

An enumerator working in farm surveys needs a basic understanding of the agricultural operations done by the farmers during the crop season. It is on these subjects that he will be asked to collect much of the information required by the surveys. This chapter will therefore review common farming practices and will explain what information enumerators will probably be asked to gather.

### 14.1 Land preparation

Before a crop is sown, the land is prepared. This is done for four reasons:

- To loosen the soil so that the roots can grow and so that rain can penetrate more easily;
- To turn organic matter (and sometimes manure or fertilizer) under into the soil;
- To control the growth of weeds;
- To shape the seedbed (into ridges, beds, or mounds).

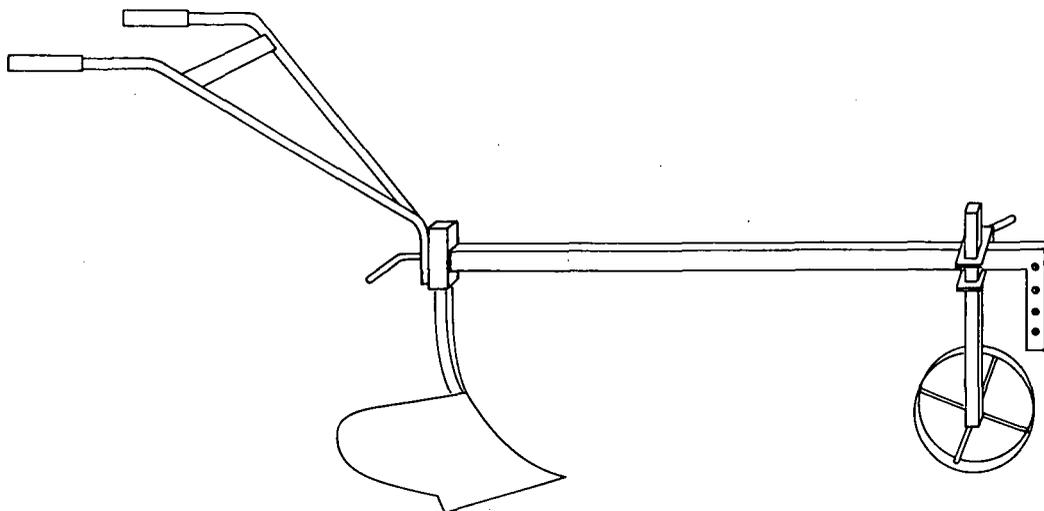
Land can be prepared in three ways:

- By hand (using a spade, hoe, rake, etc.);
- By animal-drawn implements (a plough, harrow, etc.);
- By heavier tractor-drawn implements.

Land preparation by hand loosens the top soil and gets rid of the weeds.

Implements drawn by animals and tractors can penetrate more deeply into the soil and can do a better job of preparing the land. They can really plough it.

Ploughing means turning over the top soil and burying all the weeds and organic matter. The depth of ploughing depends on the type of traction and the way the plough is adjusted. Ploughing should always be deep enough to loosen the soil where the roots will develop.

