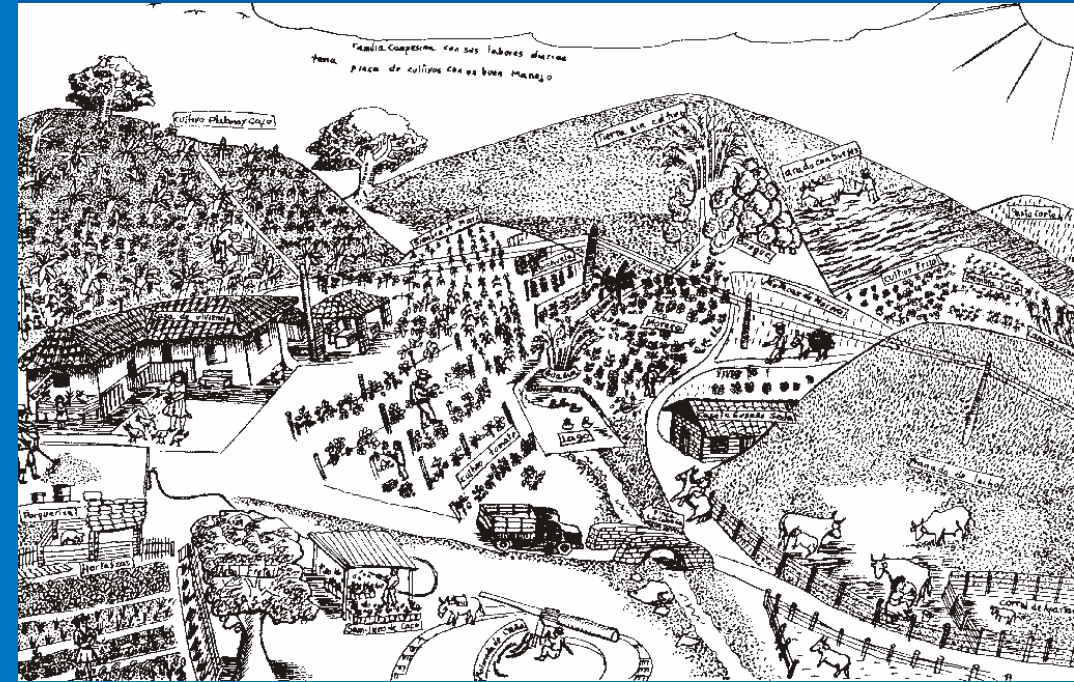


# Handling Unexpected Problems

# 07



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The International Center for Tropical Agriculture (CIAT) is dedicated to the alleviation of hunger and poverty in tropical developing countries, through the application of science to increase agricultural production while conserving natural resources. CIAT is one of 18 international centers of the Consultative Group for International Agricultural Research (CGIAR). The CGIAR is a group of 40 countries and international agencies that support agricultural research for development in the tropical countries of the world.

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**Handbooks for CIAL**

# **Handling Unexpected Problems**

**HANDBOOK No. 07**



## Presentation

This handbook is the result of participatory research carried out by several institutions and rural communities. The handbooks were designed by farmers. The examples are based on real cases and form part of the experience of the Local Agricultural Research Committees (CIALs) that participated in the project from the beginning. The following CIALs collaborated in the preparation of this handbook: Cinco Días, El Diviso, Pescador, San Bosco, Sotará and Portachuelo in the state of Cauca, Colombia.

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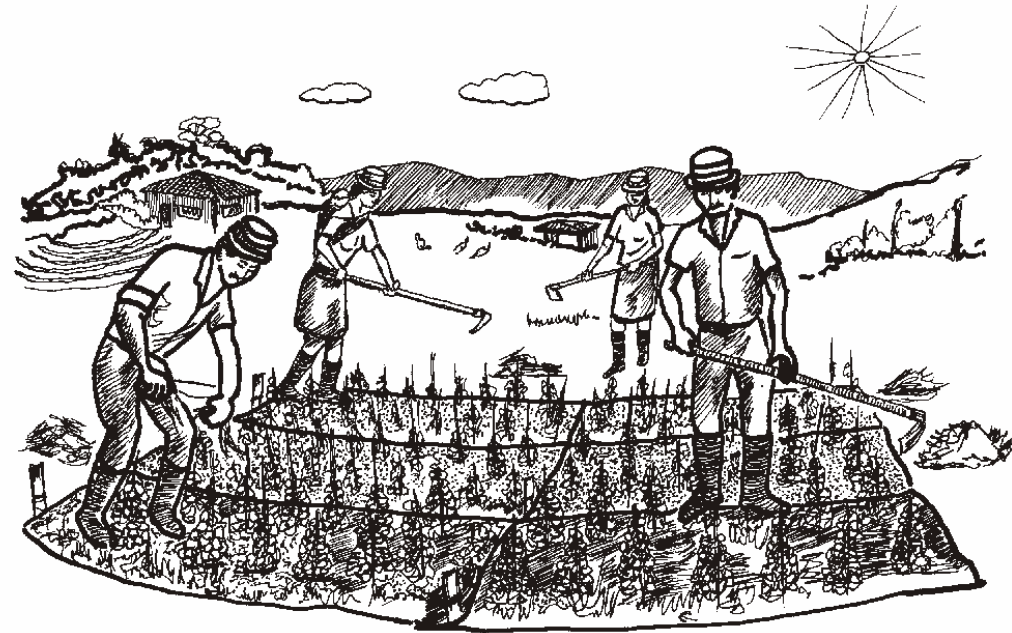
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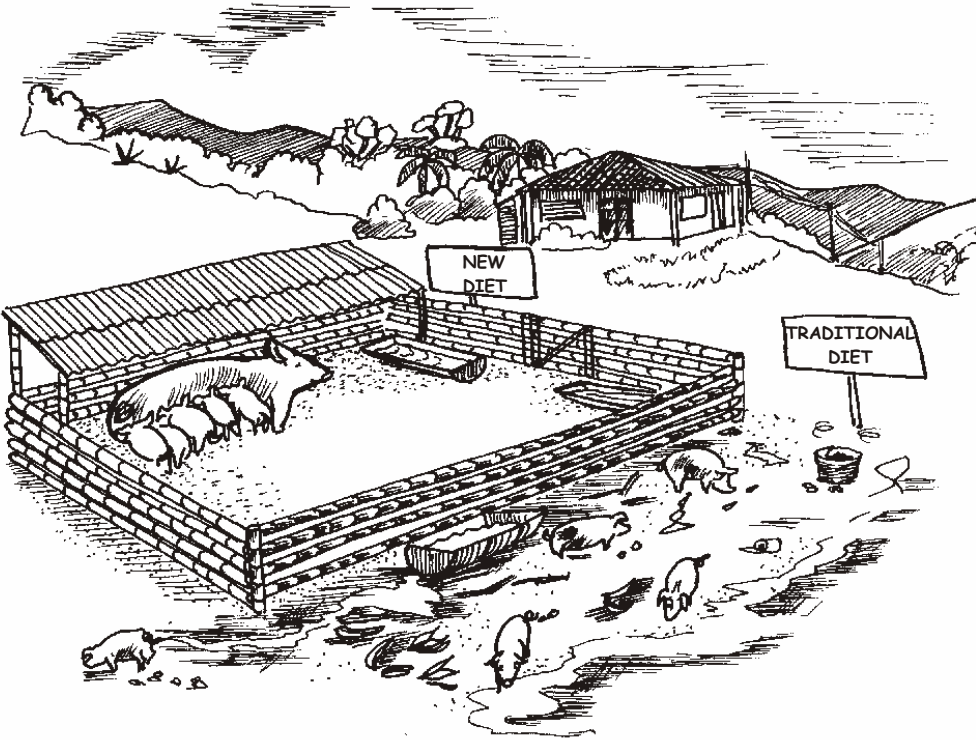
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In an **experiment** we compare one or more new things, called **treatments**, with something we already know, called the **control**.

