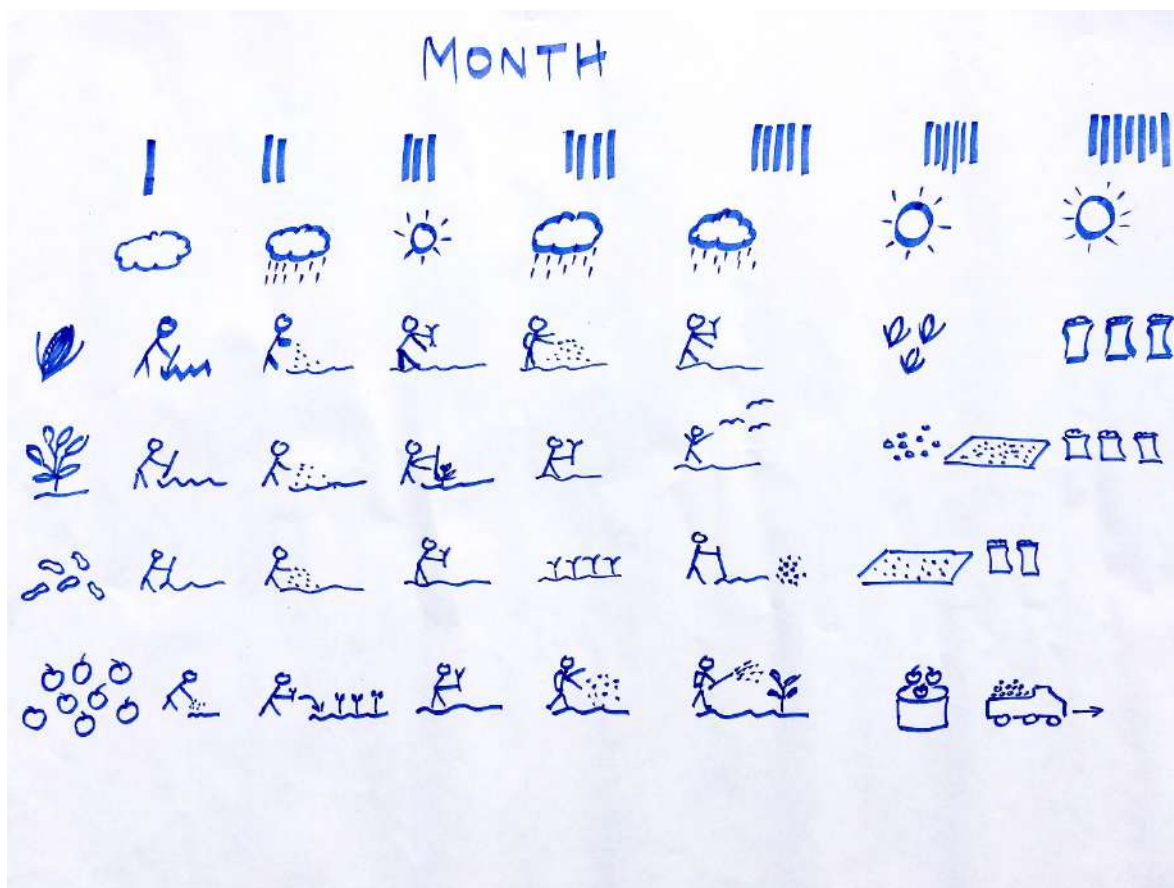
Procedure

1. On your flip chart draw your example Seasonal Calendar:
   o Draw a line at the top of the flipchart to show time and mark smaller time periods that the participants are familiar with (e.g. local names for months or parts of seasons) on it. Make sure that there are enough time periods to cover the whole crop cycle.
   o Draw rows on the left margin of the flipchart (as shown in the example); enough rows for all of the main crops grown on the farm. Put one crop on each row.
   o Then, for each crop, draw a line from when the first activity for that crop happens (e.g. land preparation) to when the last activity for the crop happens (e.g. harvesting).
   o Underneath the crop line, define when each main activity (e.g. planting, weeding...) is done with an activity line and a symbol.
   o On top of the crop line, indicate whether and how these activities may be affected by the weather and/or climate.
   Note: *you may wish to prepare the example in advance and then talk the farmers through the process.*

   You can follow the same procedure for livestock. However, some livestock may be kept by farmers all the time (e.g. grazing cattle) and may not have a clear start and end point. In such cases, draw the Seasonal Calendar for a year and show when the main activities happen and how they are influenced by weather or climate.
   If the calendar is going to be used to look at the details of crop management, you should give each crop more space, by putting each activity on a separate row or draw a separate calendar for each crop.

2. Once you have finished drawing/explaining your example Seasonal Calendar, split the farmers into pairs/small groups to draw their own individual calendars for their own farms. Ask them to draw the Seasonal Calendar to show what they think they will be doing in the coming season. Each farmer should draw their own Seasonal Calendars (for crops and livestock) but being in a pair or a small group means that the farmers can help each other with the task.

3. After farmers have drawn their Seasonal Calendars, ask them to identify and mark on them:
   o Which specific activities and their timing are particularly influenced by the weather. These may be big things like whether to grow a crop, or more specific ones like when to plant or whether to weed.
   o What aspects of the weather influence each of the activities?

4. Ask some farmers to share some of their Seasonal Calendars and what they have put as 'answers' to number 3 above. You can conclude this activity by sharing that the rest of the training in PICSA aims to a) provide farmers with some of this weather and climate information b) explore together farming and livelihood choices and detailed management options suited to the local climate and weather.

5. Ask the farmers to keep their copy of their Seasonal Calendar as they will be referring back to it throughout the PICSA approach.

Step B – Is the climate changing? Farmers' perceptions and historical records

By the end of this step, farmers should have an understanding of how the climate is changing and how it varies.

Aims of this step:

- To provide farmers with historical climate information so that they can use it to consider what has been happening to the climate.
- To analyse the historical climate information and compare it with the farmers' perceptions of change.
- If there are differences between the historical climate graphs and farmers' perceptions to:
    a) explore with farmers the possible reasons for these differences, and
    b) discuss whether this means that there are useful changes that can be made to crop, livestock or livelihood activities to address other drivers of change e.g. reduced soil fertility.
- To decide with the farmers which characteristics of the climate they should focus on when planning their crops, livestock and livelihood activities.

During this step you should facilitate farmers to:

- Understand where historical climate information comes from (see activity sheet B1).
- Understand and interpret climate graphs showing annual rainfall totals, start and end of season, season length, dry spells and temperature (see activity sheet B2); and what the implications are for crop, livestock and livelihood activities.
- Understand how climate graphs can be useful for planning for the season ahead.

Activity sheet B1 – Where does the historical climate information come from?

Why is it important for farmers to understand climate information and where it comes from?

Historical climate information is vital in the PICSA approach. It is important for farmers to understand where this information comes from and how it has been collected so that they are able to trust the outputs that they are presented with during steps B and C.

Materials

You will need a copy/copies of activity sheet B1a to pass round the farmers.

Preparation

- Familiarise yourself with the procedure below and the pictures in activity sheet B1a.

Procedure

1. Pass around the copies of activity sheet B1a.
2. Explain to the farmers each of the pictures/diagrams in turn.
3. Ensure that the farmers understand that:
   o The amount of rain that has fallen every day is measured using standard equipment.
   o The daily rainfall total is written down by meteorology staff at each of the weather stations.
   o This information has been recorded for many years; normally more than 50. The exact number of years depends on the location of the station.
   o Daily rainfall totals can be summarised and represented in a graph that displays seasonal rainfall over the past 50 years (like the one on activity sheet B1a).
   o The vertical axis shows the total amount of rain that fell each year during the rainy season (it may be useful to use the measuring cylinder as an example to explain this to farmers).

Activity sheet B1a – How is the historical climate information recorded and presented?[3]

Image credit: IDCR/ Thomas Omondi
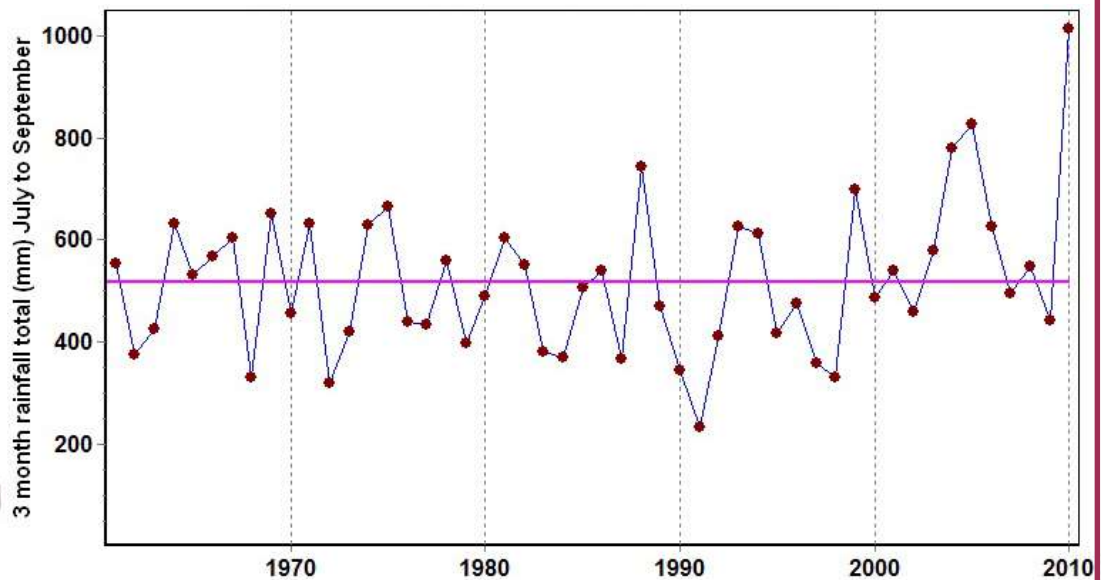
[3] Image 1 - Rainfall is measured in the field using a rain gauge. Image 2 - Rainfall measurements are recorded and stored. Image 3 - Rainfall measurements are presented on a graph.