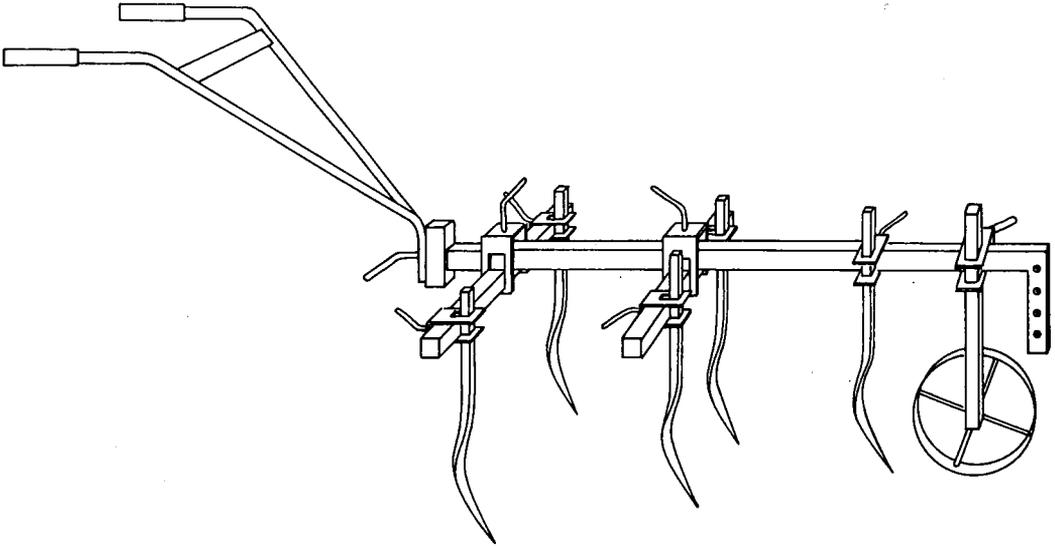


A plough for animal traction

Sometimes, when land is being prepared, the soil is not turned over but is simply scratched open and weeded. This is done with a cultivator - an instrument with heavy tines - or with simple hand tools.

After being ploughed, the land is usually harrowed. Harrowing means breaking up the clods of soil left after ploughing. A good seedbed requires small clods of soil.

The timing of ploughing is important. If there is a long period between ploughing and sowing, weeds will grow again and the land may have to be ploughed a second time just before sowing. The best time to plough is shortly after a rain, when the soil is moist but not too wet. Ploughing a field when it is too dry can cause small particles of the top soil to blow away. Such wind erosion can have serious consequences for farming.



A cultivator

On slopes, the direction of ploughing is important. Rain falling on slopes runs downhill and can wash away part of the top soil. Such water erosion is less likely to happen if ploughing is done across the slope, not down it.

On the topic of land preparation, enumerators will probably be asked to collect the following information:

- How was the land prepared?
- What tools were used in preparing the land?
- When was land preparation done?
- If the field is on a slope, do the furrows made by the plough run across the slope?
- How deep are the furrows?

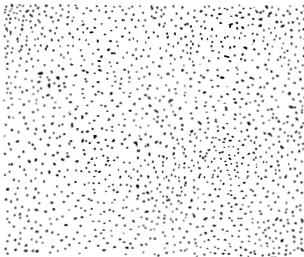
The Food and Agricultural Organization of the United Nations classifies ploughing by the depth of the furrows. It uses the following classes:

- Light ploughing : furrows less than 15 cm deep;
- Average ploughing: furrows 15 to 25 cm deep;
- Deep ploughing : furrows 25 cm or more deep.

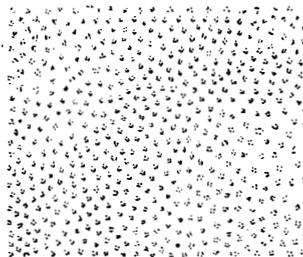
## 14.2 Sowing

A field can be sown in various ways:

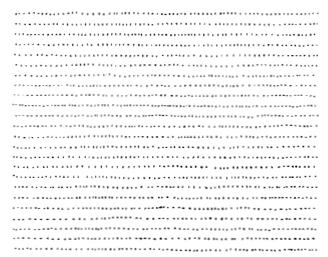
- Broadcasting: The farmer throws the seeds around him while walking up and down the field;
- Sowing in plant holes: The farmer makes a hole in the ground with a hoe, puts a few seeds in the hole, and closes it;
- Sowing in rows: The farmer sows in plant holes which are regularly spaced along a straight line. The line to be followed and the spacing of the holes can be marked on a sowing cord, or the lines can be scratched with a cultivator. Sowing in rows is necessary if weeding or ridging is to be done later by animal traction;
- Sowing with a seeder: A seeder is an implement drawn by an animal or a tractor. It sows seeds in rows. The result is the same as manual sowing in rows, but a seeder sows much faster.



Broadcasting



Sowing in plant holes



Sowing in rows

The crop production that can be expected from a field depends greatly on the variety of seed that is sown. Each seed variety has its own characteristic resistance to drought, diseases, and insects, and its own time to come to maturity.

The timing of sowing can have a great influence on crop production. Ideally, sowing should be timed so that the crop comes to maturity when the length of day and the rainfall pattern best suit the seed variety that has been sown. But sowing, of course, cannot be done until the rains have started.

If too many seeds are sown on a field, the plants will have to compete with one another for space, water, and soil nutrients, and the crop production will be low. On the other hand, if too few seeds are sown, the few resulting plants will leave more space for weeds to grow and this will also reduce production. The ideal plant density - the number of plants per hectare - is somewhere between these two extremes.

