Chapter VI

SUMMARY CONCLUSION AND SUGGESTIONS
SUMMARY

The investigation entitled "Studies on the effect of cultural and chemical control systems of Kharif weeds in Tawa Command Area", was carried out at the Zonal Agricultural Research Station, Powarkhed, Hoshangabad, Madhya Pradesh, during 1985, 1986 and 1987. The objectives of the study were to identify the weeds and nature of weed problem; to evaluate the efficacy of different weed control methods viz., chemical, cultural and integrated weed control, as well as their consequent effect on growth, yield attributing characters and yield of soybean crop; and to determine the economic viability of the treatments.

The field experiments were laid out in randomised block design with four replications. During 1985 and 1986 there were 25 treatments comprising of five herbicides viz., fluchloralin (0.500 kg ha⁻¹), metribuzin (0.500 kg ha⁻¹), oxadiazon (0.000 kg ha⁻¹), pendimethalin (0.000 kg ha⁻¹) and haloxyfopmethyl (0.000 kg ha⁻¹) and their fourteen combinations using either ½ quantity of each component herbicide or 3/4th quantity of each of them, three treatments of handweeding (one, two and three) two of the bladed harrow (one and two) and one weedy check. In the light of results obtained during 1985 and 1986, the treatments were modified and reduced to fourteen during 1987.
These consisted of three individual herbicides *viz.*, fluchloralin (≥ 1.500 kg ha⁻¹), oxadiazon (≥ 1.000 kg ha⁻¹) and butachlor (≥ 1.500 kg ha⁻¹), six integrated treatments (chemical plus cultural), two handweeding treatments (one and two), one of bladed harrow, one combination of bladed harrow plus handweeding and the weedy check. The soybean variety Punjab-1 was taken as test crop.

The observations on weed study comprised of the occurrence of weeds, composition of weed flora, weed intensity, weed shoot biomass and weed control efficiency of the treatments. While those on crop study included plant height, number of leaves and leaf area per plant, leaf area index, crop growth rate, number and weight of root nodules, number of branches, pods and grains per plant, grain weight per plant, test weight of grains, grain yield per hectare and harvest index. Benefit-cost analysis of different weed control treatments was done on the basis of current market rates.

The results are summarised below:

**Summary for 1985 and 1986**

**weed study**

1. One hundred twelve weed species comprising of 31
monocots and 81 dicots were found to occur during Kharif season in the locality.

2. In the experimental fields Echinochloa crusgalli, Cyperus rotundus, Cynodon dactylon, Corchorus acutangulus, Eclipta alba, Launaea aspleniiifolia and Commelina spp. constituted major bulk of the weeds.

3. In 1985 all the treatments proved highly effective in reducing weed intensity and weed shoot biomass, while in 1986 their efficacy was reduced due to adverse environmental conditions.

4. The competition from annual grasses was more serious during earlier part of the season, while at later stages the dicot weeds became prominent.

5. In 1985, at 30th day stage the total weed intensity under all the weed control treatments was significantly reduced. The herbicidal combinations proved superior to the single herbicides. Amongst single herbicides, oxadiazon 1.000* proved the best with close parity with fluchloralin 1.500, pendimethalin 1.000 and haloxyfopmethyl 1.000 in respect of total weed intensity. The herbicidal combination oxad 0.750

* The numerical values given just after the name of herbicides indicates its rate of application in kg per hectare.
plus haloxy 0.750 recorded the lowest value of weed intensity among all the treatments under study with significant superiority over a number of them. The rate of application of herbicides in a combination did not bring significant differences. At succeeding stages the total weed intensity was found to decrease due to maturity. At 60th day stage and at harvest three, and two handweedings stood at the top most position in respect of reducing weed intensity but the combination oxad 0.750 plus haloxy 0.750 also performed consistently better amongst herbicidal treatments. The bladed harrow was one of the least effective treatments.

In 1986, at 30th day stage, except metribuzin 0.500, fluchloralin 1.500 and a handweeded plot, all the treatments showed significant superiority over the weedy check in respect of total weed intensity. Amongst herbicidal combinations the lowest intensity was recorded under fluch 0.750 plus haloxy 0.500 but with statistical parity with most of the combinations. The weed intensity at 60th day stage did not vary significantly while at the time of harvest the variations were inconsistent.
6. In the year 1985, the total weed shoot biomass was significantly lower under all treatments, but at harvesting stage haloxyfopmethyl 1.000 showed parity with the weedy check. Amongst all herbicidal treatments metri 0.375 plus haloxy 0.750 was the best but had parity with a number of other combination treatments. The total weed biomass under the handweeding was the lowest among all the treatments.

