Doing Participatory Research with Smallholder Farmers: The Identification and Process of an On-Farm Weed Management Trial

Marlise Joubert and Tim Hart
ARC Infruitec-Nietvoorbij
PO Box X5026
Stellenbosch, South Africa
7599

Abstract
In September 1999, researchers from the ARC Infruitec-Nietvoorbij established a Honeybush demonstration plot in Friemersheim with the local smallholder farmers. For various reasons, including conflict and weed management complications, this particular demonstration plot failed. During 2000, the researchers used Participatory Rural Appraisal (PRA) techniques to carry out a participatory appraisal with some of the farmers in Friemersheim. In some of the exercises, the farmers identified weeds as a big problem. At that stage, the researchers did not realise that the occurrence of weeds was such a big problem. At the time there was pressure to establish a second demonstration plot and the significance of the weeds was overlooked. In the months following the establishment of the second demonstration plot on a new site, the researchers and farmers observed that weeds and weed control were serious problems. Initially, the research team tried to solve the problem by explaining to the farmers what they had to do and they presented a training course on weed management. Upon reflection at the end of 2000, it seemed that this approach to technology transfer was ineffective. Continual interaction with the farmers made the researchers realise that the weed problems were affecting all the crops that the farmers were growing and not only the Honeybush plants. The researchers realised that more effort needed to put into understanding the problems with weeds in the community. A meeting was held with a couple of interested farmers and the decision was taken to carry out an on farm trial with two of the farmers. Various approaches to weed management were tried which included a control and various local practices as well as current scientific knowledge applications. Vegetables, the predominant crops favoured by local farmers, were used in the trials, which will continue for a period of three years.
Introduction

In September 1999 researchers from the Agricultural Research Council (ARC) Infruitec-Nietvoorbij and Provincial Department of Agriculture - Western Cape introduced the idea of cultivating Honeybush for commercial purposes to the Friemersheim community. The older community residents used to harvest honeybush in the wild and processed it so that they could use it as a tea/infusion. After discussions with interested farmers, the ARC Infruitec-Nietvoorbij established a Honeybush demonstration plot during 1999. The plants grew well, however the agreed upon weeding activities were not carried out. The demonstration plot failed as a result and most of the plants died within a few months.

In May 2001, a handful of local farmers again approached the ARC Infruitec-Nietvoorbij and requested support in again trying to produce Honeybush. In July 2000 the research team started a Participatory Appraisal using PRA tools with the interested farmers and community members. The farmers showed a renewed interest in Honeybush production. During the appraisal the farmers indicated that weed control was one of the main problems that inhibited the growth of any crop on cultivated land.

The optimal planting period of Honeybush is from May to the middle of August to enable the good growth of the plants before the end of the rainy season. Friemersheim is part of the winter rainfall area, although the area gets occasional rain throughout the year. Honeybush is established on dry-land conditions. It may be necessary to water the plants during the first summer, but after that, the root system should be well developed, enabling further growth without any further irrigation. In August 2000, before the appraisal and reports were completed, the researchers established a second demonstration plot in the community to ensure that the winter rainfall pattern could be used and avoid installing an expensive irrigation system. This time, a larger area was planted on a portion of land of between 0.6 and 1 hectare. The Honeybush project group agreed to do the management of the planting and the maintenance of the plot. Before the planting had been completed, most of the members of the group had withdrawn because they wanted money for the work they had done. Initially it was agreed that the members of the group would work together to do the planting and the maintenance and would share the income from the first harvest. The withdrawal of most of the members left only one person, the owner of the plot who was employed full-time at the local municipality, to do all the work. Alternatively he would have to hire labour. The maintenance of this plot and the subsequent weed control practices where minimal with the result that the weeds once again took over the land and smothered the plants. The main weed at that stage was nutgrass/nutsedge.

At the time of the withdrawal of most of the members of the group, one of the farmers obtained some of the seedlings (approximately 1000) and planted these on his portion of land in extent of 0.1 hectare. These plants grew extremely well and he carried out some weed control in the form of hoeing.

