

lightly with soil (no more than 0.5 cm deep). You can do this by hand raking or by pulling tree branches or a broom back and forth over the sown area. Take care that soil is not dragged from plot to plot. Larger seeds can be sown 1–2 cm deep.

If you are not familiar with some or all of the sown species, sow the experiment in clearly marked rows or plant a few seeds on plots beforehand so you can recognise seedlings of the sown species. If the seed is spread all over the plot, it may cause difficulties later if you cannot recognise the sown species from weeds.

Vegetative planting material (stems or rooted cuttings) should be planted as soon as possible after they are collected. In the case of grass stems, plant two or three stems in one hole with one node above ground and one below ground.

### **Do you need to control weeds?**

If weeds are not a serious problem, then it is usually best to leave the sown species to compete with them. If you need to control weeds in a small experiment, then hand weeding is often the best method. If weeds are very bad in a few plots, you can weed these back to the same number of weeds as the rest of the experiment. A simple method of reducing weed problems is to let them germinate and then cultivate them out before sowing the experiment.

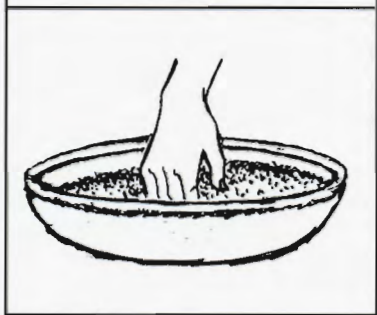
### **Do you need seedlings to transplant at a later time?**

If you anticipate establishment problems and transplanting is possible, set up a small nursery where extra seeds of the same species are sown at the same time as the main experiment. If the establishment problems do occur, you can transplant seedlings from the nursery without delaying your experiment.



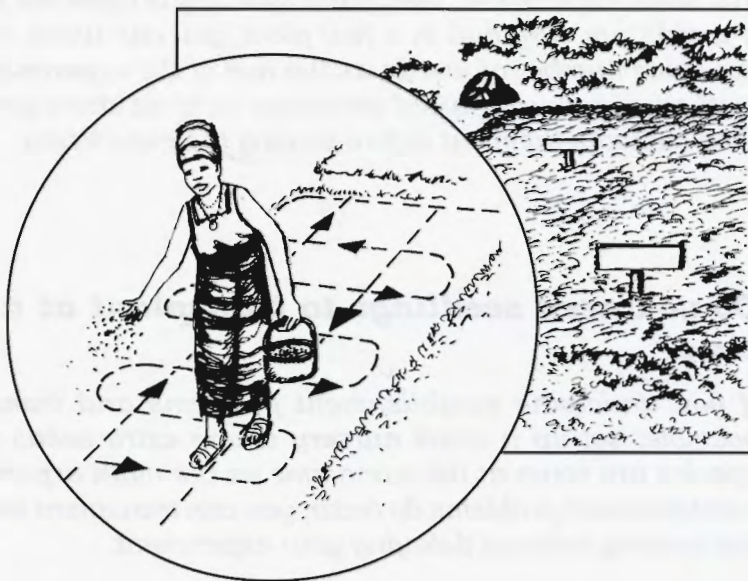
#### **Keep your methods consistent between plots.**

If the treatment involves spreading seed on the surface of the soil, make sure you do this to ALL the plots that receive that treatment. If the treatment involves sowing seed into furrows, do this on ALL the plots that receive that treatment. The best way to keep everything consistent is to have the same person apply the treatments to the entire experiment. If this is not possible, make sure each block or replication is completed by one person.



#### **Within each plot, apply treatments evenly.**

It is difficult to spread small amounts of seed evenly. You can spread them more evenly by mixing thoroughly with sand or sawdust. After you have mixed the seed with the sand, divide the mixture into two even piles. Spread the first pile by walking back and forth across the plot. Then spread the second pile by walking at right angles to the way you walked when spreading the first pile. If you are sowing seeds in rows, divide the seeds for the plot according to the number of rows in each plot.





**Apply treatments one block or replicate at a time.**

Sometimes it is not possible to apply the treatments for the whole experiment on a single day. Whether the treatments are applied in the morning or in the afternoon of one day or over several days could unevenly affect plant establishment. Soil moisture and temperature may change significantly when applying your treatments over more than one day (for example, if there is overnight rainfall). This does not matter provided each block or replicate is completed one at a time and that no block or replicate is left partially finished on any day. For example, if you are to sow an experiment comparing many varieties of maize, sow one whole block or replicate of the trial at a time, rather than sowing each species of maize in all the blocks or replicates.