Activity sheet B2 – Understanding and interpreting historical climate information/graphs

Why is it useful for farmers to understand the historical climate information for their location?

Historical climate information is useful for farmers as it enables them to better understand their local climate and therefore make more informed decisions about their crop, livestock and livelihood options.

Materials

You will need a full set of the climate graphs for the nearest available weather station. Make sufficient copies to ensure that you are able to leave one for each of the farmers.

Preparation

- You will have been provided with the appropriate climate graphs for the location in which you work. Ensure you understand them and think about the questions that farmers may have.
- Introduce the concept of historical climate information and how it is collected using activity sheet B1 & B1a.
- Explain how this information can be useful in informing farmers' crop, livestock and livelihood decisions.

Procedure

1. Begin by handing round the graph that shows total seasonal rainfall.

2. Explain that the horizontal line displays the years and that the vertical line shows the total amount of rainfall that fell in the rainy season each year. To help explain this and check that farmers understand, it is helpful to ask farmers questions.

> Example questions to check understanding of the graphs:
>
> - What year had a drought?
> - What year had heavy rains?
> - How much rain was there in x year?

3. Explore the data with the farmers by asking questions. You should establish whether or not:

   o the data shows that things are different in the last few years compared to 30/40/50 years ago? (i.e. are there any trends?)

   o shows that, from year-to-year, the changes are bigger (or smaller) than they were 30/40/50 years ago? (i.e. has the variability increased, decreased or stayed the same?)

> Example questions to explore data:
>
> - Does the graph show that there is more rainfall recently than there was 30/40/50 years ago?
> - Does the graph show that there is less rainfall recently than there was 30/40/50 years ago?
> - Does the graph show that, from year to year, the amount of rainfall varies/changes more recently than it did 30/40/50 years ago?
> - Does the graph show that, from year to year, the amount of rainfall varies/changes less recently than it did 30/40/50 years ago?

4. How does this information compare with the farmers' perceptions of the weather and climate in the area over the past 30 years or more?

> Example questions to compare perceptions and past climate:
>
> - Do you think weather and climate have changed in the last 30 years or more?
> - If so, how do you think it has changed?
> - Do you think rainfall is higher, lower or the same?

Note: In many locations the graphs will show a high degree of variability from year to year. This presents a major problem to farmers for planning. In Step C we will use tools to help us understand and address rainfall variability.

5. When you've finished discussing the graph on seasonal rainfall you should share and explore each of the following graphs with farmers:
    o   Season start date
    o   Season end date
    o   Season length
    o   Temperature
    o   Number of dry spells
    o   Lengths of longest dry spell
    o   Timing of dry spells
    o   Extreme rainfall events
    o   Any other graphs you have been supplied with for your location

    If there is not enough time to discuss each of the graphs then ask the farmers to select two or three of the graphs that they think will be the most useful for them to discuss.

> Example questions for exploring additional graphs.
>
> (a) Do they show that things are different in the last few years when compared to 30/40/50 years ago? (i.e. are there any trends?)
> (b) Do they show that, from year-to-year, the changes are bigger (or smaller) than they were 30/40/50 years ago? (i.e. has the variability increased, decreased or stayed the same?)
> (c) Is this information useful and how could you use it for planning/choices/decisions?

6. Find a public place where all of the graphs can be displayed so that people can see and discuss them.

Activity sheet B2a – Exploring differences between perceptions and the historical climate information

Why explore these differences?

If there are differences between the farmers' perceptions of the weather and climate over the past thirty years and the data collected by meteorological agencies it is important to try and understand with the farmers why these differences exist. With everybody talking about climate change, it is easy to assume it is the cause of many of the problems that we see; however, it may not be the only or main cause. Although it is clear that climate change is happening, it is important to consider the possible causes of individual problems, because if we don't focus on the real causes we may not identify solutions that work.

In some locations it has been found that farmers perceive rainfall to have decreased but the climate data collected show that:

(a) There is often no clear evidence of rainfall having decreased.

(b) Rainfall has always been very variable from year to year and continues to be.

(c) Temperature has increased.

If this is the case where you are working it may be useful to complete the following short exercise:

(a) Ask the farmers, "What are these perceptions based on? (What makes you think rainfall has decreased?)". Discuss these possible causes with the farmers. Farmers may suggest problems like lower yields and lower water tables amongst others.

(b) For each of these suggestions, ask farmers, "What could be causing these problems?" For example:

- What could cause reduced yield or food shortage?

- What could cause lower water tables?

- What could cause changes in vegetation?

It may be helpful to place these problems on a flipchart and ask farmers to draw connections that they see. See an example of this (for reduced yield) on page 24.

Example Discussion of causation

What could have caused decreased yields other than reduced rainfall?

Maybe reduced soil fertility?

Yes that is a possibility. How could we improve soil fertility?

Water conservation

Increased organic matter

Reduced tillage

Crop rotation

Example causal diagram

population increase

long term cultivation
of same land

loss of organic matter
with little replacement

loss of nutrients
from soil

poor soil fertility

low yields

hunger
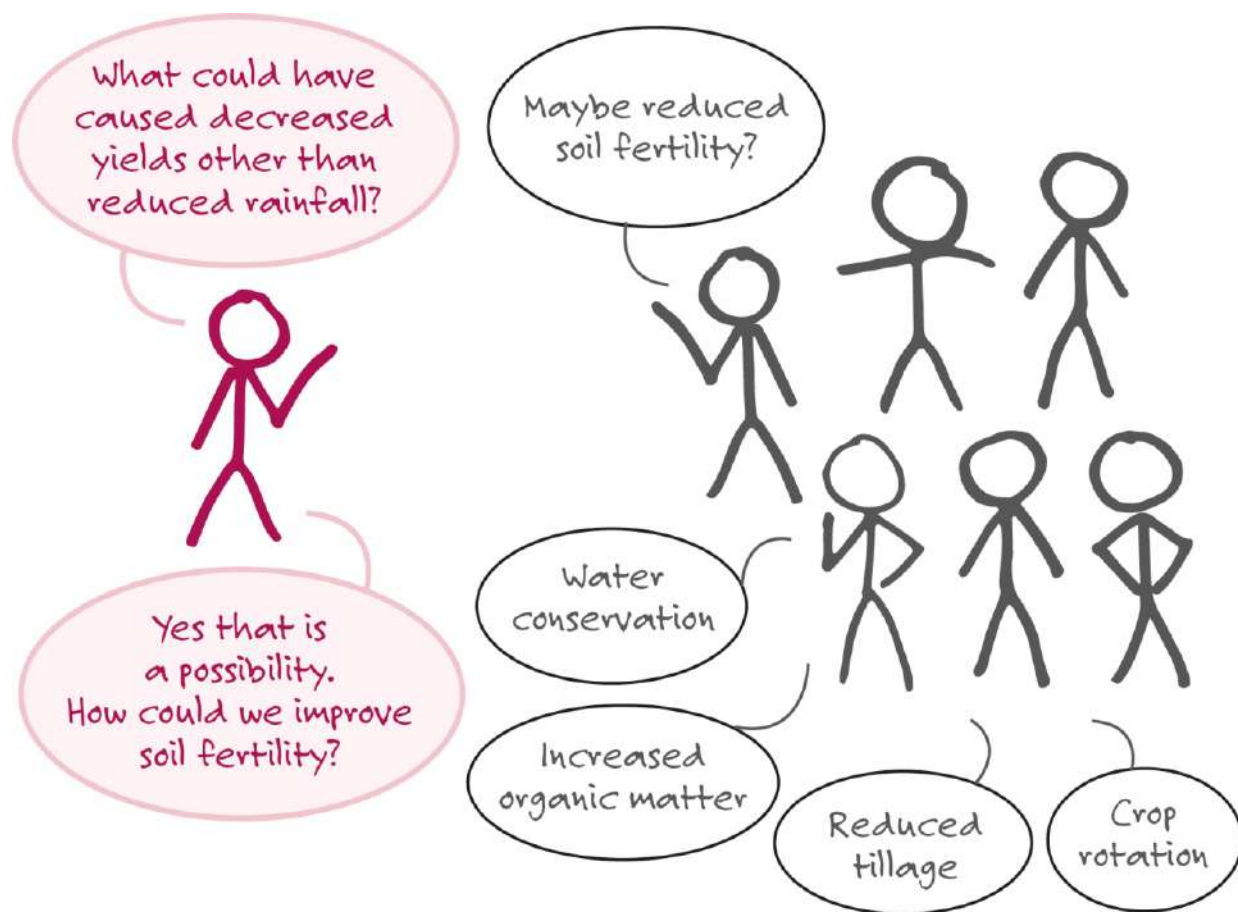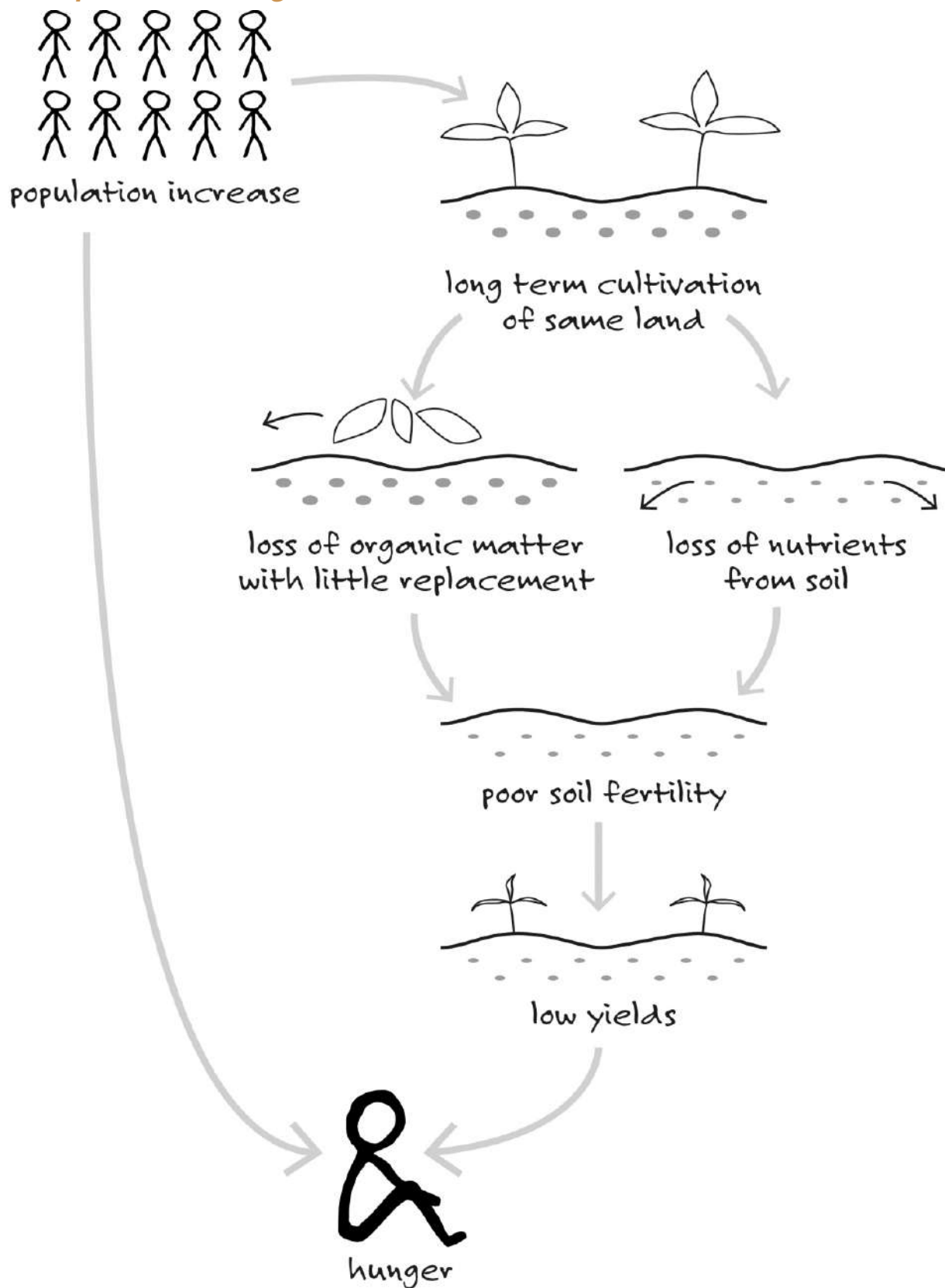
Step C – What are the opportunities and risks? Using graphs to calculate probabilities