On the topic of sowing, enumerators will probably be asked to collect the following information:

- How was the sowing done?
- What tools were used?
- When was the sowing done?
- What seed variety was sown?
- What is the plant density?

### 14.3 Crop maintenance

Crop maintenance means all the activities undertaken by the farmer to control the environment of the plants and help them grow. Crop maintenance includes:

- **Thinning:** If too many plants are growing in a field, some of them are pulled out of the ground so that the remaining plants do not have to compete with one another;
- **Weeding:** The plants should not have to compete with weeds for the nutrients and water in the soil. Weeds should be pulled out or cut off as soon as they emerge. A crop seldom recovers fully if weeding is delayed;
- **Cultivating:** This means loosening the surface of the soil to allow water to penetrate to the roots, and to minimize the evaporation of water from the soil;
- **Ridging:** Piling a ridge of soil up against the base of the plant rows places more soil around the roots and makes it easier for excess water to drain away in the furrows. Tied-ridging involves making cross-ridges in the furrows, to trap the water.

All these activities can be done by hand, or with a hoe, or by equipment

drawn by animals or tractors. Some cultivators have a standard frame to which different sized tines can be fitted. If animals are used for crop maintenance, a yoke larger than that used for ploughing is needed so that the animals do not trample the plants. The methods and equipment used by the farmer will influence the quality of his work and should therefore be observed carefully.

The timing of the operations is also important. Often a farmer will combine his first weeding with thinning and cultivating. But if he waits too many days between planting and his first weeding, or between his first and second weeding, this will have a harmful effect on the crop performance.

On the topic of crop performance, enumerators are likely to be asked to gather the following information:

- What crop maintenance operations did the farmer do?
- What tools or equipment did he use?
- How many days were there between the various operations?
- Did the crop develop well?

The many observations that enumerators will be asked to make during crop maintenance will be helpful later on to explain differences in yields obtained by neighbouring farmers.

#### 14.4 Application of fertilizer

Fertilizer stimulates plant growth by adding nutrients to the soil or by replacing nutrients taken away by the previous crop. Fertilizer can be either manure or chemicals. Manure has the added advantage of improving the structure of the soil because of its organic nature. The quantity of manure available to the farmer depends on the size of his herd and whether the farmer collects the manure. If the cattle are kept together, it is easy for the farmer to collect the manure and put it on his fields. Often, however, the cattle roam around freely and the manure is lost.

Other organic matter can be used to bring nutrients to the soil. This may be either in the form of compost (mixture of organic residues which have been left to decompose) or green fertilizer (a crop grown to be ploughed into the soil).

If chemical fertilizers are used they will supply nutrients but will not improve the soil structure (which can still be improved by ploughing the weeds into the soil). There are 'straight' fertilizers, with only one nutrient (e.g. nitrogen or phosphate), and 'compound' fertilizers which contain more than one nutrient (e.g. ammonium phosphate contains both nitrogen and phosphate). A 'complete' fertilizer contains nitrogen (N), phosphate (P), and potassium (K). The quantity of each nutrient contained in a complete fertilizer is marked on the sack as a percentage of the weight, in the order N-P-K. A sack containing 100 kg of fertilizer and labelled 18-24-18 contains 18 kg of nitrogen, 24 kg of phosphate, and 18 kg of potassium. The remaining 40 kg include traces of other chemical components (which also help plant growth), filler substances, and impurities. Usually, agronomists will recommend a minimum fertilizer application, depending on the crop that is grown and on local soil conditions.

It is not always true that a higher dose of fertilizer automatically results in a higher yield. If lack of soil nutrients is the most limiting factor for the growth of the plant, a higher fertilizer input will result in a higher yield. At a certain level of fertilizer input, however, other aspects can become the most limiting factors (e.g. crop maintenance) and a higher dosage of fertilizer will then not lead to a higher yield. To decide what quantity of which type of fertilizer it is best to apply, one should think not only of the plant requirements and the soil properties, but also whether the cost of the fertilizer will be offset by the expected increase in production.

The method of applying fertilizer influences its effectiveness. Fertilizer can be broadcast on the soil and then ploughed into it, so that the nutrients are available to the seeds as they start growing. Or it can be applied around the plant or between rows during weeding.