**We put the treatments and control under the same conditions and manage them in the same way.**



If we don't use the same conditions and management for the treatment and the controls, we may reach the wrong conclusions from our experiment



When we experiment, problems or difficulties are bound to occur.

It's not always easy to place the control and the treatments under the same conditions or to manage them in the same way.



Let's look at some common problems and ways to solve them so that we can be sure of drawing reliable conclusions from our experiments.

One Committee did an experiment comparing 4 new bean varieties, with the local variety as the control.

**They wanted to know which varieties were most resistant to the bean diseases in their area.**

What if pests or diseases invade the experiment?



They planted the experiment in three farms. The diseases appeared and some plants were more affected than others.

The owner of the field where the experiment was planted was worried. He consulted the Committee. Almost all the plants of one of the varieties were heavily infected with blight.

To avoid losing the plot, he wanted to spray the sick variety.



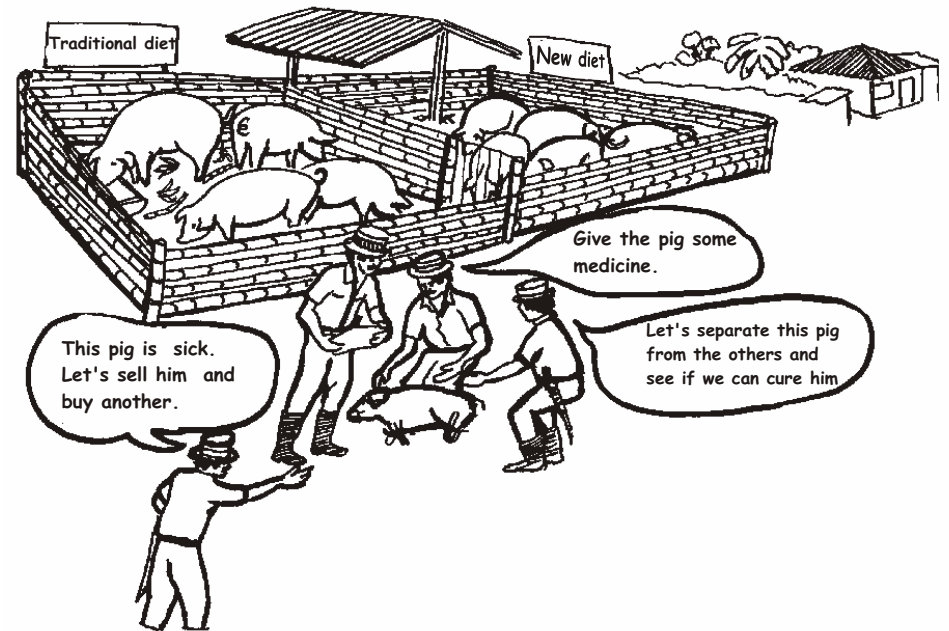
The committee discussed whether to spray or not. In their village pesticides were rarely used. They reviewed their objective. They realised that if they sprayed the most affected varieties, they wouldn't know if these could resist the diseases or not. They convinced the owner of the field that none of the plots should be sprayed.



When they evaluated the experiment they could easily see which varieties were most resistant and they felt confident about their results.

One Committee compared two diets for fattening pigs. The **control** was the traditional diet, which they fed to 5 pigs. The **treatment** was a new diet. They raised 5 pigs on the new diet.

What if pests or diseases attack only part of the experiment?



One of the pigs fattened on the traditional diet became ill. The Committee went to the pig pen to see what they could do.



