CHAPTER 1

INTRODUCTION
I INTRODUCTION

Among the various factors which contribute to the economy, growth and development of a region, agriculture plays a dominant role in most of the states in Indian Republic. This is particularly true in case of Madhya Pradesh, which is mainly an agriculture dependent state. The eastern part of Madhya Pradesh (Fig.1) known as Chhattisgarh region is called the 'rice bowl' of Madhya Pradesh as in this region, rice is alone grown during Kharif season. It is the only staple food for the millions of Chhattisgarh.

The net sown, net irrigated and irrigated and rainfed area of rice in this region in are shown below:

<table>
<thead>
<tr>
<th>District</th>
<th>Net sown area</th>
<th>Net irrigated area</th>
<th>Irrigated</th>
<th>Rice area</th>
<th>Rainfed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raipur</td>
<td>934.9</td>
<td>344.2</td>
<td>331.7</td>
<td>485.1</td>
<td></td>
</tr>
<tr>
<td>Durg</td>
<td>556.8</td>
<td>168.0</td>
<td>116.7</td>
<td>247.2</td>
<td></td>
</tr>
<tr>
<td>Rajnandgaon</td>
<td>503.0</td>
<td>551.7</td>
<td>50.4</td>
<td>227.8</td>
<td></td>
</tr>
<tr>
<td>Bastar</td>
<td>836.8</td>
<td>15.7</td>
<td>13.5</td>
<td>338.6</td>
<td></td>
</tr>
<tr>
<td>Bilaspur</td>
<td>818.7</td>
<td>184.4</td>
<td>176.3</td>
<td>491.7</td>
<td></td>
</tr>
<tr>
<td>Sarguja</td>
<td>581.8</td>
<td>18.9</td>
<td>2.7</td>
<td>328.1</td>
<td></td>
</tr>
<tr>
<td>Raigarh</td>
<td>529.5</td>
<td>31.1</td>
<td>24.4</td>
<td>363.4</td>
<td></td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>19205.5</td>
<td>3009.9</td>
<td>956.7</td>
<td>4000.6</td>
<td></td>
</tr>
</tbody>
</table>

In the entire Chhattisgarh region, the irrigated area is about 17.10 percent of the net sown area. This is slightly higher than the Madhya Pradesh State average of 15.6 percent. Canal system forms the major source of irrigation, providing 75 percent of gross irrigation. Tanks are also important source of irrigation sharing 13.9 percent of gross irrigation, while only 5.3 percent of
irrigated area is under wells. It can be seen from the above table, that except in Raipur, Bilaspur and Durg districts the irrigated area is quite small as compared to rainfed area. Even in these 3 districts the rainfed area is still more than the irrigated area.

The cultivation of rice under rainfed conditions poses a number of problems, like poor crops stand, severe weed competition, especially during seedling and vegetative stages up to biasi.* Management of rainfed rice is, therefore, a very difficult task and would involve simultaneous approach on all these problems.

Rice originated from hot humid tropics where monsoon rains and flood water create environmental crisis for at least part of the growing season. The entire cultivation of rainfed rice is dependent on SW monsoon rains which are uncertain, ill-distributed and unpredictable. Monsoon rainfall in eastern M.P. generally starts in the mid June and lasts to the end of September or some times the first week of October. Assured rains are expected for 80-90 days, out of which actual rainy days may not be more than 50-55 percent. Approximately 85 percent of the annual rainfall is received during this period through light to heavy showers.

The traditional rice culture system in the kharif, depending on the monsoon rains, have been developed based on the topography of the land and the time of onset and distribution of monsoonal rains. They can be broadly classified into 3 categories -

* Biasi is a type of cultural operation which is done in direct seeded rice. Twenty to thirty five days after sowing the fields are converted to flooded conditions with the intensification of monsoon after inter-culturing with a wooden plough.
(i) Rice growing on upland situation mostly rainfed,
(ii) Medium land rice both in broadcast 'biasi' and transplanting conditions under protective irrigations, (iii) Low land irrigated rice under puddled condition followed 'Lehi' (sowing of pre-germinated seeds in puddled field) and transplanting.