If you do not have enough planting material of one species for the whole experiment, it is usually much better to complete sowing one block or replicate at a time and leave some blocks or replicates empty, than to reduce the sowing rate for that species in all blocks. Alternatively, if the species is easily propagated or spreads on its own, you could sow the central area of each plot, filling in the outer areas at a later time. If transplanting is possible, you can greatly increase the success of plant establishment by sowing the seed in a well-managed nursery and transplanting individual seedlings to the field plots.

**Minimise the effect of one treatment on another.**

If the plants in one treatment grow very fast, they can spread quickly. You may need to stop them from moving into other plots or shading other species by cutting them back, or by leaving an alley between plots.

If you have a fertiliser trial, be aware of the movement of fertiliser from one plot to another, especially on sloping land. One way to reduce this is to use large plots for the fertiliser treatments with the varieties or species planted in subplots within these large plots. This is called a **SPLIT PLOT DESIGN**. Another method is to have a wide space between the plots of different treatments planted with vegetative barriers.

*If you are applying an insecticide spray as a treatment to some plots and not others, be careful that spray does not drift onto the other plots. Avoid spraying and applying fertiliser on windy days.*



### **Record any mistakes immediately.**

*Everyone makes mistakes occasionally! If the wrong treatment is applied to a plot, note the change immediately and make sure everyone knows. Don't forget to note this on the experiment map as well.*

**DO NOT IGNORE ANY PROBLEMS THAT ARISE!** *If the experiment has been damaged by insects or flooding, don't think that the experiment is wasted and that no more data can be collected. You may still be able to obtain meaningful results from what might appear to be a ruined experiment. Discuss the problems with other people as they may be able to offer you suggestions on how best to deal with the situation.*



# 6

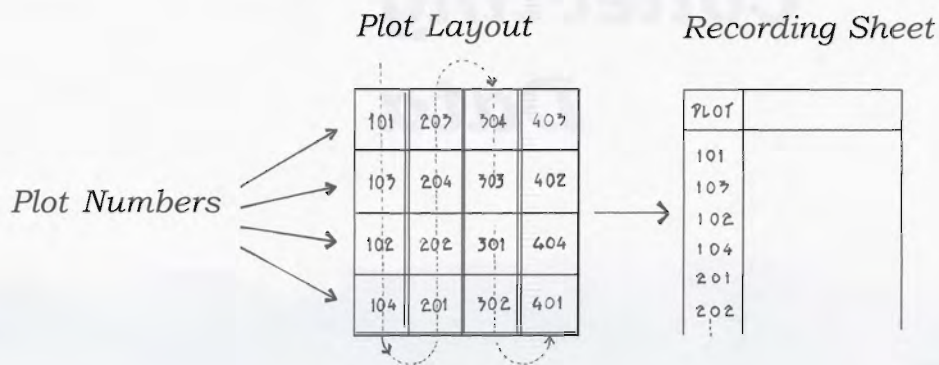
## Collecting Data



### **Recording sheets should be clear and self-explanatory.**

A good way to reduce error is to have recording sheets with a row for each plot and a column for each variable you will measure. Prepare these before going out into the field.

It is handy to have the plot numbers on the sheet arranged in a way that ensures mobility and consistency when gathering data in the field. This will reduce the chance of data being recorded in the wrong place.



Have a space at the top of each sheet for recording the date and the name of the person collecting the data.

The recording sheets should be clearly written and detailed enough that someone not involved in the experiment can understand what was measured and be able to read the data.