Characteristics of main weed problem

It is difficult to determine the broad spectrum of dormant weeds on fallow land. Once the soil is disturbed during soil preparation, the weeds are stimulated to grow. This is the best time to get rid of the weeds. However, due to the rush to plant the Honeybush the significance of the weed problem was not realised so no weed control was carried out following the soil preparation.
After planting the Honeybush seedlings the weeds, mostly nutgrass, started to grow very quickly. It also became clear that there was the potential for a wide variety of weeds in the soil, which had previously not been noted by the researchers. In the case of Honeybush, it is not necessary to cultivate the soil again after planting. Following further discussions with farmers, it became clear that in different areas in the community, the weed problem was often different with other weeds being prominent. The research team started to pay increasing attention to the weeds in the area and what the farmers were saying about them.

The nutgrass grows from spring to autumn and at the beginning of winter it will die off. Nutgrass multiply by means of bulbs and one plant can produce several bulbs. Once the soil is disturbed, the different bulbs start to grow. Every bulb is a plant that can produce several more bulbs. With the use of herbicides the plants will die off, but another lot of the bulbs will start to grow. In the soil at Friemersheim, the seed bank of the weeds was very high. Ideally the bulk of the seed bank should be removed before the planting of any crop. However, one will have weeds all the time. It will take one to two seasons of extensive weed control to lower the numbers of the weed. It is possible that once the nutgrass are reduced in number another weed can become dominant.

**Decision to do a weed trial**

At the end of 2000 the ARC Infruitec-Nietvoorbij researchers held a demonstration on weed management for Honeybush. Only the farmer who had been involved in the second demonstration plot attended this session. After a discussion with this person at a follow-up meeting, it was realised that he understood what had been explained and demonstrated, but did not implement the control procedures. While the theory seemed to be understood, the practical application was not carried out. The reason for this was the lack of personal time and extra resources such as labour.

The researchers then held a meeting with interested farmers in March 2001 to discuss local weed control practices. During this discussion it became evident that the traditional weed control method of hoeing in fact helped to increase the problem and not to resolve it. The farmers indicated that they did not believe in using herbicides because these did not seem to work in their conditions. After further probing which was confirmed by one of the farmers after the meeting it became evident that the farmers make use of herbicides, but that the incorrect concentration and often the incorrect herbicide was used, making the application of herbicides ineffective. This seemed to be partially due to the high cost associated with herbicides and the incorrect information that was often provided to them by herbicide suppliers.

During the discussion the researchers explained the difference between contact and systemic herbicides. The farmers did not realize that there were different types of herbicide that functioned in different ways. The farmers pointed out that their lack of good results with the use of herbicides was probably due to the fact that they were using inappropriate herbicides based on their lack of knowledge. This resulted in all applications being ineffective. It was pointed out to them that it is essential to control the weeds before new seeds are formed. This would prevent the increase of seeds in the seed bank.

Farmers again pointed out that weeds were a particularly severe problem because they reduced crop yield and subsequent income and livelihood returns. Researchers were informed that the nutgrass could reduce crop yields from between 50% and 100%. Wild radish was indicated as a further problem but the farmers indicated that this was easier to control.
Design of the trial

During the discussion and based on the information obtained from local farmers preceding the meeting it became evident that a weed trial, focusing on the appropriateness and effectiveness of different weed control practices, was needed. To do this the trial was formulated in such a way that the local practices of the farmers and the experiences of the researchers were included for comparative purposes. It was further assumed that the practices of the researchers might be more effective in comparison to those of the farmers but might not be appropriate given the farmers’ social environment and economic circumstances. The different weed control practices included in the trial were the following:

♦ Control - do not do anything in the plot
♦ Hoeing by hand
♦ Hoeing by plough
♦ Mulching - this was unknown to the farmers
♦ Herbicide - systemic, if available for the crops
♦ Herbicide - contact killer, if available for the crops

The farmers' perception of the effectiveness of each treatment, input costs, labour and yield of each treatment is indicated in Table 1.