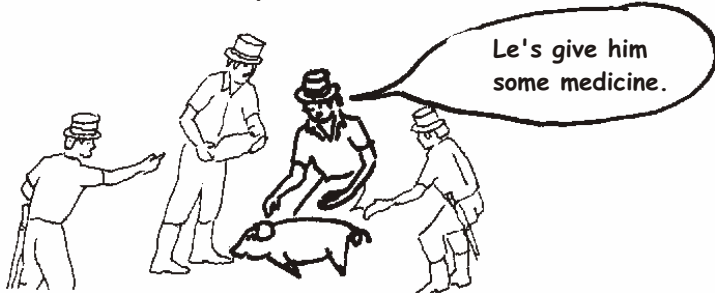
The Leader proposed to isolate the sick animal and to continue fattening the healthy ones.



The Secretary suggested medicine for the pig.

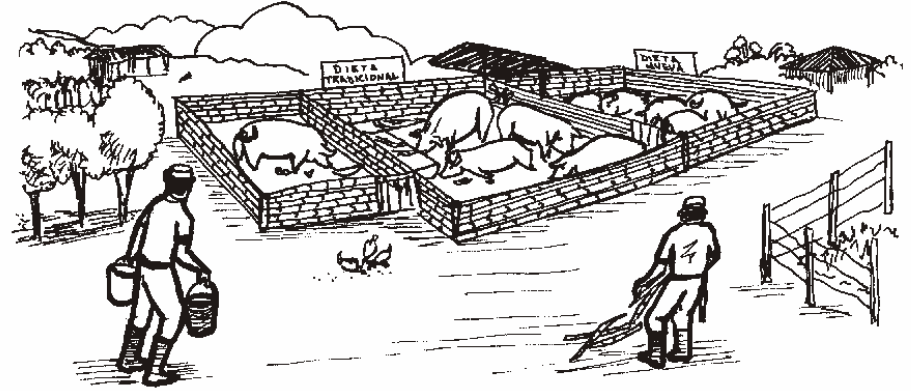


The Treasurer wanted to sell the pig and buy another one for the experiment.



The Communicator wanted to isolate the pig to see if he would recover.

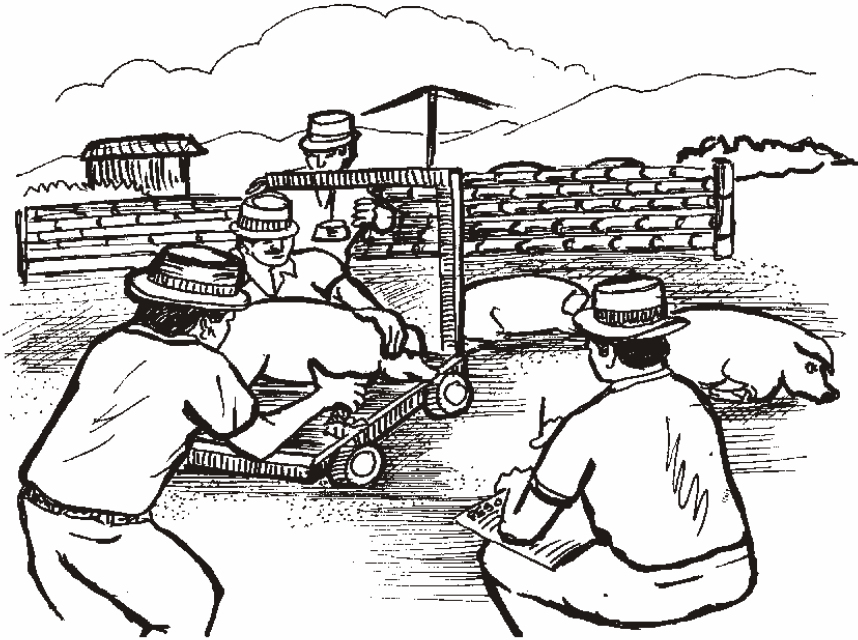
The Committee liked the Communicator's suggestion. They isolated the pig and were able to cure him.



They carried on feeding all the other pigs as planned.

When the time came to weigh the animals, they excluded the weight of the sick pig from their calculations.

To calculate the average weight of the pigs fed on the traditional diet, they added up the weights of the healthy animals and divided it by 4.



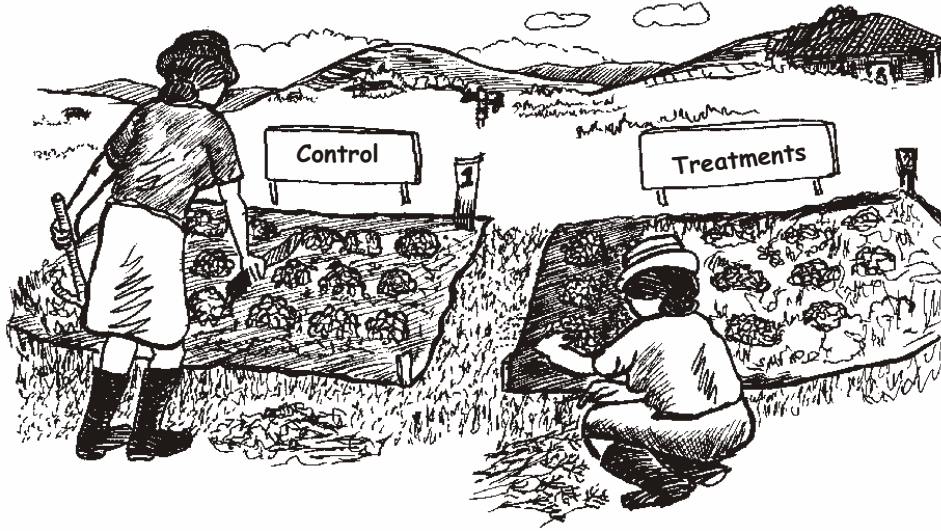
**What if animals eat or damage part of an experiment?**

They added up the weights of the 5 pigs on the new diet and divided by 5 to get their average weight. Then they compared the results for the two diets.

A Committee experimented with ways to control wormwood, a weed that had invaded their potato fields.

In **the control** plots they cut back the weeds.