By the end of this step, farmers should be able to calculate the probabilities of weather and climate characteristics and use the information to help make informed decisions for coming and future seasons.

Aims of this step:

- Enable farmers to use graphs to work out simple probabilities that are of interest to them and will help them to plan.

During this step you should facilitate farmers to:

- Calculate the probability of receiving a given amount of rainfall (activity sheet C1).
- Calculate the probability of different start dates for the season (activity sheet C1).
- Calculate the probability of a season being a specified length (activity sheet C1)
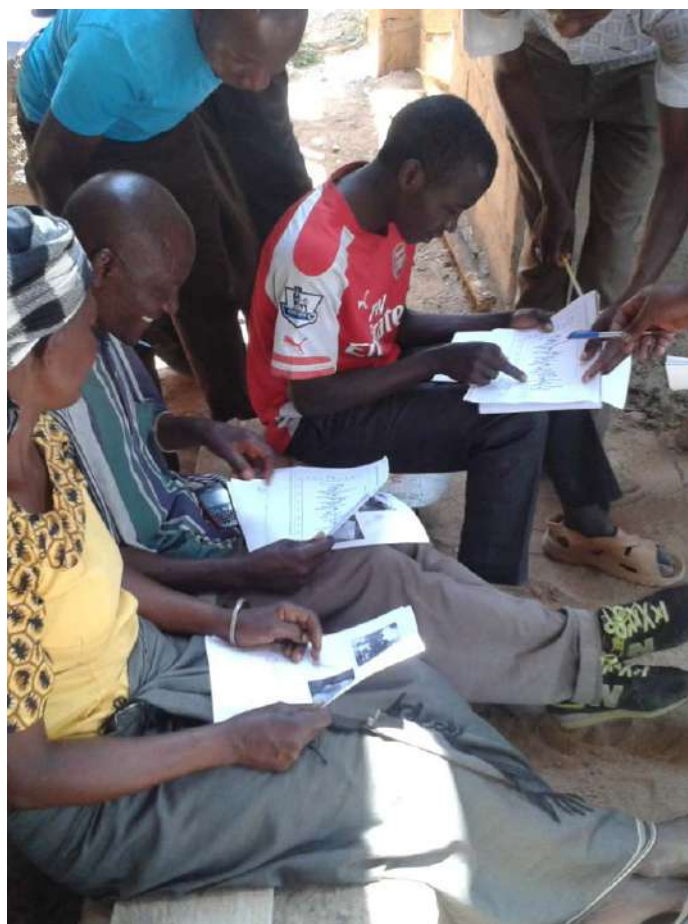
Activity sheet C1 – Calculating probabilities of weather and climate characteristics

Why is it helpful to calculate the probabilities of weather and climate characteristics?

Knowing the probabilities of different weather and climate characteristics can help farmers to make important decisions about crops, varieties, planting times, livestock management and livelihood choices[4].

Materials

You will need multiple copies of the historical climate graphs (these should have been handed out to farmers during Step B).

Preparation

You discussed the importance of the climate graphs in Step B. Explain to farmers that you will now discuss how these graphs can be of practical use in their planning.

Example

The graph below is an example graph from Dodoma, Tanzania, showing 80 years of seasonal rainfall totals. We will calculate probabilities from this, but you will have historical climate information from your area too. In this exercise you and your group are going to use this to calculate the probability of more than 500mm of rainfall in a season[5].

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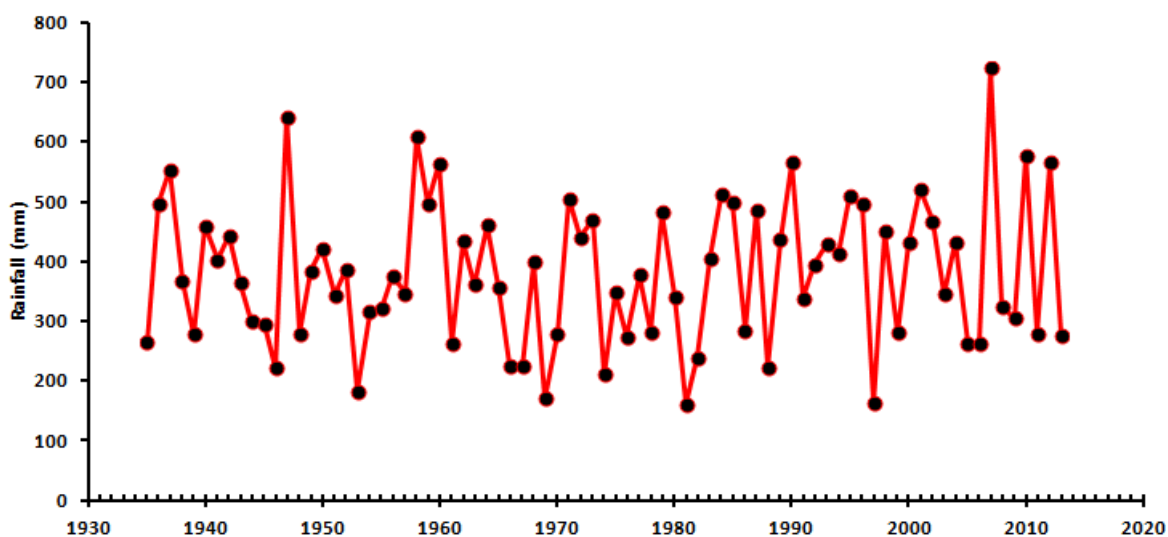
[4] If there are clear trends in the graphs then you will have discussed different ways of treating probabilities during the training course you have received.

[5] You may want to use a different amount of rainfall, that is more meaningful for the farmers in your group for this exercise

Procedure

1. Organise the farmers into pairs or small groups to look at the graph of seasonal rainfall totals.

2. Remind the farmers what period of time is covered by the historical climate information. What is the first year recorded? So how many years are there in total? In the example (graph for Dodoma on the previous page) there are 78 years (1936 – 2013) so there are 78 seasonal rainfall points.

