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DIAGNOSIS

WEED CONTROL

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## 1. ROTATIONS

The status of the field during the previous cropping season often influences the types of weeds that are present. If one particular crop is grown continuously, for instance, it may be that there is a build-up of certain types of weeds. If, on the other hand, there is a rotation of crops, then weed control methods in one season may be beneficial for the following season's crop. An example of this is the rotation of a row crop with a broadcast crop, where interrow cultivation in the former helps control weeds that are difficult to control in the latter.

The type of fallow system also affects the weed population. If crops are alternated with a fallow this may control certain types of weeds. If planting is done after a long fallow period, then the weed population may change over successive cycles, becoming more difficult to control and eventually leading to the abandonment of the plot.

### Questions and Observations

- If there is a rotation, how does weed management in the previous crop affect the current one? Are herbicides used on the previous crop? What kinds of weeds are prevalent in the preceding crop?
- If it is a bush fallow system, how many years does the farmer use the same field before fallowing it? How does the weed population change over successive cycles? Why does the farmer eventually abandon the plot (fertility, weed burden, both, other?)
- Does the rotation pattern permit the use of herbicides, or are there residual effects?

- If there is a fallow rotation, are weeds controlled during the fallow or not?

## 2. LAND PREPARATION

One of the principal reasons for tilling the soil prior to planting is to control weeds that would compete with the crop. The adequacy of this weed control is obviously dependent on the quality of the tillage (or pre-planting herbicide application or burning).

A very important factor here is the time elapsed between this initial weed control and planting. A cultivation may be done in preparation for planting, and then a delay caused by lack of rain, shortage of equipment, or some other reason allows weeds to become re-established.

### Questions and Observations

- Are any post harvest operations performed to control weeds for the next cycle?
- How thorough a job of weed control is done at the time of land preparation? Is the soil well-tilled? Are herbicides applied before planting?
- What is the rainfall pattern at planting time? How often is this a cause of poor initial weed control (i.e. drought following land preparation which leads to delayed planting)?
- If there is a delay between land preparation and planting, is there an attempt to kill the weeds (re-burning, application of herbicide, extra tillage, etc.) before planting?

- If herbicides are used before planting, what type, dosage?
- In systems with irrigation, is there a "pre-irrigation" to control weeds?
- When is burning carried out in relation to the first rains?

### 3. PLANTING

Planting arrangements and densities strongly interact with weed populations and control methods. Farmers may plant crops at low densities and/or high spacing to facilitate mechanical weed control. Plant spacing may be high for other reasons, such as low soil fertility or moisture. In any case, this high spacing may encourage the growth of weeds because of inadequate crop cover. On the other hand, farmers may plant crops at very high densities in order to control weeds.

In small grain crops, there is also the problem of contamination of the seed. The source and management of the farmer's seed should be checked to see if there is the possibility of significant contamination with weed seeds.

#### Questions and Observations

- What is the weed population at planting time?
- Is planting normally done before the rains have begun?
- Is planting staggered? Is this done to spread the weeding burden, or for other reasons?
- Is plant spacing done to allow easier weeding e.g., wide spacing to allow hand or mechanical cultivation?

- Is plant spacing so wide as to encourage excessive weed competition?  
What is the reason for this type of spacing?
- Is seeding done at a very high rate in order to control weeds?
- What is the source of the seed? Is there evidence it is contaminated with weed seeds?
- Are herbicides applied at planting time? Which ones, dosage?
- If herbicides are applied pre-emergence, what is the soil condition at time of application?
- Is any type of mulching practiced?

#### 4. WEED POPULATION

Obviously the most important information on the adequacy of weed control comes from observing the weeds in farmers' fields. Investigators want to assess the types, distribution and importance of weeds in the field. They also want to assess the type of competition between weeds and the crop. This includes an understanding of the growth cycle of the weeds and an analysis of the nature of competition between weeds and the crop, for moisture, nutrients, or other elements.

#### Questions/Observations

##### Types of Weeds

- What are the predominant weeds in terms of frequency, cover?
- Are the predominant weeds annuals or perennials; broadleaf, grasses, sedges?
- How many have a growth habit similar to that of the crop?
- Do farmers recognize particularly difficult weeds? Which do they say are the worst? How do they control them?

- What type of competition exists among the various weeds? Would selective control of certain types lead to an increase in others?

#### Amount of Weeds

- Does the weed population (amount and types) vary greatly from field to field? Why?
- Do particular weeds occur in patches or certain areas? Why?
- (Ways of measuring amount of weeds).

#### Growth Cycle

- Which of the major weeds emerge at the time the crop emerges?
- How much competition is there from weeds in the first one-third of the crop's growth cycle?
- What is the timing of the farmer's weed control in relation to seed setting in the major weeds?
- How are these weeds spread (manure, irrigation water, wind, contaminated seed)?

#### Evidence of Weed Competition

- Are the roots of weeds and crop intermingled? Do they occupy the same part of the soil profile?
- What is the rainfall pattern? Is it adequate early in the growing season and inadequate later on?
- Is there evidence of moisture stress in the crop?
- Is there any evidence of weeds shading the crop?
- Evidence of nitrogen or other deficiencies?
- Evidence of fertility x weed growth interactions?
- Evidence of allelopathy? (Need examples)

#### Other

- Do the common weeds host insects or diseases of the crop?

- Do weeds present problems at harvest time?

## 5. WEEDING METHODS

It is necessary to assess the methods that farmers use to control weeds. The number and timing of each weeding operation is also important. It is also worthwhile to assess farmers' perceptions of other cultural practices which help control weeds.