In **the treatment** plots they pulled up the wormwood by its roots.



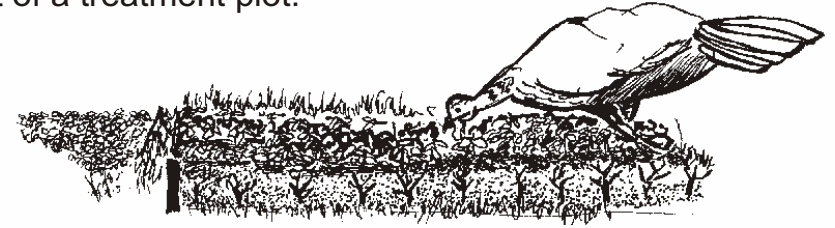
The experiment had 2 plots.

In the control plot the Committee cut back the weeds.

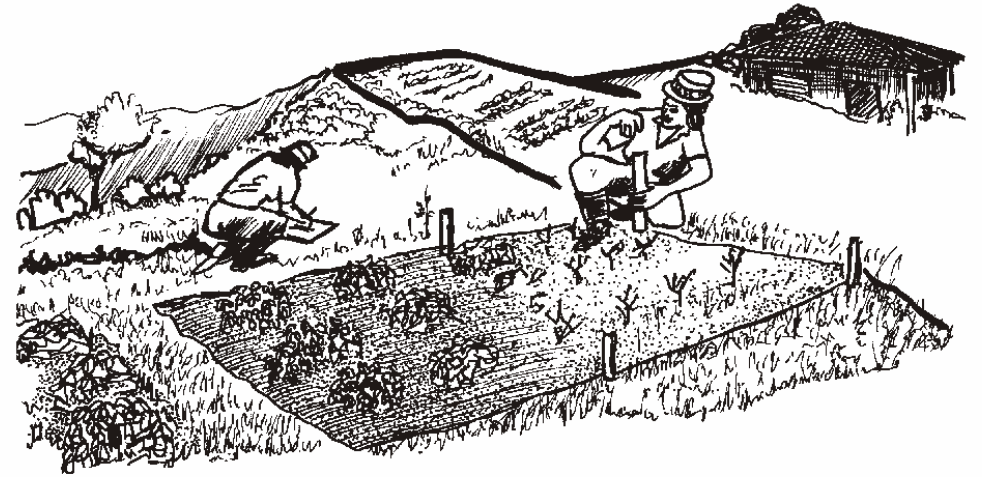
In the treatment plot they pulled up the weeds by their roots.

The research Committee checked their experiment a month after planting.

They discovered that turkeys had eaten part of a treatment plot.



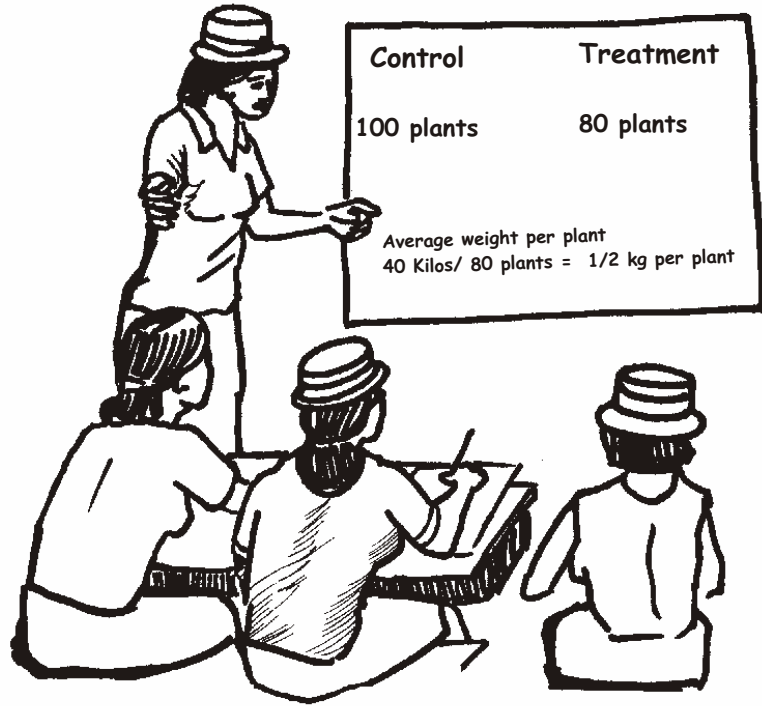
The owner of the field replanted the area that the birds had damaged.



The Committee marked the replanted part of the plot.

They decided **not to include** the replanted potatoes when they weighed the harvest.

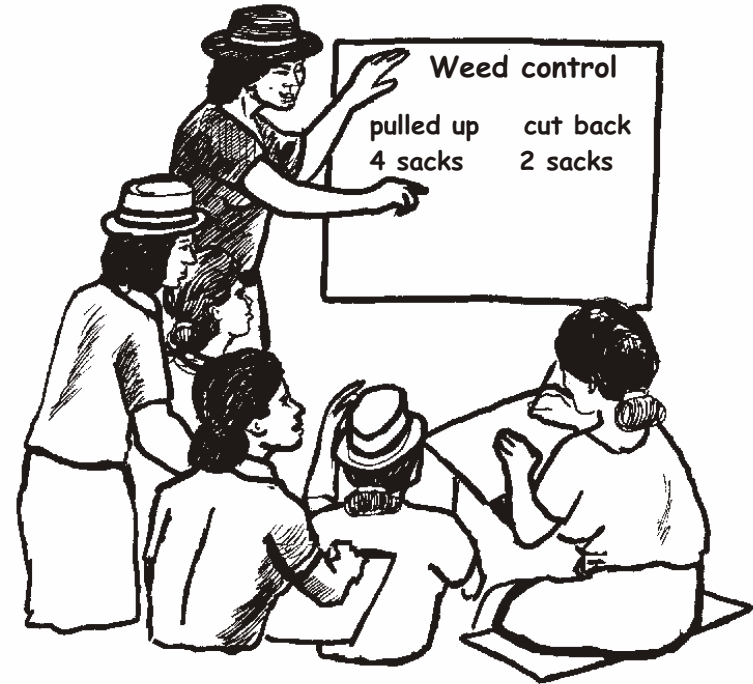
At the harvest they counted 100 plants in the control plot and 80 in the treatment plot, where the turkeys had been.