3. Ask them to identify 500mm of rainfall on the vertical axis.

4. Using a piece of paper ask the farmers to cover all of the rainfall points that are below 500mm (see example in the graph on the next page).

5. Ask the farmers to count the rainfall points that are still visible – this tells them how many seasons in the past 78 years that the seasonal rainfall has been over 500mm.

> In our example that means that in fifteen seasons in the last 78 years the rainfall has been 500mm or more.

Photo: John Gathenya

6. The next step is to divide the number of visible rainfall points by the total number of rainfall points on the historical climate graph to work out your probability.

> In our example graph this means that the number of rainfall points, 15, is divided by the total number of years recorded, 78. 15/78 = 0.19 which is approximately 0.2 or 1 in 5. This exercise has taught us that for any season in the near future the probability of the area from the example receiving 500mm or more of rainfall is 1 in 5
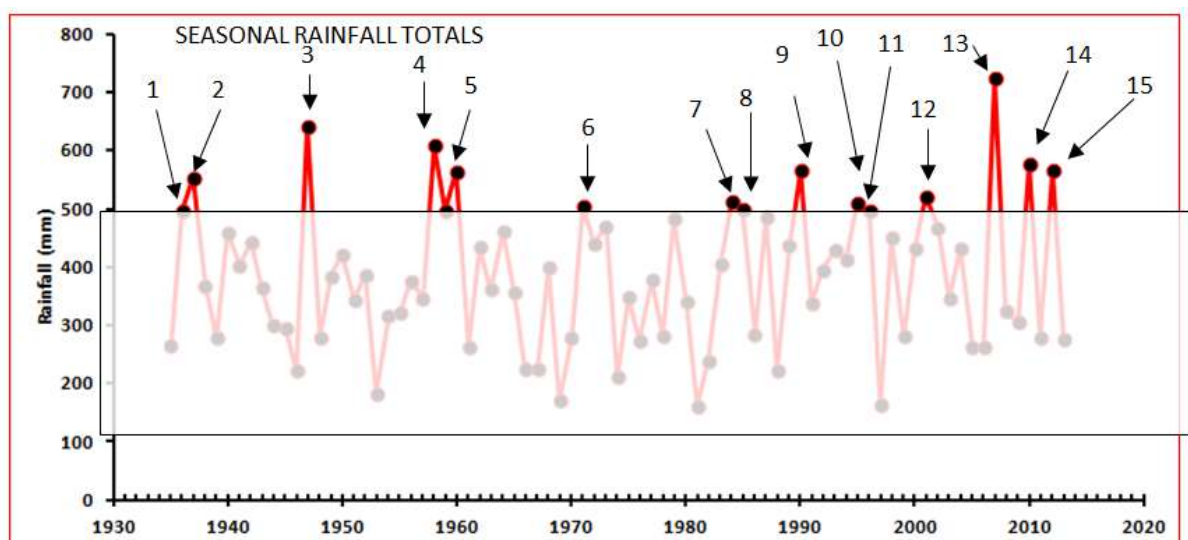
7. Help the farmers to make this calculation with their own graphs and to work out the probability that they will receive over 500mm of rainfall in the coming season.

8. Once everyone has agreed on the probability then write it clearly on a flipchart or board for everyone to see.

9. Farmers should then use this same approach to calculate the probabilities for other weather and climate characteristics that are set out in the same format. Help the farmers to calculate probabilities for:

    o Season start date – One of the biggest decisions farmers make is when to plant so knowing the probability of the rainfall season starting for different dates can be very useful. A farmer may plan ahead for specific dates OR when it starts raining on a particular date they can use the calculation to tell them how likely it is that the rainy season has properly started (so that they can avoid planting with a 'false start').

    o Season length – Can be useful in selecting crops and varieties that require different lengths of time to mature.

Again, once the farmers have agreed on the probabilities for these characteristics then write them clearly on a flipchart or board for everyone to see. *These probabilities can now be used by farmers to help assess their options in Step D and to plan for the coming season.*

10. Identify which other characteristics, if any, they would like to explore further (either in the session or in their own time). For example:

    o Season end date – Can be useful when considering crops that need moisture for an extended period or crops that have a specific need to 'dry-off' soon after they have matured (e.g. sunflower).

Step D - What are the options for the farmer?

By the end of this step, farmers should be aware of which crop, livestock and livelihood options are open to them.

It is important to remember that what individual farmers think is best for their household may vary widely. Individual attitudes to risk and the resources of each household are both likely to influence farmers' choices. It is therefore useful to consider a broad range of options to ensure that all of the farmers you are working with, whether they are wealthy, poor, male, female etc…, are able to identify options that may be suitable for their circumstances.

Aims of this step:

- To explore existing and new crop, livestock and livelihood options that may be suitable for the local climate and weather.

During this step you should facilitate farmers to:

- Calculate the probability that the seasonal rainfall will be sufficient for specific crops and varieties (see activity sheet D1a).
- Use the Crop Information Tables (in appendix 1) to compare different crops and varieties and to identify options with farmers.
- Discuss the implications of this probability when considering risk and the farmers' planting strategies.
- Construct a Crop Practices Matrix to identify and consider other crop related practices that are suitable to the location (e.g. soil and water conservation practices which improve retention of water and chances of good yields; see activity sheet D1b).
- Construct a Livestock Options Matrix to identify and consider livestock related options (see activity sheet D2).
- Construct a Livelihood Options Matrix to identify and consider livelihood related options (see activity sheet D3).

Activity sheet D1a – Crop Information Tables

What are Crop Information Tables used for?

Crop Information Tables help farmers to understand the requirements of specific crops and varieties which are crucial in understanding the crops that best fit the local climate. Crop Information Tables can be used to assess the climate related risks of different crops at a given location.

Materials

You will need the completed Crop Information Table.

Preparation

This step builds on the activities completed in Step C. We are now going to use the probabilities, with Crop Information Tables, to help with planning. The Crop Information Table for your location is included as appendix 1[6].

Ensure that you understand the information in the Crop Information Table (appendix 1) and that you are able to explain the information to farmers.

Example Crop Information Table

Crop	Variety	Days to maturity	Crop water requirement	Chance of sufficient rainfall if season starts on x (Early)	Chance of sufficient rainfall if season starts on x (Middle)	Chance of sufficient rainfall if season starts on x (Late)
Maize	Local	120	480	5/10	4/10	2/10
Maize	Pioneer xxx	100	350	7/10	5/10	4/10
Sorghum	Seed Co xxx	110	300	5/10	7/10	6/10

Procedure

1. Remind the farmers how they worked out probabilities for seasonal rainfall during Step C.

2. Explain the information in the Crop Information Table, beginning with the different crops and varieties and then the days required to maturity and how this differs for each crop / variety. Next, explain the crop water requirement to the farmers (see box 'Days to maturity and crop water requirement).

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[6] Location specific appendices need to be prepared in advance of the training.

Days to maturity and crop water requirement

When you calculated probabilities in Step C you used the total amount of rainfall for the whole season. Now that we are comparing crops/varieties it is important that we are more specific. Each crop/variety requires a certain amount of time to grow to maturity and each crop/variety has a certain water requirement during this period of time. Any rainfall after this period is not helpful for the crop and so should not be considered when comparing different crops/varieties. To use the total seasonal rainfall would therefore be misleading so we need to use rainfall totals that match the maturity period and crop water requirements of specific crops.

In the Crop Information Table for your location this will have been calculated for you.

3. Explain how the three probabilities calculated in Step C can be combined to produce one probability for each of the varieties on a range of potential planting dates. This information can be used to help understand which varieties are best suited to the local climate (i.e. which varieties are most likely to receive sufficient rainfall over their maturity period).

   Note: As it would take a long time to work this out for each crop with the farmers, the calculations have been done in advance and the probabilities are given in the last three columns of the Crop Information Table*.*

4. Hand around the Crop Information Tables and explain the information that they contain. The Crop Information Tables specific to your location are in appendix 1.
5. Split the farmers into small groups and ask them to consider the probabilities of the different crops and varieties listed in the crop activity sheet, and to identify which ones are most likely to succeed in this location at different start dates.
6. Ask the groups of farmers to choose which crops and varieties they think would be the most suitable combination to plant. Discuss their choices with them. Are they what they would have expected? Why?
7. Make a list of all the crops and varieties that the farmers are interested in planting (there doesn't have to be a consensus across the group) – you will need this list for Step E.

Limitations

It is important to note that the Crop Information Tables come with limitations:

- The rainfall data is from a single point and so is not representative of individuals' farms.

- The crop water requirement is for a maximum yield (under field trial conditions) which may be unrealistic (and not what most farmers are aiming for).

- The probability is for sufficient rainfall across the maturity period and doesn't take account of when during the period the rain actually falls.

- The probabilities do not take into account other factors which may affect crops (e.g. dry spells or diseases).

Activity sheet D1b – How to construct a Crop Practices Options Matrix

What are crop practices matrices used for?

There are a wide range of practices that can increase the likelihood of achieving good yields. This exercise helps to identify locally known and new practices that are likely to be useful to farmers in the location. The matrix provides a way for farmers to consider which practices they want to learn more about and to try.

Some of the practices should help address climate and weather challenges and improve the crop probabilities given in the previous section e.g. soil and water conservation practices in semi-arid areas will increase the chances of a crop obtaining sufficient moisture.