Table 1: Farmers’ perception of the significance of the various variables in each of the experimental conditions

<table>
<thead>
<tr>
<th>Method of weed control</th>
<th>Input cost</th>
<th>Effectiveness</th>
<th>Labour required</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>None</td>
<td>Low</td>
<td>Low</td>
<td>Poor</td>
</tr>
<tr>
<td>Hoeing</td>
<td>Low</td>
<td>Mean</td>
<td>A lot</td>
<td>Mean to above mean</td>
</tr>
<tr>
<td>Hoeing by plough</td>
<td>Low</td>
<td>Mean</td>
<td>Less than hoeing</td>
<td>Above mean</td>
</tr>
<tr>
<td>Mulching</td>
<td>More than hoeing</td>
<td>Above mean</td>
<td>More than hoeing</td>
<td>Good</td>
</tr>
<tr>
<td>Herbicide - systemic</td>
<td>High</td>
<td>Mean</td>
<td>Low</td>
<td>Above mean</td>
</tr>
<tr>
<td>Herbicide – contact killer</td>
<td>High</td>
<td>High</td>
<td>Less than hoeing</td>
<td>Good</td>
</tr>
</tbody>
</table>

For the farmers the aim of the trial was the control of the weeds. There was also the need to improve yields while simultaneously reducing the inputs (labour and herbicides) required for cultivation. In essence, there needed to be a balance between yield and inputs that would result in more money in the bank.

The farmers identified the different steps to establish and manage a crop. From this the trial was planned using locally preferred vegetables as the crop of choice. A schedule depicting the different steps/tasks was compiled. For each task the responsible person (farmers or researcher) was identified.

A table for record keeping and monitoring purposes was compiled by one of the researchers and included the following:

♦ Date
Description of the process of carrying out the weed trial

After the meeting in March 2002, the records of this meeting were discussed with the interested farmers to ensure that they were still satisfied with the planned activities. When these were finalised each of the participants was given a copy of the plan, indicating the schedule and tasks. Farmers agreed to record their activities and to complete the monitoring/record forms every time that they went to the trial or carried out some activity that was related to it. At each visit the progress was discussed and the necessary changes were made.

The researchers planned to be with the farmers during the first stages of the trial, but the weather prevented this as it delayed the soil preparation and crop planting activities. For more than a month visits to the area were planned every weekend so that the farmers and the researchers could carry out the activities together but the heavy rains continued. Eventually the researchers visited the farmers to recap on the proposed process, hoping that the rain would stop long enough so that the soil would dry out and soil preparation could begin. However, on the day of the meeting it started to rain again and the researchers and farmers were again only able to discuss the trial.

The trial was finally started in May 2001, six weeks after the preferred starting date. Cabbage was the crop selected by the farmers and the schedule of activities is as follows:

May 2001 The farmers and the researchers prepared the soil for the trial and the cabbage seedlings were planted.
June 2001 There was no difference between the different treatments at this stage and no weeds were evident.
July 2001 The leaves of the cabbage plants were burned as a result of the high chlorine content in the water. No weeds were evident in any of the plots.
August 2001 The farmers continued to use the water and by this time most of the cabbages had died. Some weeds were showing but the farmers were a bit despondent because the cabbages were dying. It was suggested that they continue with the trial because some results will be obtainable.
September 2001 All the cabbage plants had died. Despite this, the farmers were able to see a difference between the various treatments. The mulching treatment seemed to indicate the best result for there were very few weeds on it in comparison to the other treatments.
The experience of implementing the trial

One of the big problems in implementation of the trial was the weather. The heavy rainfall in the area delayed the preparatory activities and the trial started six weeks later than planned. This initially prevented the researchers and farmers from being able to carry out the desired activities together at the scheduled times.

The idea of participatory research and experimentation was new to the participating farmers. They were not used to participating in trials and did not see the need to do all the different tasks that were planned. In many cases several telephone calls were made to the farmer representative to discuss the task, but the activities were not implemented or were not implemented according to plan. While this probably did not make too much difference to the trials involving the local weed control practices, it affected the results of the researchers’ treatments and these could not be used effectively for comparative purposes.

The farmers involved are employed locally on a full-time basis and return home late in the evenings. Based on this and the fact that some of them lived far from their farms it was agreed that those participating in the trial would carry it out at their homes. After the seedlings were planted, it was very dry and they had to be watered by hand using the municipal water that was available at the farmers’ homes. However, this water contained a lot of chlorine and burned the leaves of the young plants, killing most of the plants. The farmers and researchers decided to go on with the different control practices irrespective of the presence of the vegetables. At the end of this phase the mulched plot exhibited far fewer weeds than any of the other trials. However, yield patterns were not available because the plants had died as a result of the chlorine in the water. The researcher organised with the farmers that she would harvest the weeds for stricter comparison. However, when she got to the sites they had decided to clean up and ploughed the whole area. There was no further data for comparison purposes beyond the observations made by the farmers and the researchers.