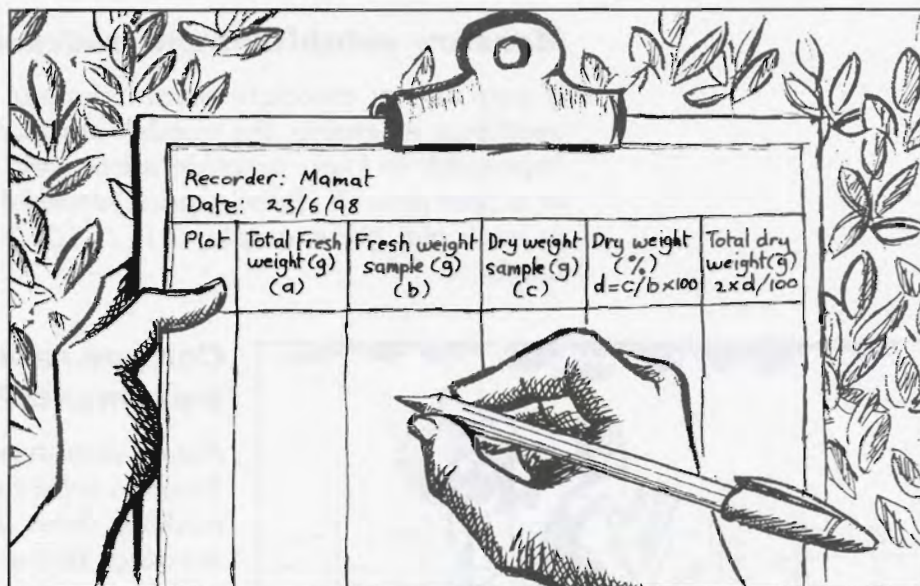
Even in the dry season, your data sheets can get wet. Use pencils or waterproof pens. When in the field, carry your papers in a plastic bag.



**Provide extra space on the recording sheets for notes, comments and calculations.**

Unforeseen things often happen in experiments, such as flooding or insect damage, that can affect the results of the experiment. Allow extra space on the recording sheets to make notes on what is happening. Additional notes on unexpected events and when they occur will help you to interpret the results later on.

Copying your data from one sheet to another can result in errors. You can reduce these errors by adding extra columns to your data sheets for calculations. For example, when harvesting large plots, you might record the total fresh weight and the fresh weight of a sub-sample in the field and then calculate the total dry weight from the dry weight of the sub-sample. The field data and the calculated results could be on the same recording sheet, as shown.



**Data should be collected from one block or replication at a time.**

Collecting data from one block or replication at a time will ensure that all the treatments in that block or replication have been measured under similar conditions. Where possible, finish one block or replication before starting on the next and complete the entire block or replication before having a break.

#### **Be consistent when collecting data.**

*One way to ensure consistency is to use the same person to conduct or supervise harvests and make measurements (especially if the measurements rely on the judgment of the recorder). In forage trials, for example, one common cause of inconsistency is when plants are cut to different heights by different people because they use different methods.*

#### **Measure establishment success.**

*If you do not measure establishment success (e.g. the number of seedlings emerging, the number surviving to mature plants), then it is impossible to know whether a low yield is due to a low plant density, or to poor growth. Even a quick estimate of seedlings per square metre in each plot (for example, 0.1, 1, 10, 20 or 30 seedlings/m<sup>2</sup>) is very useful.*



#### **Can you rate the performance of the treatments?**

*Not all data have to be physically measured. You can collect data by looking at plants and ranking them using criteria such as colour, seeding, flowering, disease resistance and yield.*

*This can be helpful not only as a regular measurement but also if something unexpected happens (such as flooding or insect damage).*

*You may think that the experiment is destroyed and no data can be collected from the damaged plants. However, you can still get information and make some meaningful conclusions from what may seem like a ruined experiment. For*

*example, if your forage species evaluation experiment has been grazed by wandering animals, you could take a measurement of which species the animals preferred.*



You might compare the plots using the following system:

- 0 = not grazed
- 1 = lightly grazed
- 2 = moderately grazed
- 3 = heavily grazed

If you are rating plots, it is often important to set standards for your rating system. For example, you may be rating the leafiness of new maize varieties on a scale of 1 (low leafiness) to 5 (very leafy). In this case it will be useful to harvest some examples of each rating to measure the percentage of leaf in the sample and therefore know how leafy scores of 1, 2, 3, 4 and 5 really are.

### **Collect relevant climatic data during the experiment.**

Measuring simple climatic variables at the experimental site (in particular, daily rainfall and temperature extremes) is often essential to help understand the results.

### **Visit the experiment site regularly.**

If you check the site regularly with other field workers and farmers, you will be more aware of changes that are occurring in the experiment. Recording particular events, such as the date of flowering, might help you better understand the results at the end of the experiment.

There is also a better chance of correcting any mishaps that might happen, such as chasing goats out of the experiment, repairing fences, replanting after poor establishment or replacing lost plot labels.