The Committee based their evaluation of the harvest on the average weight per plant. In the plot damaged by the turkeys, they considered only the plants that had not been replanted.

The members of the Committee felt confident about their results.

They were sure that pulling up the wormwood by its roots gave better results than cutting the weeds back.



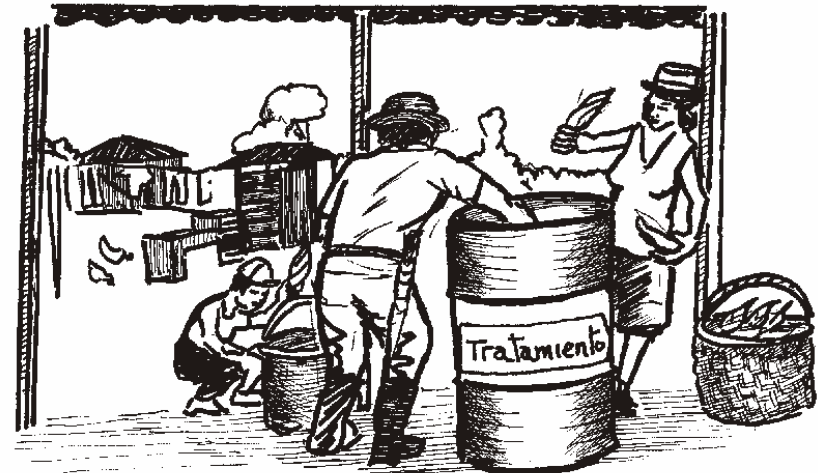
They explained to other farmers in their village that pulling up the wormwood weeds gave higher potato yields.

One Committee compared two ways of storing maize. In **the control** they stacked the maize in the house, according to local tradition.



What if we don't provide the same conditions for all the treatments in our experiment?

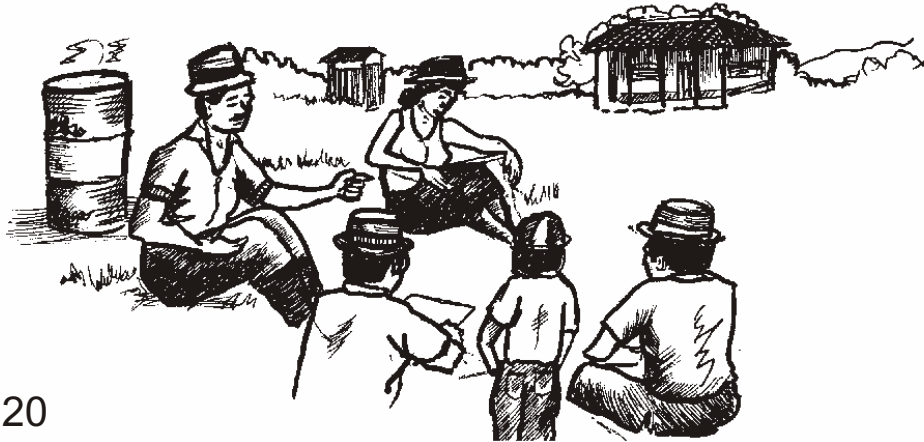
In **the treatment** they used a 50 gallon drum as a silo. They did the experiment on three farms



On one of the three farms, the maize in the 50 gallon drum began to look and smell bad. The maize stored this way on the other two farms looked fine.



The drum containing the spoiled maize was rusty. The committee wasn't sure whether they should include the results from the rusty drum when they evaluated the experiment.



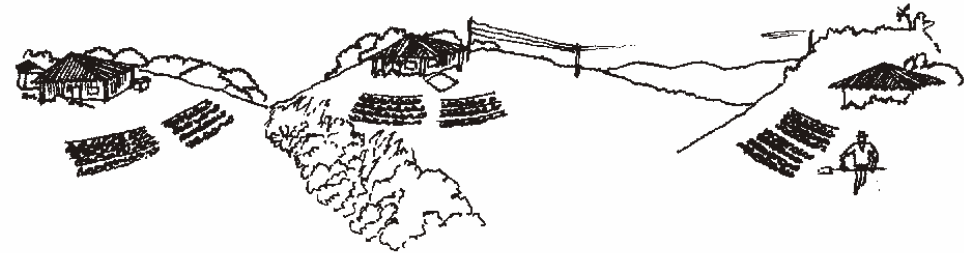
They decided that the results from the rusty drum were important. They realized that they should paint the inside of the drums with anticorrosive paint before storing maize in them.



**They also learned to avoid using the drums as storage silos in humid conditions.**

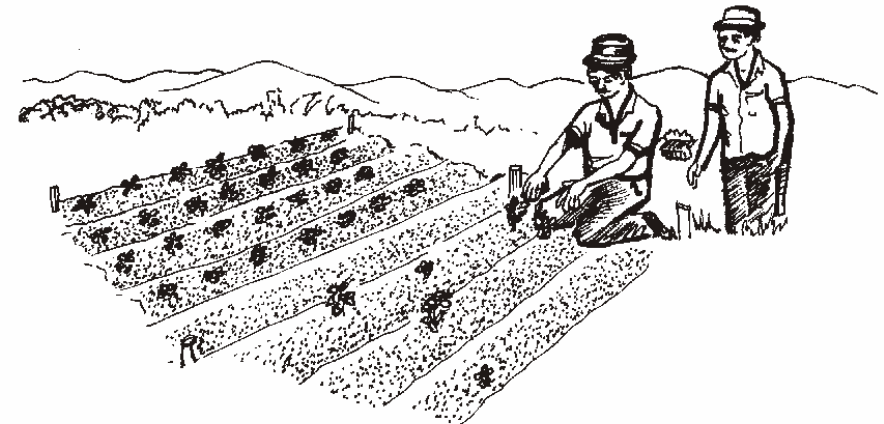
**The Committee also saw that it is possible to learn from an experiment even if you made a mistake in setting it up.**

In another village the Committee tested two new varieties of soybean, comparing them with a control variety that they had been growing for some time. They planted three replications of the experiment on different farms.