Note: it is not possible to include all possible crop related practices but rather to identify those that are likely to be most useful to farmers in the location.

Materials

You will need a large sheet of paper and a marker pen (alternatively, the matrix may be drawn on the ground using a stick and stones, cartons or other items). You will also need to refer to the Crop Related Practices Table if one is available for your area (see appendix 2), which gives information on practices promoted by extension and NGOs.

Preparation

This step follows immediately from Step D1a which focused on identifying crops and varieties for farmers to consider for the location. Some of the practices here will help improve probabilities.

- Discuss the reason for constructing the Crop Practices Matrix with farmers.
- Different crop practices will be important to individual farmers depending on the skills they have, what they can afford to do, labour resources etc… as well as their aims and attitudes to risk. It is important to ensure that all farmers' views are represented during this activity.

Layout of Crop Related Practices Matrix

Procedure

1. Draw the outline of a Crop Related Practices Matrix on a flipchart.
2. Ask farmers to suggest all the different practices that they are aware of for improving crop production, particularly those that help address the problems and opportunities due to weather and climate. Depending on the location, examples could include soil and water conservation practices such as mico-pits, tied ridges and increasing soil organic matter. Many practices may have several benefits in addition to addressing the weather challenges. Other examples could include staggered planting, mixed cropping, use of legumes. Ask farmers to start with the practices that they think are the most useful as the list may be long.
3. Mark these on the chart (preferably using a drawing so everyone can understand it and remember which it is).
4. Introduce other crop related practices that you think might be good in this location. Refer to the Crop Related Practices Matrix if it is available (see appendix 2).
5. Explain each of the headings at the top of the matrix:
   o Who does the practice: Ask farmers to identify whether the labour for the practice is most likely to be by women, men or both and to mark this on the matrix.
   o Benefits and who benefits: Use this column to consider with the farmers how each of the crop practices would be likely to benefit them. Note that different options will have

different benefits and aims. Then ask farmers to indicate who is likely to receive benefits from the practice - men, women or both.

o Performance in 'Low', 'Medium' and 'High' rainfall seasons / years: Use this column to consider how each of the crop practices is expected to do in each of these different conditions in the area.

o Investment: Use this column to consider the level of investment required for each practice. Is it high (H), medium (M) or low (L). You may want to split this column into time and money.

o Time to benefit: Use this column to consider how much preparation time a farmer would need to be able to carry out each of the practices and how long it would be before they start to see any benefits. Make sure you take into account whether farmers would need extra time to learn new skills, or acquire materials.

o Other risks or disadvantages: Use this column to highlight any other risks involved with the crop practices (e.g. less crop residue for livestock feed as it is used for mulching).

6. Go through the crop practices one by one, asking the farmers about each of the headings and agreeing on what should be filled in. It is important that the decisions are made by the group and not by you, the facilitator.

7. Include in your discussion identifying with the farmers which, if any, crop practices are likely to be helpful in most seasons (whether they are low, medium or high rainfall seasons) or that will still give a reasonable yield in poor seasons. Mark these with a circle.

8. Put a star beside any of the crop practices that any of the farmers are interested in (there doesn't have to be a consensus across the group). Important - you will need this completed matrix to use again when you get to step E.

Note: The aim is not to cover each of the practices in depth. If farmers are particularly interested in some practices that are new and that require more detailed coverage, you may need to arrange a separate session on this.

Activity sheet D2 – How to construct a Livestock Options Matrix

What are Livestock Options Matrices used for?

Livestock are very important in dealing with climate variability. The procedure outlined below is designed to identify the key ways in which climate effects different types of livestock and therefore how climate information can be used to help plan livestock management.

Note: as there are so many types of livestock and methods of keeping them, it is not possible to provide detailed guidelines for all the different types of livestock here.
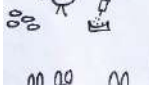
Materials

You will need a large sheet of paper and a marker pen (alternatively, the livestock options matrix may be drawn on the ground using a stick and stones, cartons or other items).

Preparation

- Discuss the reason for constructing the Livestock Options Matrix with farmers.
- Different livestock options will be important to individual farmers depending on what skills they have, and what they can afford to do, labour resources etc… It is important to ensure that all farmers' views are represented during this activity.

Example Livestock Options Matrix

Procedure

1. Draw the outline of a Livestock Options Matrix on a flipchart.
2. Ask farmers to suggest all the different livestock types that they are aware of and mark these on the chart (preferably using a drawing so everyone can understand it and remember which it is).
3. Then ask farmers to suggest the different livestock management options that may be used under differing weather conditions (i.e. moving herds to find pasture, breeding fewer animals, conserving feed etc…) and mark these on the chart.
4. Add any other livestock options that you think might be appropriate in this location. If it is available, refer to the Livestock Options Matrix for livestock options that are considered suitable for this location by development organisations (see appendix 3).
5. Explain each of the headings at the top of the matrix:
   o Who does the practice: Ask farmers to identify whether the labour for the livestock or management option is most likely to be by women, men or both and to mark this on the matrix.
   o Benefits and who benefits: Use this column to consider with the farmers how the livestock type and/or management option would be likely to benefit them. Note that different options will have different benefits and aims. Then ask farmers to indicate who is likely to receive benefits from each - men, women or both.
   o Performance in 'Low', 'Medium' and 'High' rainfall years: Use this column to consider how the livestock type or management option is expected to do in each of these different conditions in the area.
   o Investment: Use this column to consider the level of investment required for each livestock type or management option. Is it high (H), medium (M) or low (L).
   o Time to benefit: Use this column to consider how much preparation time a farmer would need to start keeping the livestock type or to be able to carry out the management option. Make sure you take into account whether farmers would need extra time to learn new skills, acquire stock, build housing or gather materials.
   o Other risks and disadvantages: Use this column to highlight any other risks or disadvantages involved with the livestock type or management option, such as lack of market, tenure issues, disease risks etc…
6. Go through the livestock types and management options one by one, asking the farmers about each of the headings and agreeing on what should be filled in. It is important that the decisions are made by the group and not by you, the facilitator.
7. Put a star beside any of the livestock types and options that any of the farmers are interested in (there doesn't have to be a consensus across the group) – you will need this list for step E.

Activity sheet D3 – How to construct a Livelihood Options Matrix

What is the Livelihood Options Matrix used for?

- To work with farmers to identify the different livelihood options that are available to them and which may be most suitable to different types of households.
- To introduce new livelihood options for the farmer so that they may consider what they are interested in and what they want to try.

Materials

You will need a large sheet of paper and a marker pen. Alternatively, a Livelihood Options Matrix can be drawn on the ground using a stick and stones, cartons or other items.

Preparation

- Discuss the reason for constructing the livelihood matrix with the farmers.
- The Livelihood Options Matrix is designed to be carried out with a group of farmers; however, different livelihood options will be important to individual farmers depending on what skills they have, what they can afford to do, labour resources etc…. It is important to ensure that all farmers' views are represented during this activity.

Example Livelihood Options Matrix

Procedure

1. Draw the outline of a Livelihood Options Matrix on a flipchart.
2. Ask farmers to suggest all the different livelihood activities that they are aware of.
3. Mark these on the chart (preferably using a drawing so everyone can understand it and remember which it is).
4. Add any other livelihood options that you think might be appropriate in this location. Refer to the Livelihood Options Matrix for livelihood options that are considered suitable for this location by development organisations if it is available (see appendix 4).
5. Explain each of the headings at the top of the matrix.
   o Who does the practice: Ask farmers to identify whether the labour for the livelihood option is most likely to be by women, men or both and to mark this on the matrix.
   o Benefits and who benefits: Use this column to consider with the farmers how each of the livelihood options would be likely to benefit them. Note that different options will have different benefits and aims. Then ask farmers to indicate who is likely to receive benefits from the option - men, women or both.
   o Performance in 'Low', 'Medium' and 'High' rainfall seasons / years: Use this column to consider how each of the livelihood options is expected to do in each of these different conditions in the area.
   o Investment: Use this column to consider the level of investment required for each option. Is it high (H), medium (M) or low (L). You may want to split this column into time and money.
   o Time to benefit: Use this column to consider how much preparation time a farmer would need to be able to carry out each of the options. Make sure you take into account whether farmers would need extra time to learn new skills or gather materials.
   o Other risks and disadvantages: Use this column to highlight any other risks or disadvantages involved with the livelihood.
6. Go through the livelihoods one by one, asking the farmers about each of the headings and agreeing on what should be filled in. It is important that the decisions are made by the group and not by you, the facilitator.
7. Put a star beside any of the options that any of the farmers are interested in (i.e. there doesn't have to be a consensus across the group) – you will need this list for step E.

Step E – Options by context

By completing step D the farmers will have identified the different crop, livestock and livelihood options that may be of interest in their location.

Aims of this step:

1. To acknowledge/discuss the concept of 'options by context' with farmers.

During this step you should facilitate farmers to:

- Understand their options, based upon their individual circumstances.
- Choose which options to consider in more detail.

Activity sheet E1 – Providing options by context

Why are we using 'options by context'?

All households are different and options that are best for one household are likely to be different to those that are best for another depending on the context. Options include any enterprises or management practices. Context is made up of features of the household, including wealth, size, education, availability of land, soil types, and livestock holdings etc…, as well as individual farmers' goals and attitudes to risk. It is recognised in development work that we should aim to support farmers to make their own decisions, by providing farmers with different 'options' so they can:

- choose which they think are best for them, and
- and how to adapt and implement them to their own circumstances.