During 1986, haloxyfopmethyl was the most effective herbicide. Different herbicidal combinations were nearly equal in effectiveness. Handweeding appeared to be the most effective treatment. Fluch 0.750 plus haloxy 0.500 and oxad 0.750 plus haloxy 0.750 showed parity with handweeding in this respect.

7. The best control of *Echinochloa crusgalli* as well as codominant monocot weeds was obtained with haloxyfopmethyl. Fluchloralin, pendimethalin, metribuzin and oxadiazon were next in order of merit. All the combinations proved highly efficient in reducing the intensity and biomass of *Echinochloa*. Handweedings and bladed harrow were found quite effective against *Cyperus rotundus*. None of the herbicidal treatments could made significant reduction in the intensity and biomass of *Cyperus* as compared
with the weedy check; however, the weed biomass under oxadiazon 1.000 was substantially lower.

9. Season long efficient control of *Cynodon dactylon* was achieved with haloxyfopmethyl. The competition posed by *Cynodon* was increased at each succeeding stage being maximum at harvest.

10. Oxadiazon was found as the most effective herbicide against *Commelina* spp., while haloxyfopmethyl was ineffective.

11. Metribuzin, fluchloralin, oxadiazon and pendimethalin proved to be highly effective against *Corchorus acutangulus*, while haloxyfopmethyl had no effect. This weed posed serious competition at advance stages.

12. Only the cultural methods proved to be promising against *Launaea aspleniiifolia*.

13. *Eclipta alba* came up slightly late in the season and continued till harvest, consequently making all the herbicidal treatments ineffective. All the cultural treatments were significantly effective in reducing the weed competition.

14. Oxadiazon, fluchloralin and metribuzin proved more effective against codominant dicot weeds while haloxyfopmethyl was ineffective.
Crop study

1. The initial plant population was statistically uniform. The plant population at harvest was significantly lower under the weedy check than the treated plots. The final plant population was negatively associated with weed intensity and weed biomass.

2. The plant height of soybean at early stages did not vary significantly while at the advance stages the variations were significant but with an inconsistent trend.

3. The leaf area index and crop growth rate were adversely affected due to weed competition and showed negative correlation with the weed intensity and weed shoot biomass.

4. The number of root nodules under fluchloralin 1.500 was significantly increased over the weedy check, while remaining treatments and the weedy check were at par in that respect. Different treatments did not affect the nodule weight significantly.

5. The yield attributing characters of soybean were negatively correlated with the weed intensity and weed shoot biomass.
6. In 1985, oxad 0.500 plus haloxy 0.500 had the higher number of branches but showed parity with most of herbicidal treatments as well as hand weeding. All the treatments were significantly superior to the weedy check in that respect. In 1986, three handweedicings produced the maximum number of branches. Amongst herbicidal treatments, metri 0.375 plus haloxy 0.750 was the best, although having parity with many other herbicidal combinations.

7. The three handweeding treatment gave the maximum number of effective pods during both years. In 1985, all the herbicides, except haloxyfopmethyl 1.000, were significantly superior to the weedy check, while in 1986, the haloxyfopmethyl 1.000 proved better than others, in respect of number of pods. Except fluch 0.750 plus oxad 0.500 in 1986, all the combination treatments had significantly more number of pods than that under the weedy check in both the seasons.

8. The values of number of grains and grain weight per plant were the highest under three handweedicings, during both years. All the single herbicides were at par in respect of number of grains and grain weight per plant during both the years. Most of the
combination treatments showed parity in respect of these yield attributes but fluch 1.125 plus oxad 0.750 in 1985, and fluch 1.125 plus haloxy 0.750 and fluch 1.125 plus metri 0.375 in 1986 recorded the more values than any other herbicidal treatment.

9. In 1985, only fluch 0.750 plus haloxy 0.500 recorded significantly higher test weight as compared with that under the weedy check. In 1986, three handweedings gave the maximum test weight closely followed by fluch 1.125 plus metri 0.375 and haloxyfopmethyl 1.000, having a significant edge over the weedy check.

10. The grain yield of soybean was significantly increased under all the treatments during both years.

In 1985, amongst all the treatments, fluch 0.750 plus oxad 0.500 gave the highest grain yield closely followed by three handweedings, but it was at par with most of the combination treatments, fluchloralin 1.500, and one, and two handweedings.