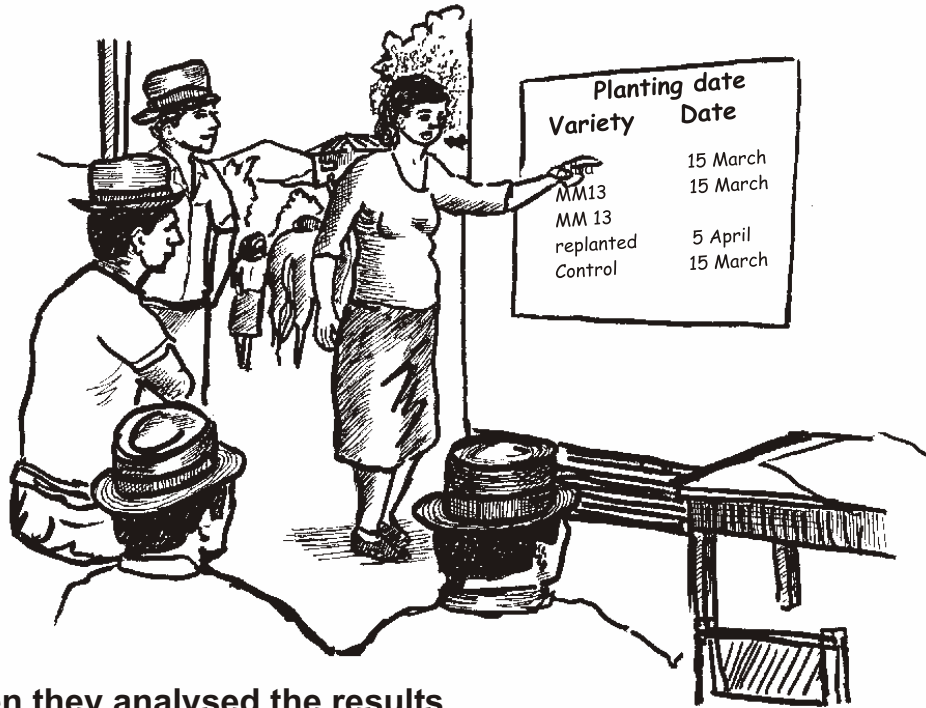


**What if we can't manage  
the treatments and the control in the same way?**

In some of the treatment plots, only a few plants germinated. The Committee noticed that the poor germination occurred in the same treatment on all three farms.



The Committee searched for an explanation.  
The seed that had germinated poorly was old.  
They decided to replant the affected  
plots with good quality seed.



**What if we manage one of the treatments differently from the others?**

**When they analysed the results of the experiment the Committee excluded the replanted variety. They compared only the results of the varieties that had germinated well.**



A Committee tested a new variety of maize as a support for climbing beans. They planted the climbing bean with the traditional variety of maize in the **control plots**



They planted the climbing bean with the new variety of maize with in the treatment plots.

They planted the experiment in three different farms.



Some time later they noticed that the ears had already begun to develop, but only on the traditional variety. The tassels of the new variety were full of a beetle that eats maize pollen.



Although pesticide use was rare in their area, one farmer suggested spraying the new variety. The Committee met to decide what to do.



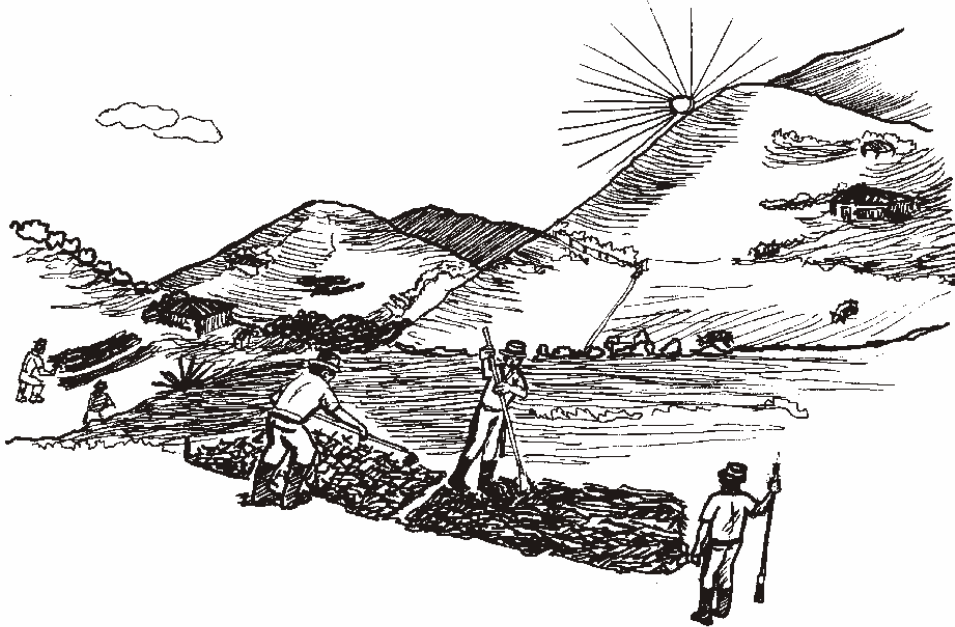
They decided against spraying because it would mean treating the control and the treatments differently. They realized that the experiment was telling them that the new variety was not appropriate for their conditions because it flowered when the pollen beetles were active during December and January.