As such, two neighbouring farmers may practice different options, or the same option in different ways, and both succeed.

Materials

Use the lists of crops, livestock and livelihood options drawn up in step D.

Preparation

Complete the activities in step D.

Procedure

1. Explain the idea of 'options by context' (see "Why are we using 'options by context') and discuss with the farmers why it is important. Identify examples of practices used by some farmers and not others, and the reasons for this.

2. Refer back to the lists you made with the farmers in step D:

    o Crops and varieties options list
    o Crop practices options list
    o livestock options list
    o livelihood options list.

3. Ask all the farmers to identify options from these lists that they would like to explore further.

Step F – Compare different options and plan

By the end of this step, farmers should be ready to decide on the options that they intend to use in the forthcoming season. This requires a more detailed look at each of the options to help farmers explore which are best suited to their individual context. Participatory Budgets are a useful tool for this but are not necessarily suited to all options.

Aims of this step:

1. To help farmers select the options that they wish to try out or implement.
2. To enable farmers to use Participatory Budgets, when helpful, to be able to compare the different options that they are interested in implementing.
3. To facilitate farmers to plan how they will integrate the options that they select into their livelihoods.

During this step you should facilitate farmers to:

- Identify which of the options it would be useful to create Participatory Budgets for and which do not need this.
- Create their own Participatory Budget for their crop, livestock and/or livelihood options (see activity sheet F1).
- Identify the advantages, disadvantages and practical requirements of options that do not require a Participatory Budget.

Activity sheet F1: How to construct a Participatory Budget

What are Participatory Budgets used for?

Participatory Budgets are used to evaluate the resource inputs and outputs of the different crop, livestock and livelihood options. They enable farmers to identify the options that are best suited to their household and thus make informed choices about which options they may want to implement or try. They also help farmers to plan ahead and to prepare, by identifying what activities, money and resources are needed and when.[7]

Materials

You will need a sheet of flipchart paper and a marker pen. Alternatively, a Participatory Budget can be drawn on the ground using a stick and stones, cartons or other items.

Preparation

- Discuss with farmers what the purpose of drawing a Participatory Budget is.

Example of a Participatory Budget

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[7] Participatory Budgets can be useful in a number of other applications including: planning when to do activities (e.g. plant a new crop); identify busy periods when there may be competition for time and/or resources; exploring options for introducing new activities; understanding when investment is required with a new enterprise

Procedure

1. Decide upon the option that the farmers want to consider using the example Participatory Budget.
2. Draw a Participatory Budget template with as many columns for time periods as the option requires. The periods that you choose will depend on the activity you are exploring, for example tree or livestock enterprises might use years, most crops would use months and poultry might use weeks.
3. Write the option at the top of the flipchart and record the planned size (i.e. acres or herd size).
4. For each time period (column) e.g month, add the activities that are required (e.g. land preparation, planting, harvesting, veterinary services, selling livestock etc….).
5. For each activity, find out and add:
    o   What inputs (e.g. seed, labour, pesticides, etc...) are required for each activity in each time period? Include the quantities of each input and prices that farmers have paid for inputs.
    o   Any family labour linked to the activities, should also be added as it is important that farmers consider this in their decision making.
    o   What outputs, if any, relate to each activity in each time period, including the quantity of each output and, the amounts and prices of any produce that was sold? If the price for any of the outputs is higher or lower than normal that year, farmers should use a 'typical' price so that the option does not look better or worse than it really is.
    o   Produce consumed by the family or kept for consumption should be recorded as this should also be considered in decision making. However, if the household keeps produce for home consumption then it is better not to convert this into a cash value, as the farmer is not going to sell it.
6. Once the outputs and inputs for all the activities over the whole time have been accounted for, work out the cash balance (all cash income minus any variable costs) and record it in the balance row.
7. By adding and subtracting the balances in the different columns you can calculate the overall balance for this option over the production period. If the farmer has kept some produce and is not planning to sell it then record the amount of produce (e.g. 5 x 3kg bags of beans) together with the overall cash balance.
8. Now conduct 'What if' scenarios by asking farmers to identify what are the most likely things that could influence the option negatively and positively. They should adjust the Participatory Budget to see what effect these influences have on the balance. For example, in a participatory budget for a new crop, farmers might want to use the Participatory Budget to explore 'what if the price of the produce was low', 'what if the rains started late'

> Dividing farmers into suitable groups: Step F will work best if each group is made up of farmers that want to examine the same options, and who have similar circumstances (eg farm size, access to resources). This needs to be done in a way that does not embarrass anyone. The easiest way is to ask farmers to a) select which options they are interested in, then b) ask them to get into smaller groups with other farmers that they think are the most similar to themselves.

9. Once the process of creating a Participatory Budget has been well understood, split the farmers into pairs or small groups to draw their own Participatory Budgets for the options they are interested in. Different farmers may be interested in different enterprises or options.

10. Once the group has multiple Participatory Budgets, farmers that have worked on different options should be asked to share their results and explain their budgets to each other. Through this process farmers will compare and contrast the different options, including current enterprises, to help them decide which options are best in their individual circumstances. It is important if possible to leave the PBs with the farmers who have drawn them.

Farmers may wish to compile more Participatory Budgets on their own outside of the meeting and this is to be encouraged. Please make sure, if possible, that farmers have flip chart paper and pens left with them to use.

Step G – The farmer decides

Aims of this step:

1. For each individual farmer to identify the crop, livestock and/or livelihood options that they would like to implement in the coming season/near future.

During this step you should facilitate farmers to:

- Use the products from steps A, D and F to make informed decisions about what they intend to do in the coming season/near future (see activity sheet G1).

- Re-visit their individual Resource Allocation Maps and Seasonal Calendars and update them with their plans. It may be easier to create new ones, which is fine too.

Activity sheet G1 – Farmer decision making

Why is it important that farmers are the decision makers?

It is important that farmers are the decision makers as it is the farmers who are taking all of the risks. The PICSA approach aims to enable farmers to make better decisions but not to make decisions for them.

Up to this stage you have taken the farmers through steps that have explored the different crop, livestock and livelihood options that are relevant to their local area and climate. It is now important that the farmers individually decide what they would like to do in the next season. Given 'options-by-context' as introduced in step E, it is very likely that different farmers will choose different options. This should be encouraged. Some may decide to make no changes at all and if this is the case then they should not be pressured into making changes.

Materials

You should use the outputs from steps A, D and F.

Preparation

Ensure that each farmer brings their Resource Allocation Maps and Seasonal Calendars that were created in Step A and that the lists and Participatory Budgets from Steps D and F are available.

Procedure

1. Ask each farmer to look at their original Resource Allocation Maps and Seasonal Calendars.
2. Using the products from Steps D and F, ask each farmer to identify which options, if any, they would like to implement.
3. Ask the farmers to mark these changes on their Resource Allocation Maps and Seasonal Calendars (ask farmers to include detail on these for example the areas of the crops and the numbers of livestock).

Monitoring

It can be useful to record what, if any, options farmers decide to implement. However, it is essential that farmers do not think that you are 'checking up' on them or feel under any kind of pressure.

Activity sheet G2 – Facilitating implementation of farmers' choices

There may be key factors or 'bottle necks' that could stop farmers from implementing options that they have selected. A common example is that farmers may have identified specific crops and varieties they want to grow, but are unable to access seed. Your role as a facilitator is to try to help address such factors; however, this needs to be done in a sustainable way. You want to help develop solutions that will work not just this year but also in the future, and will not always require your input.

There are many different constraints to obtaining seed that will vary with location and context. Likewise, there are a wide range of possible processes and solutions. It is not possible to cover them all in this manual, but here are some general tips and ideas that have been useful elsewhere.

- Discuss the problem with farmers to clarify what it is and what the possible causes are.
- Help farmers to help themselves – encourage farmers to identify solutions and what steps they can take. For example, the group may nominate a member to visit seed suppliers and purchase seed for them.
- Consider what actions you as the facilitator can take that will lead to long-term solutions – e.g. find out cell numbers of reputable suppliers and provide these to the group, see if a seed supplier would be willing to do a demonstration plot and provide some seed for farmers to try, ask your colleagues if they know of communities that managed to get seed every year and how this was achieved.

Below are two examples of successful interventions:

- After looking at historical rainfall graphs a group of farmers in Zimbabwe identified that they needed seed of new maize varieties. Rather than wait for it to be supplied through the normal channels, which were unreliable, the group organised for members to purchase and supply it.
- In an area of Tanzania, farmers using PICSA identified new millet and sorghum varieties that they wanted to plant but could not access. The facilitator arranged for seed to be obtained from the local agricultural research station, and the farmers were able to purchase it.

Although you are likely to face many different limiting factors, try to remember these guiding principles:
1. Help farmers to help themselves.
2. Facilitate connections between farmers and other players such as input suppliers, projects and markets.

Step H – The seasonal forecast

What is the seasonal forecast?

The seasonal forecast is produced by the national meteorological agency. It is a product that is provided shortly before the season begins. By the end of this step, farmers should understand the seasonal forecast for their locality for the next season and the implications of this for the plans that they have made.

Aims of this step:

1. To disseminate the seasonal forecast in a way that farmers understand.
2. To help farmers understand what the seasonal forecast means for their location and for them as individuals.

During this step you should facilitate farmers to:

- Understand what the seasonal forecast is and where it comes from.
- Understand terciles and how they are used in the seasonal forecast and from this, how this information may be used (see activity sheet H1).
- Understand the advantages and the limitations of the seasonal forecast (what it does tell us and what it does not tell us).