It would have been easier if the researchers had been based closer to the farmers so that they could have made visits to the area at least every two weeks. This would have been beneficial during the periods when it rained heavily in the beginning. The researchers were based over 400 km away from the farmers necessitating a lot of planning in order to make a visit to the community. Extension officers and researchers who are based closer should not experience this problem. The distance factor is going to affect most activities because often the visits to the community are not always mutually appropriate to both the farmers and the researchers but are undertaken at times when the researchers can visit a number of communities in the area.

A second trial will need to be carried out in order to determine which of the practices is the most appropriate for the farmers given their circumstances. This could not be determined during this trial because of the numerous problems experienced and the lack of any yield.

The experience of working together should increase the cooperation between the farmers and the researchers during a second trial because both will be more familiar with the circumstances of the other.

Lessons learnt

"Seeing is believing." Despite the result that the plants died from the chlorine in the water and the original aims of the trial could not be determined, the farmers were able to see that the mulching treatment was effective in controlling the incidence of the weeds. While
the observations satisfied the farmers with regard to the effectiveness of one method over another, the appropriateness of the trial to the agricultural practices of the farmers could not be determined. Observations are satisfactory for determining the results at one level and the farmers like this because they can see what is taking place.

When researchers are involved in joint research with farmers, they need to be present far more often than they were during this process. This is particularly the case in instances where the researchers are including their technology in trials to compare them with local practices.

During this trial, it was noticed that the farmers do not practise crop rotation. This seems to be based on the fact that the preferred crops are potatoes because a market exists and they currently fetch a good price. However, it is not rotated with any other crop. Seasonal crop rotation helps to reduce the build-up of weeds and interferes with the development of the weed seed banks processes. It also considers the different needs that different crops have for root depth, lime and other nutrients. According to Riote (1975) and Jeavons (1991) crop rotation of host plants weakens the soil-borne pests. There is a need to investigate why crop rotation is not practised and to look at alternatives.

According to the farmers, they do not control for weeds during soil preparation. It is more important to do weed control at this stage than after the crops are planted. If one controls weeds at soil preparation, weed control after planting will be more effective, less costly and require less labour. This will be included in a second trial.

A second trial will have to include a number of treatments such as including two mulching treatments using different thickness in the mulch layers. The trials should also begin much earlier in the growing season.

**Conclusion**

The researchers should put more time into the projects that they do with farmers. This avoids confusion and increases motivation. However more time and thus more presence does not mean more control of the research. Control of the process by the farmers allows the researchers to learn firsthand about the farmers’ agricultural practices. This allows them to provide assistance in terms of these practices and to conduct research that will improve/optimise these practices as suited to the farmers. For any agricultural research and extension work to be successful, it is necessary to get the trust of the farmers. Once the farmers trust you, they will find it easier to discuss their needs and indicate the assistance they require to improve their farming.

Participating in a trial such as the one described here provides farmers with a framework whereby they can solve other problems or carry out similar trials in the same way on their own. Invariably information gleaned from such farmer-initiated research will be directly relevant to farmers’ local practices.

The researchers’ awareness of the weed problem arose from the involvement of the farmers and the ARC researchers in the cultivation of Honeybush and the problems experienced with that project. However, it was soon realised that it is important to address the issues that are most pressing to the farmers before starting with other farming aspects. In this case, once the farmers know how to control the weeds effectively researchers and extension officers can put more effort into other cultivation aspects. If the weeds cannot be controlled or are not considered is there any point in trying to improve on other areas of
agricultural production. Introducing a new crop, such as Honeybush, can become more difficult when it does not consider issues that are important to the farmers.

A second trial will again be planned in conjunction with the researchers and the farmers. By necessity this trial will include the original treatments and also different types of mulching. This is due to the fact that the first trial was incomplete in that the effectiveness and appropriateness of a particular method could not be determine from the data collected. There is a further need to consider agro-ecologically appropriate weed control practices that fit in with the farmers’ agricultural practices and circumstances.

The process described here which looks at the general needs and most pressing problems of the farmers while giving them control over the process can be replicated in other communities. However, it is important to note that the specific results of the trials or research that is carried out will probably differ from area to area as the success of a particular treatment in a trial is dependant on the extent of the problem and the area in which it is being carried out.

References