In 1986 the maximum yield was obtained with three handweedings. Amongst single herbicide treatments, haloxyfopmethyl 1.000 was the best in respect of
grain yield. Amongst combinations, fluch 1.125 plus metri 0.375 gave higher yield but showed parity with many other treatments.

The grain yields during both years were observed to be negatively correlated with the weed intensity and weed shoot biomass. The growth and yield attributing characters were found to have a significant positive correlation with the grain yield.

11. In 1985, the maximum harvest index was noted with fluch 1.125 plus pendi 0.750 which was at par with many other treatments but significantly superior to the weedy check. In 1986 HI did not differ significantly.

12. In 1985, fluch 0.750 plus oxad 0.500 gave the maximum net return, while during 1986 the two bladed harrow proved the most beneficial amongst all the treatments. The highest benefit/cost ratio was found with the bladed harrow treatment during both years due to its low cost.

Summary for 1987

Weed study:

1. The dominating weed flora consisted of Echinochloa crusgalli, Cyperus rotundus, Cynodon dactylon and
Commelina spp. The dicot weeds were suppressed due to above mentioned dominating weeds.

2. Two handweedings as well as integrated treatments performed appreciably while herbicides alone and bladed harrow alone were least effective in reducing total weed intensity.

3. Fluch 1.125 plus one handweeding had the lowest intensity of Echinochloa crusgalli but had parity with two handweedings as well as most of the integrated treatments.

4. Two handweedings and some integrated treatments proved significantly effective in reducing the intensity of Cyperus rotundus while it was more than that under the weedy check in case of herbicides alone.

5. The treatments having handweeding component, reduced the intensity of Cynodon dactylon significantly, while herbicides and bladed harrow were not effective.

6. Butachlor was the most effective herbicide against Commelina spp.

7. Oxadiazon was the most effective herbicide against Acalypha indica, Physalis minima and codominant dicot weeds.

8. Keeping aside the two handweedings, the minimum weed shoot biomass was recorded under fluch 1.125
plus one handweeding which showed parity with other integrated treatments comprising of handweeding. Amongst herbicides alone, fluchloralin 1.500 made significant reduction in the weed biomass.

**Crop study**

1. The number and weight of grains per plant were adversely influenced due to weed competition. The grain yield with two handweedicings, fluch 1.125 plus one handweeding and buta 1.125 plus one handweeding were at par. Amongst herbicides alone, only fluchloralin 1.500 increased grain yield significantly over the weedy check.

2. The integrated treatments *viz.* buta 1.125 plus one bladed harrow, fluch 1.125 plus one handweeding and buta 1.125 plus one handweeding proved better than the two handweeding treatment in respect of the net returns. In terms of benefit/cost ratio the one bladed harrow ranked at the top position due to its low cost.
Conclusions

In Tawa Command Area of Hoshangabad, 31 monocot and 81 dicot weed species were recorded in the Kharif season. *Echinochloa crusgalli*, *Cyperus rotundus*, *Cynodon dactylon*, *Commelina benghalensis*, *Corchorus acutangulus*, *Eclipta alba*, *Launaea aspleniifolia* and some other dicot weeds were predominant.

Weeds incurred a loss of 46 to 65 per cent in terms of grain yield of soybean.

Use of herbicides is an efficient and economical substitute for the cultural methods of weed control. The herbicides possess the limitation of their efficacy against many weed species, but use of herbicidal combinations take care of the diversity of the weeds.

The effective herbicidal treatments viz., fluchloralin (ppi) @ 0.750 to 1.125 plus either of oxadiazon (preem) @ 0.500 to 0.750, metribuzin (preem) @ 0.250 to 0.375 or haloxyfopmethyl (postem) @ 0.500 to 0.750 kg ha⁻¹ should be preferred over mere cultural methods for control of weeds for the reasons of operational feasibility under uncertainty of rainfall and timely
weed suppression and reduction in man power requirement.

The specific herbicides should be selected giving consideration to the weed flora (viz., haloxyfopmethyl for all grassy weeds, fluchloralin for annual grasses and dicots like Corchorus sp., Sesbania sp., Phyllanthus sp. etc., oxadiazon and metribuzin for dicot weeds).

Under the condition of heavy infestation of noxious perennial weeds the herbicidal cum cultural methods viz., fluchloralin 1.125 plus one bladed harrow or one handweeding 20 DAS, should be preferred.

Suggestions for further research

1. For the control of noxious weeds viz., Cyperus rotundus and Saccharum spontaneum in cropped fields search of either an efficient herbicide or some biological control method should be made.

2. Studies on weed suppression through cropping sequences and other feasible agronomical measures should be carried out.