Activity sheet H1 – The seasonal forecast

What is the seasonal forecast used for?

The seasonal forecast is a product that is provided before the season begins and then updated during the season. In many countries it is currently limited to providing probabilities of the total amount of rainfall for the season being above normal, normal or below normal, compared to previous seasons. For agriculture and livelihoods this can be used as a further source of information to help adjust existing strategies and plans.[8]

Preparation

You must understand the seasonal forecast that has been given by the meteorological agency and print out copies of the seasonal forecast for Malawi and the graph that shows the terciles for this area (e.g. the graph similar to the one on the following page but using data for your nearest met. station).

Example of a seasonal forecast
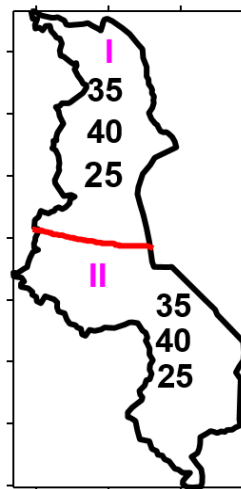
Source: Example seasonal forecast for Malawi, provided by DCCMS

Understanding the Understanding and using the seasonal Forecast:

1. Start by showing the group this example of the seasonal forecast, which provides the seasonal forecast for Malawi. Explain that you will use the figures from the north and south of Malawi to support our explanation of the seasonal forecast. Explain that for the south of Malawi, the forecast was of a 35% chance of an "above normal" season, with 40% chance of a "normal" season and 25% of a "below normal" season.

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[8]Here we describe the way the seasonal forecast is currently given by many National Meteorological Services. However, they are hard at work improving both the forecast itself and the way the results are presented to you and to farmers. We will update this section as improvements are implemented.

Seasonal Total Rainfall for Balaka
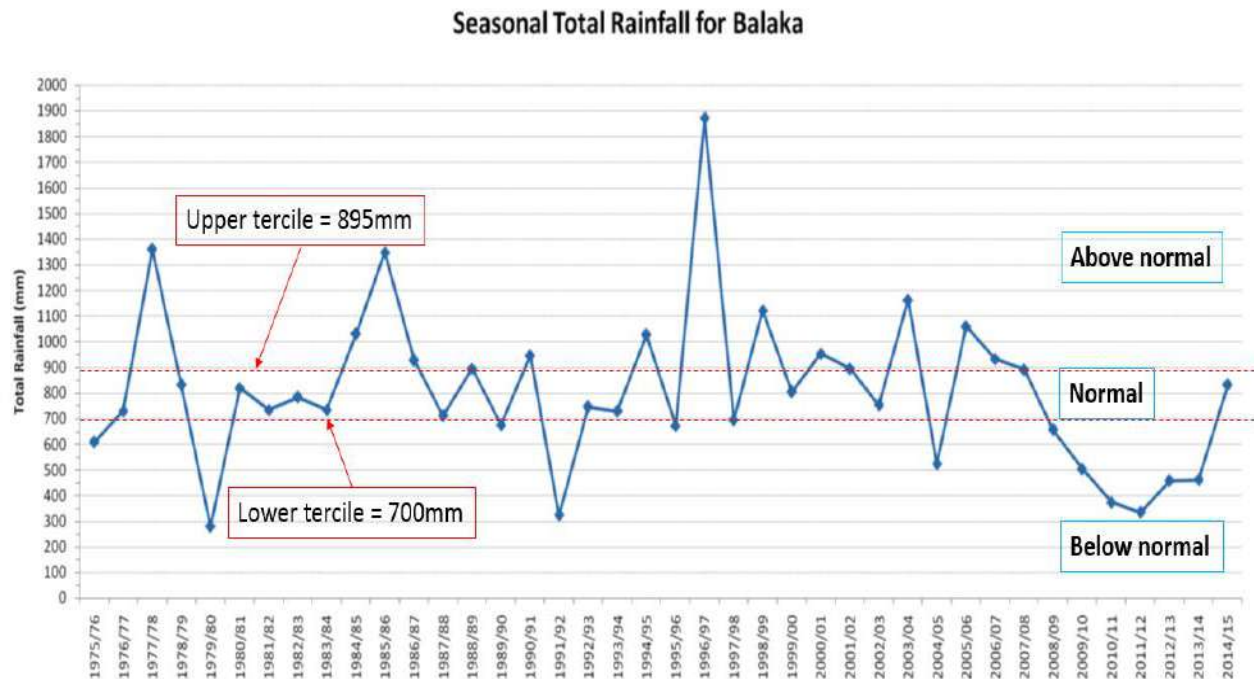
2. Next show them the graph with the terciles (same as the one above but for the Met. station for your area) and explain that this shows what is meant by the three categories, "above normal", "normal" and "below normal" season, for one station. These categories are sometimes called "terciles" because they divide the data into three equal groups (the group may have heard of "quartiles" before, which divides a data set into 4 groups). You can see in the graph that 1/3 of the years in the graph had a rainfall total of more than 895mm, which is "above normal" and 1/3 of the years had total rainfall of less than 700mm, which is below normal. The total rainfall of the remaining 1/3 of the years fall in between 700mm and 895mm, which is normal. To ensure that this is clearly understood you could ask the farmers to count the occurrences in each tercile.

3. Once the farmers understand what the seasonal forecast means you can use the following examples[9] to illustrate how the information might be used.

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[9] These calculations only work because we chose the limits as 700mm and 895mm, which were the terciles for our station. One future improvement that the Meteorological Offices are planning for the seasonal forecast is that it will permit you to adjust any risk. Until that is available, you can get an idea by assuming the risk changes just as it did for the terciles. Namely, if you knew that you needed 300mm of rain for sorghum and had worked out the risk before the seasonal forecast as 1 year in 6. Then if a risk of 1 year in 3 overall has changed to 1 year in 4 this year, then a risk of 1 year in 6 will now change to about 1 year in 8. And so on.

Example 1:

Suppose a farmer found that a crop needs 895mm of rainfall to succeed. That means it needs "above normal" rainfall at this site. The calculations you did earlier, with the historical rainfall data, show that maize would only have succeeded in 1/3 of the past years because its rainfall needs are 895mm which puts it in the upper tercile ("above normal"). Therefore, the crop risks failing in 2 years in 3. Without further information the farmer might decide this is very risky, and not plan to grow maize.

However, once he gets the seasonal forecast for the coming year he may want to re-evaluate his decision. The Seasonal Forecast says that there is an estimated 45% chance (almost 50/50) of getting an above normal year, so the risk for the crop is now less. If ever he really wanted to grow the crop, then this is a possible year. Of course it is still risky, after all, a 45% chance of success still means that there is a 55% chance that you won't get enough rain. But that is less risky than without the forecast.

Example 2

Suppose a different crop needs at least 700mm, meaning it is in the lower tercile (the line at the top of the first category) and needs "below normal" rainfall at this site. Looking at the historical data, the farmer doesn't get enough rain for this crop in 1 year of every 3, so she would have been OK in 2/3 of the past years.

With this seasonal forecast she sees that the chance of below normal rainfall is estimated at 25%, or 1 year in 4. So her risk with the crop is less than usual.

Perhaps this is therefore a good year to use more fertiliser, in order to boost the potential for an increased yield in a year where the probability of the crop being successful is high.

If you find these calculations difficult to discuss with farmers then it is often sufficient to give them an idea of the way their baseline risks have changed with the forecast.

If the forecast is in the direction of above normal, e.g. 45/30/25 then the risks of not enough rain will now be smaller.

On the other hand, if the forecast was 20/30/50 the risk of getting too little rain is now larger, so it is a good year to be cautious.

Step I – Identify and select possible responses to the forecast

By the end of this step, farmers should have reconsidered their crop, livestock and livelihood options chosen during step G and decided whether to continue with or amend their plans following the seasonal forecast provided and explained in step H.

Aims of this step:

1. To enable farmers to reconsider the plans that they have made within the context of the seasonal forecast and make suitable adjustments.

During this step you should facilitate farmers to:

- Discuss and consider the implications of the Seasonal Forecast and adjust any of their plans for the season if they wish to (see activity sheet I1).

Activity sheet I1 – Using the Seasonal Forecast and revisiting plans

Why revisit the crops, livestock and livelihood options and plans?

The plans developed by the farmers for the next season/year have so far been based on long-term climate and weather information. On the other hand, the Seasonal Forecast provides some indication of what is expected in the coming season, so farmers may want to use this additional information to adjust or revise their plans accordingly.

Materials

You should use the seasonal forecast from step H, and the plans farmers' made for their farms for the next season (step G).

Preparation

Ensure that each farmer brings the plans they made in step G:

- Resource Allocation Maps.
- Seasonal Calendars.
- Participatory Budgets.

Procedure

1. You should have just explained the Seasonal Forecast for the coming season to the farmers. Make sure that everyone understands:

   o how seasonal forecasts are produced,

   o the advantages and limitations of seasonal forecasts, and

   o what the forecast is for the coming season.

2. Ask the farmers to look at the plans that they have made for the coming season again (from step G). Remind them that their plans were created based on a good understanding of the climate and weather in their area and that this understanding comes from recordings from many past years. It is also worth reminding them that the probabilities they calculated based on historical climate information can be used in future seasons. It is important that farmers are aware that the decisions they have made so far have a strong foundation in historical climate data and that the Seasonal Forecast can add to the information base they have built, but should not necessarily outweigh it.