**What if we make a mistake in choosing a location for the experiment?**

They decided to look for a variety of maize that bloomed before the appearance of the pollen beetle in December.

One Committee tested different pasture grasses. In the control plots they planted the traditional Yaragua grass. In the treatment plots they planted a new variety of Brachiaria.



They wanted to find out which grass withstood the summer drought better. They repeated the experiment on 3 different farms.

On one of the farms a plot of Yaragua became flooded with water.

The owner of the farm told the committee that the experiment had failed.

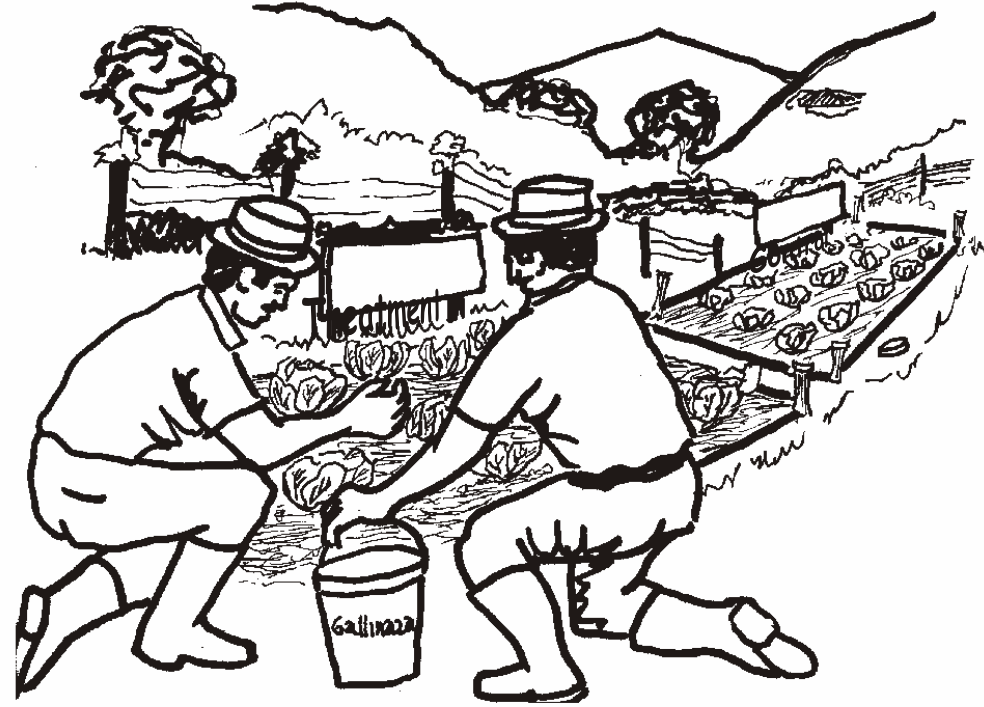
When the Committee checked the field they saw that less than half of the Yaragua plot was flooded.



They decided to divide all the plots in half so that they could compare equal areas of the pasture grasses.

A Committee did an experiment with chicken manure. In the control plots they fertilised cauliflower with the traditional amount of manure. In the treatment plots they fertilised with a larger quantity.

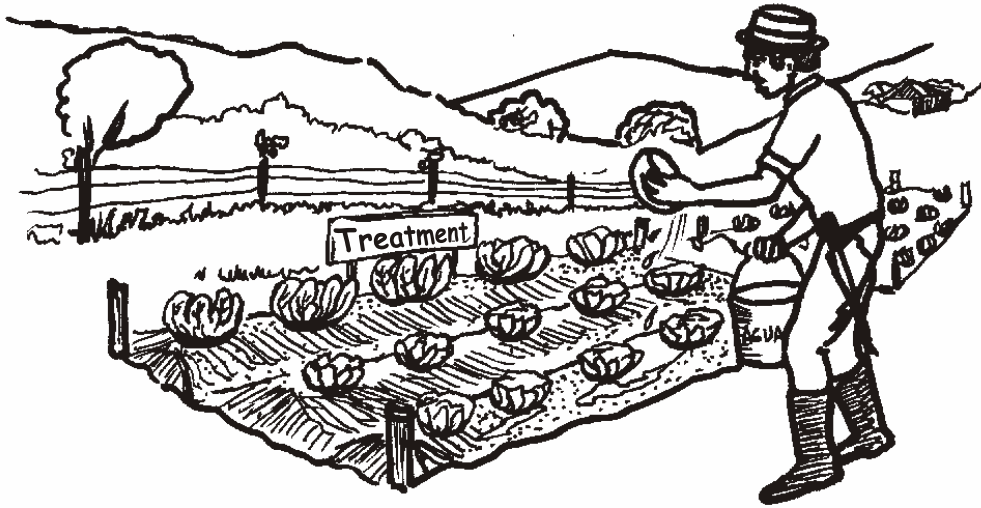
**What if we are careless and treat one part of the experiment differently from the rest?**



Each plot was 10 meters long with 10 rows of cauliflower.

They planted the experiment on three farms. When they harvested on the first farm they noticed that one of the treatment rows had much larger cauliflower plants than the others.

The owner of the farm remembered that he had been in a hurry to finish planting the experiment, and had accidentally put more chicken manure on one of the rows.



He had put the correct amount of fertilizer on the other rows.

The Committee decided not to include the row containing the larger plants when they evaluated the experiment



To be sure of getting a reliable result, they evaluated 9 of the 10 rows in all the plots.

A Committee compared 4 treatments or new varieties of pumpkin with a control variety that was popular in the region. They repeated the experiment in 5 fields on 5 different farms.

On the day of the harvest, a heavy rainstorm hit one of the farms.