Also of importance is the timing of the fertilizer application. In a plant's early stage of development, it grows quickly and needs many nutrients. Fertilizer has to be applied at that stage. If fertilizer is applied earlier, before the plant is well started, there is a chance that the fertilizer will be used more by the weeds around the plant than by the plant itself. If it is applied later, when the plant no longer needs so many nutrients, the fertilizer will have little effect and its cost will not be compensated for by a bigger harvest.

On the topic of fertilizer application, enumerators will be asked to obtain the following information:

- What type of fertilizer was used and what was its concentration?
- What quantity was applied?
- How was it applied?
- When was it applied?

## 14.5 Crop protection

Crops can be damaged in many ways, but many measures can be taken to protect them. The seeds can be given a chemical treatment which keeps them in good condition until the growing process starts. Later, the plants can be sprayed to protect them from insects, either as a preventive measure or after the first signs of insect infestation. Later still, the harvested grain can be treated before it is stored in the granary so that it keeps longer.

Many types of insecticide are available to protect crops, each of them having a specific action. Sometimes an insecticide will kill only one type of insect and will not hurt another type. The project's agronomist will determine which insecticide is needed in the local situation. If he does not come to the fields regularly during the growing season, the enumerator may be asked to observe the crops for signs of insect damage. If he sees any, he will probably be asked to send a few damaged plants to the agronomist, who will then identify the insect and prescribe the right insecticide.

Although correct insect control does not increase the yield, poor insect control can greatly reduce the yield. Enumerators will probably be asked to follow the insecticide spraying closely. The things they should observe are:

- The type and quantity of insecticides used (on the seeds, on the crop, and on the harvest);
- The dates of application (a crop often needs more than one treatment).

Other crop damage which enumerators will be asked to observe is that caused by:

- Diseases;
- The weather (long period of drought);
- The topography (low part of the field flooded);
- Cattle, birds, wild animals;
- Fire.

The enumerator should carefully observe any such damage and take notes of what caused it. Later, if a certain farmer's production is below expectation, the enumerator's notes will help explain why.

## 14.6 Cropping pattern

A farmer's cropping pattern is the way he distributes his different crops over his fields in one growing season. The crops can be grown in 'pure stand' (one crop growing on the field) or in 'mixed cropping' (two or more crops growing on the field at the same time).

Mixed cropping may mean growing alternate rows of each crop (intercropping), mixing crops within a row, or broadcasting (mixing the crops purely at random). Sometimes, the second crop is planted only after the first one is well established.

Mixed cropping has the advantage of lowering the risk to the farmer in case one of the crops fails. Once in while, the rainfall in the growing season may be such that a certain crop fails completely; but there is a

very small chance that two crops with different rain requirements will fail at the same time.

Another advantage is that insect populations will be smaller in mixed cropping than in pure stand because the quantity of plants of one type together will be less, which makes them less attractive to the insects.



### Intercropping

When the growing season is long enough, two crops can sometimes be grown one after the other on the same field in the same year.

On the topic of the cropping pattern, enumerators will be asked to obtain information on:

- What crops are grown by the farmer?
- Which crops are grown in pure stand?
- Which crops are grown in mixed cropping?
- What type of mixed cropping does the farmer practise?

## 14.7 Crop rotation

Crop rotation is the succession of different crops grown on the same field over the years. A good crop rotation helps preserve or restore soil fertility, because different crops use different nutrients and leave different residues. A rotation may include food and cash crops, grass and fodder crops (crops which are used to feed livestock), or simply leaving the land fallow for a few years (allowing the natural vegetation to grow back). If legume crops (peas and beans) are included in a rotation, they will take nitrogen from the air and fix it in the soil, thus helping to replace the nitrogen removed by a previous cereal crop.

On the topic of crop rotation, enumerators will be asked to obtain information about each field. The questions are likely to be:

- What crop or crops are being grown on the field?
- What crop or crops were grown in the previous season?  
(Sometimes, enumerators are asked to gather crop rotation data about even earlier seasons.)
- Are the crop residues burned, grazed, or ploughed under?

## Chapter 14 : Questions

Questions: (All questions pertaining to your area.)

- I. Describe the techniques the farmers use to prepare their land.
- II. For each of the main crops grown in your area, describe the sowing method used by the farmers.
- III. Crop maintenance activities were discussed in 14.3. For each of these activities, state whether it is done by the farmers in your area.