### Questions and Observations

- How many weedings are carried out?
- What methods are used for each weeding?
- If herbicides are used, which ones, dosage?
- If herbicides are used only sometimes, what determines the occasions when they are used (shortage of labor, certain types of weeds, etc.)?
- For each weeding operation, when does it begin and end? How long does it take to weed a given area?
- What is the growth of the crop and the size of the weeds at each weeding?

## 6. LABOR FOR WEEDING

Weeding usually requires a considerable amount of labor, and weed control may be inadequate because of the farmer's inability to provide a sufficient amount of labor at the appropriate time. This may be because the farmer has other work to do that interferes with weeding the crop under consideration, and weeding is thus delayed or done inadequately. On the other hand, it may be that the cropped area is very large in

relation to the family labor available, or that it is difficult to hire laborers, either because they are not available or because of a cash shortage. In some cases weeding is done by communal labor parties, and farmers may differ in their access to this source of labor.

#### Questions and Observations

- Are there activities that compete for labor at weeding time (e.g. weeding on other crops; extended planting period which delays attention to weeding, etc.)?
- If weeding is done by family labor, are there sufficient workers to do an adequate job? Which members of the family are responsible for weeding? Do they have other tasks or activities that compete with weeding?
- If weeding is done by hired labor, is it available at appropriate time and do farmers have cash to pay for it? Are there special arrangements with hired labor (share cropping, etc.)?
- Are there communal arrangements for weeding? If so, how is scheduling, labor allocation arranged?
- Do farmers consciously take advantage of other cultural practices to aid in weed control? (Crop arrangement, choice of variety, mulching, rotations, etc.)

#### 7. MACHINERY AND CHEMICALS

The tools, machinery and, chemicals for weed control should be adequate for the job. If farmers are using hand tools, they may or may not be of appropriate design. Plows too may be in poor condition or of inappropriate design.

In some cases these tools or machinery may cause significant damage to the crop, as when excessive hoeing leads to root pruning, or late plowing damages plants.

The availability of machinery is another problem. Sometimes farmers are delayed in their weeding by having to wait for rented plows or tractors. Sometimes the nutritional status of draft animals is poor at weeding time as well.

If farmers use herbicides, they may be limited by the availability of sprayers or water, as well as by the type of herbicide available in their area.

#### Questions and Observations

- Are tools and machinery that are used for weed control adequate?  
Can they be repaired locally?
- Is there evidence of root pruning or other plant damage because of weeding methods?
- If machinery is rented, is it easily available?
- What is the availability of draft animals for weeding?
- Are they well trained?
- What is the nutritional status of draft animals at weeding time?
- Are herbicides available? What types? Sprayers? Parts (nozzles, etc.)?
- If herbicides are used, are there measuring devices and advice on usage available to the farmer?
- How difficult is access to water for mixing herbicides?

## 8. RAINFALL PATTERNS

Sometimes weeding cannot be done because of climatic conditions. Too much rain means that laborers (or machinery) might not be able to enter the fields. In other cases farmers may delay their weeding until some rain softens the soil.

The number of weedings farmers do is sometimes affected by the farmers' perceptions of the likely yields, e.g. less weeding may be done if the farmer feels that the crop yield will be poor because of drought.

### Questions and Observations

- Are there any climatic factors which delay weeding (too much rain to work; too little rain so that ground is too hard for hoeing, etc.)?
- Is the number of weedings often determined by farmers' perception of outcome in a particular year?
- Is rainfall so heavy that herbicides may be ineffective?
- Are there often extended dry periods which would make herbicide use risky?

(See also sections 2,3,4 for further questions related to rainfall patterns)

## 9. OTHER ACTIVITIES COMBINED WITH WEEDING

Sometimes farmers save labor by combining two operations. An example of this is the application of fertilizer at weeding time in order to cover the fertilizer in the weeding. At other times the weeding also helps to improve drainage or irrigation channels or farmers may say that it support the plants.

### Questions and Observations

- Is weeding combined with a fertilizer application? Does this imply a delay in one or the other of these operations?
- Is weeding combined with a thinning?
- Does one of the weeding operations serve another purpose, such as forming irrigation channels, improving drainage or supporting plants?

### 10. FERTILIZATION

There is a significant interaction between fertility and weed control. If weeds are not adequately controlled, then increasing fertilization may have little benefit for crop yields, as most of the added fertilizer may be taken up by the weeds. In other cases, however, early fertilization may help the crop compete better with weeds. Thus the timing and amount of fertilization is an important factor in understanding weed problems.

If animal manure is used for fertilization, there is the possibility that weed seeds may be introduced to the field in this way.

### Questions and Observations

- When is fertilization carried out in relation to weed control?
- Is animal manure utilized on this or preceding crops? If so, is there any indication that this is a source of weed seeds?

## 11. INTERCROPPING

Intercropping is a common practice among farmers in developing countries. At times the intercrop interferes with adequate weeding, by restricting hand or mechanical cultivation, or by limiting the type of herbicide that can be employed. At other times, however, an intercrop helps to smother weeds.

### Questions and Observations

- Does an intercrop help control weeds?
- Does an intercrop interfere with weeding?
- Does a relay crop (or following crop in a rotation) limit the types of herbicide that can be used, or otherwise influence the type of weed control?

## 12. OTHER USES OF WEEDS

Sometimes farmers do not weed as thoroughly as recommended because the weeds serve as forage for their animals. This might mean that early tillage is not practiced, or that a last weeding of the crop is not done. At other times, a thorough job of weeding is avoided as a means of erosion control.

In some instances, farmers leave certain weeds in their fields because they are a source of food.

### Questions and Observations

- Are weeds used as forage for animals? How important are animals to the system?

- Does a preceding fallow serve as forage, thereby restricting possibilities for early tillage?
- Are some weeds left in the field in order to control erosion? How does the tillage and weed control system affect erosion?
- Are some "weeds" sources of food, or do they have other uses?