3. Farmers may or may not want to adjust some of these plans now that they have the seasonal forecast. Explain that whether they want to make adjustments, and the kinds of adjustments that they make, is likely to depend on two main factors:

- o ***What 'skill' the Seasonal Forecast has previously had in the country and that location.*** In other words, if you compare the forecasts for each previous year with what actually happened in each year, how accurate were they? Often this information is not available from Met services.

- o ***How 'clear' is the forecast for the season?*** For example, if the terciles are all equal for total seasonal rainfall (33.3: 33.3: 33.3) or similar to each other then they cannot clearly be predicting above normal, normal or below normal rainfall. It would not be sensible to adjust plans on the basis of this 'unclear' forecast. On the other hand, if the forecast showed terciles that are very different to each other e.g. 50: 30: 20, then the forecast is clearly indicating there is greater likelihood of above normal rainfall this season. This 'clearer' forecast is more useful to farmers.

4. Discuss these points with farmers to see what they think about the seasonal forecast and explore whether they think it is definitive and informative enough for them to consider changing their plans.

5. Ask the farmers to consider whether the forecast for the coming season has any implications for the crop/livestock/livelihood options that they chose and the plans that they made. For example, if the forecast is for below normal rainfall how has the probability/chance of them receiving enough rainfall for their chosen practice changed? You could refer back to the crop tables to help with this.

6. Ask the farmers to mark any changes that they wish to make to their plans on their Resource Allocation Maps and Seasonal Calendars (from step G) or make new ones if easier.

Step J – Short-term forecasts and warnings

By the end of this step, farmers should understand what short-term forecasts and warnings are, how they can be received and how they can be useful.

Aims of this step:

1. To enable farmers to understand the short-term forecasts and warnings that they receive.
2. To facilitate farmers to identify examples of the ways that they can use and respond to short-term forecasts and warnings.

During this step you should facilitate farmers to:

- Consider different types of short-term forecasts and warnings that they may receive and how they can be used (see activity sheet J1).

Activity sheet J1 – Short-term forecasts and warnings

What are short-term forecasts and warnings, and what can they be used for?

Short-term forecasts and warnings are produced by national and sometimes international meteorological organisations. These are normally for the next day or few days. Farmers can use these to make short-term decisions about their farming and livelihoods.

Materials

For this step you will need copies of appendix 5 as well as appendix 6 for your location. If you are working in a location where forecasts and warnings can be sent by text to farmers then you will also need appendix 7 to take the cell phone numbers and names of farmers who wish to sign up to receive this service.

Preparation

Make sure that you clearly understand and can explain exactly the meaning of each of the terms used in short-term forecasts and warnings.

Prepare a list of terms used in local forecasts and warnings for each farmer (see appendix 6).
Ensure that you have all of the necessary materials ready, including appendices 5, 6 and 7.

Procedure

1. Pass around the copies of appendix 5 which shows where forecasts come from and how they can be received by farmers.
2. Explain each of the pictures/diagrams in turn.
3. In different countries short-term forecasts will have different content and be presented in slightly different ways. Using the activity sheet with examples developed for your location (see appendix 8), explain to farmers:
   - How often (when) the different forecasts are produced.
   - What main aspects of the weather the forecasts cover.
   - The past 'skill' of the forecasts (if this information is available).
4. Go through the terms that are used in local forecasts and warnings for your area (see appendix 6), and agree with farmers what they each mean (including in their local language).
   Note: there is likely to be information for each of the different ways of disseminating forecasts (e.g. radio, mobile phones etc…).
5. Provide each farmer with the list of terms to take home.

Step K – Farmers identify potential responses to short-term forecasts and warnings

This step helps farmers identify how they might usefully employ short-term forecasts and warnings at the start of and during the season.

Aims of this step:

By considering different example forecasts in this exercise, farmers will be better prepared to deal with real forecasts and warnings when they receive them.

During this step you should facilitate farmers to:

- Practice responding to weather forecasts and warnings.

Activity sheet K1 – Use of short-term forecasts and warnings

Materials

For this step you will need the farmers to have their Resource Allocation Maps and Seasonal Calendars from Step I, the activity sheets giving the terms used in short-term forecasts and warnings, and the sheet giving example forecasts and warnings (appendix 8).

Procedure

1. Explain that the purpose of this exercise is to practise using short-term forecasts and warnings, and for farmers to identify how they might use actual forecasts during the season. We don't know what the forecasts will be but practising will help to improve preparedness by thinking about possible responses and learning from each other.
2. Pass around the copies of appendix 8 which gives example short-term forecasts and warnings.
3. Ask farmers to have their Resource Allocation Maps and Seasonal Calendars ready to look at.
4. Ask farmers to imagine that it is now near the start of the season (give a date e.g. about one week before the season normally starts).
5. Read out the first example forecast.
6. Ask the farmers to interpret the forecast (discuss and agree what it means). Then ask farmers to individually think about:
   o What effects, if any, the forecast could have on their farm? *Consider <u>each of the enterprises and main options they have</u>, and any activities they have planned for the start of the season*.
   o What actions, if any, they might take in response to the forecast?
7. Ask farmers to share and discuss examples that they have come up with.

   Note*: Again, remember that different farmers may decide to do very different things, depending on their circumstances, farm, aims etc. In many cases farmers may decide not to make changes or adjustments.*

8. Continue this exercise with the different examples of short-term forecasts and warnings on sheet K1a, by reading out each forecast/warning and then repeating steps 5 and 6.

Step L – Learn from experience and improve the process

At the end of the season it is important to review the PICSA process with farmers and to identify lessons for the future. This can be in a group meeting and involve discussing the following questions with farmers:

- In what ways (if any) did farmers find the training and use of PICSA useful?

- Which parts of the process were the most helpful and why?

- In what ways could the PICSA approach be improved e.g. if we use it next year?

It would be helpful to write up on a flip chart the main points that come from the discussion.

If possible at this meeting, provide updated historical graphs with the climate data from this last season included. Farmers can then see how the season compared with other years.

Appendices

A note on the appendices:

Appendices 1-8 need to be prepared in advance of the training workshop. They provide locally specific information in relation to climate, options available to farmers and regarding local communication. The following provide the titles and where relevant, blank forms that can be filled in. For further information visit www.walker-institute.ac.uk/research/PICSA

Appendix 1: Crop Information Table

The information in the crop information table needs to be location specific.

Crop	Variety	Days to maturity	Crop water requirement	Chance of sufficient rainfall if season starts on x (Early)	Chance of sufficient rainfall if season starts on x (Middle)	Chance of sufficient rainfall if season starts on x (Late)

Appendix 2: Crop Related Practices Matrix (practices identified as potentially suitable for this are by development organisations)

This information needs to be location specific and should be collated well in advance of training.

Appendix 3: Livestock Options Matrix (options identified as potentially suitable for this area by development organisations)

This information needs to be location specific and should be collated well in advance of training.

Appendix 4: Livelihood Options Matrix (options identified as potentially suitable for this area by development organisations)

This information needs to be location specific and should be collated well in advance of training.

Appendix 5 – Where do short-term forecasts come from and how are they communicated to farmers

They are prepared and released from the forecasting office of the national meteorology agency. The process, including the frequency and timing of short term forecasts will differ from country to country. This appendix needs to be prepared by or with the National Met Service.

Appendix 6 – A list of common terms used in short term forecasts and their explanation

The common terms used in a forecast will differ from country to country and should be translated into local language/s. This appendix needs to be prepared by or with the National Met Service.

Appendix 7 – List of cell phone numbers of farmers who wish to receive up-to-date weather forecasts

Farmer name	Location	Livestock or crop farmer?	Mobile phone number

Once you have collected the mobile numbers please send them to ……………………………..

Appendix 8 – Example short-term forecasts and warnings

The kinds of information and the terminology in the short term weather forecast will differ from country to country and should be translated into local language/s. This appendix needs to be prepared by or with the National Met Service.

About PICSA

This manual is a step-by-step guide to the Participatory Integrated Climate Services for Agriculture (PICSA) approach which has been developed to help smallholder farmers manage climate variability and risks.

The manual has been designed to support field staff in their work with farmers in the lead up to and during the agricultural season. Emphasis is placed on supporting farmers, with information and tools, to make decisions that best suit their individual contexts and objectives (options by context).

The PICSA approach couples local climate, crop, livestock and livelihood information with participatory planning tools that farmers can use to decide the best farming and livelihood options for them. PICSA makes extensive use of historical climate information provided by National Meteorological Services to facilitate farmers to explore risks and opportunities.

www.walker-institute.ac.uk/research/PICSA

About the Walker Institute

The Walker Institute was established by the University of Reading in 2006. It aims to use research to enable the development of climate –resilient societies, which are able to adapt to an uncertain, changing world. We address some of the fundamental questions facing development and encompass social, economic, technological and political strategies across all scales of society.

www.walker-institute.ac.uk

About the Statistical Services Centre

The Statistical Services Centre (SSC) was established in 1983 and is part of the School of Mathematical and Physical Sciences at the University of Reading. The SSC team combine academic excellence with extensive practical experience to provide high quality training and consultancy support in all facets of statistics and data management.

http://www.reading.ac.uk/ssc

About the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), led by the International Center for Tropical Agriculture (CIAT), brings together the world's best researchers in agricultural science, development research, climate science and Earth System science, to identify and address the most important interactions, synergies and trade-offs between climate change, agriculture and food security.

www.ccafs.cgiar.org