What if we accidentally lose some of our results?



The Secretary's notebook was soaked and the ink ran.

One farmer complained that the accident had spoiled the experiment because without the record book there was no way of knowing which variety produced the most.

The Committee met with the owners of the 5 fields to discuss what to do. People felt that there was no reason to discard the experiment. They had planted 5 replications so that they could still draw conclusions even if part of the experiment was lost. Since they had managed all the fields in the same way, they could base their conclusions on the remaining 4 fields.



They had lost the information from one field, but the other four replications remained. There really was no problem at all!

**What if we are afraid of losing an experiment?**

One Committee did an experiment on fertilization of cassava.

In the control plots they didn't fertilize the cassava.



They fertilized with chicken manure in the treatment plots. They planted the experiment on three different farms.

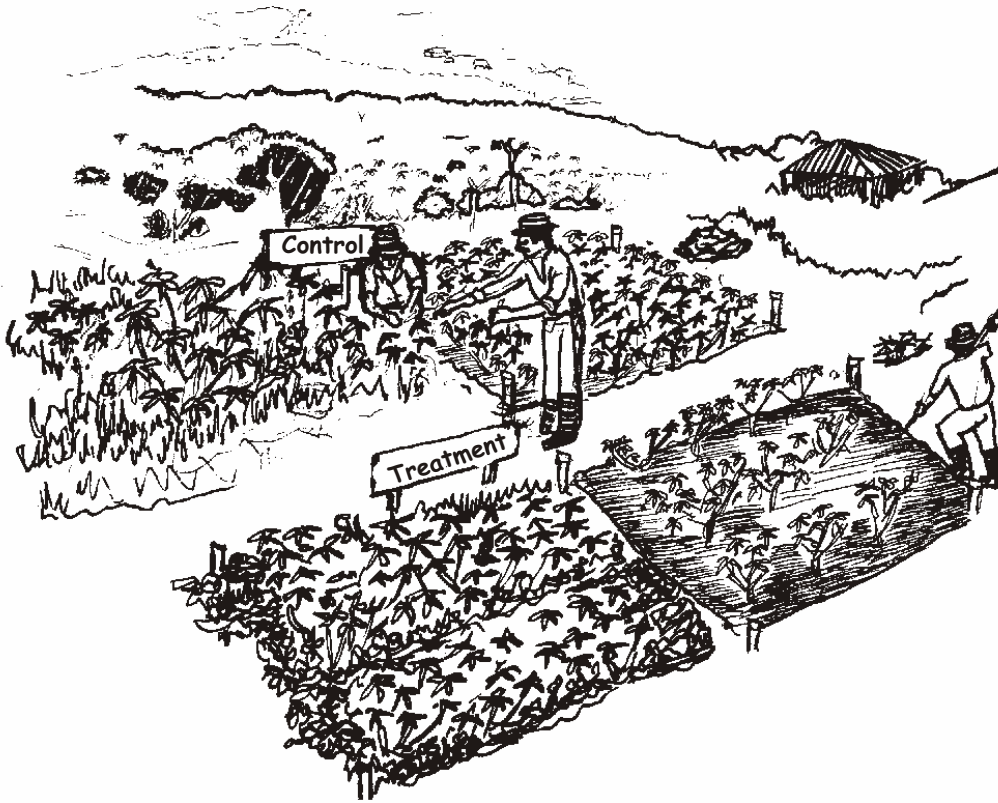
All the fertilized plots filled with weeds. The owners of the farms thought that the cassava would form no roots because of the weeds. They wanted to weed the plots so that they wouldn't lose the harvest.



The Committee met to analyze the situation. They knew they had to treat all the plots in the same way. If they weeded the treatment plots several times, then they would have to do the same in the controls.

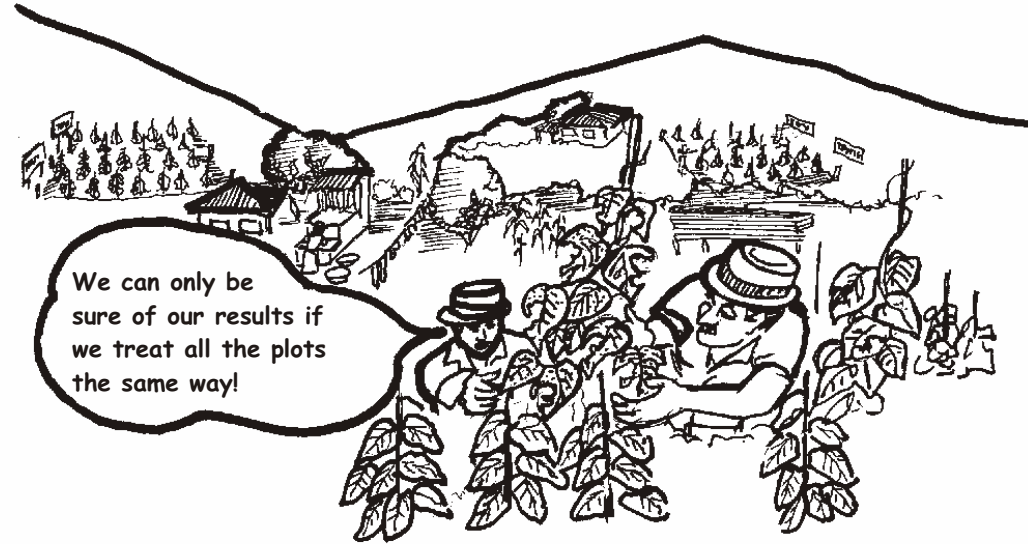


The Committee and the owners of the fields decided to divide each control and treatment plot in two and to weed one half.



This way they would be able to compare yields from plots that had been managed in the same way.

When we manage the treatment and control plots in the same way, we can be more confident of our results.



The problems that arise during our experiments are actually excellent opportunities for us to learn new things.