On rainfed situation, early duration rice cultivars will grow direct seeded broadcast or sometimes drilled in lines with the first premonsoon showers in early June, to be harvested by the end of September to early October.

The problems encountered in this system are (i) Moisture stress in the event of adverse distribution of rain, and the damage to the crop if there is heavy rain at the sowing & germination time, (ii) heavy weed infestation, (iii) difficulty in fertilizer management because of rapid water percolation and problems with water retention in the soil. It has been possible to get grain yield in the range of 2-3 t/ha by resorting hoe seeding (drilling), use of hoes or herbicides for timely control of weeds. In the medium lands of most of the rice areas photosensitive traditional varieties of 130-140 days duration are grown with dry sowing under broadcast locally known as 'Khurra' and sowing also under optimum moisture conditions called 'Battar' sowing and afterwards converted to flooded conditions with the increased intensity of monsoonal rainfall. There 'biasi' operation is carried out when the plots attain 25-35 days age. Broadcast 'biasi' seeding results in uneven crop stand also. The maintenance of adequate plant population is still a problem under this 'biasi' system. The most disadvantage aspect of such a rice crop is the mixed stand in which it is difficult to distinguish easily between the rice and the weeds.
Poor germination of seeds in dry-seeding results on account of non-maintenance of moisture in the top 5-6 cm soil and in the moist seeding because of sudden flooding and resultant compaction of the top soil after heavy showers (Mahatim Singh, 1978). In case of transplanting, raising of the nursery as well as its transplantation can not be made definite, as for both the operations accumulation of water in the field is a pre-requisite. Uncertainty of rains generally results in delayed transplantation and use of aged seedlings which ultimately results into either complete failure of the crop or poor yields.

In order to ensure a better crop stand in any of the situations mentioned above, rice seeds must be sown in such a manner that it remains in the moist soil as long as the seedlings emerge out of the soil and are also in a position where it may be possible to distinguish these seedlings from the weeds. Sowing of rice seeds in lines 20-30 cm apart at a depth of 5 cm has been found helpful in achieving these objectives.

Upland rice is grown under conditions conducive to profuse weed growth. As such during the early stages of crop growth, severe weed-crop competition is a big constraint for improving rice productivity. In the rice ecosystem of this region, weeds play a dominant role by competing for light, moisture and nutrient with rice crop (Noguchi and Makayama, 1978; Bhan et al., 1980; Singh and Singh, 1983). Based on a large number of coordinated multilocation trials in India (Pillai and Rao, 1974 and Venugopal et al., 1983) it was estimated that the extent of yield reduction in rice due to weeds alone is about 15-20 percent for transplanted rice, 30-35 percent for direct seeded under puddled condition and over 50 percent
in direct sown upland rice. Despite this fact, pest and diseases have alone drawn much greater attention of the farmers and researchers than weeds. This is because injuries caused by pest to crops are easily noticable, whereas the weeds wage a hidden war on crop plants. The sight of uniformly stunted growth of a weedy crop does not distract a passers by till it comes to harvesting.

However, if the weed population could effectively be controlled, rainfed rice cultivation may offer an unique advantage of improving the productivity over irrigated land. But this task again is not easy. The type of the weed flora obtainable under rainfed conditions is so variable that it may not be possible to control them by one method alone. Not only this, flushes of weeds come up at different stages. The experimental results showed clearly that the losses caused by weeds in rainfed rice can be reduced to a great length by chemical as well as mechanical weed control methods. Keeping the rainfed rice fields weed free throughout the season is by far the best method for minimising the losses due to weeds (Singh and Peddi, 1984). But this will not be possible in view of the labour cost. The second alternative appears to be a combination of pre and post-emergence herbicides as reported by De Datta (1981), but this too is again a costly affair and can not be adopted by farmers in general. The other alternative appears to be the mechanical weeding for which line sowing and suitable stage of weeding the pre-requisite.
In view of the above considerations, present investigation entitled 'Effect of light, moisture and nutrient in relation to methods of seeding and weed management on the productivity of direct seeded rice' was carried out at Indira Gandhi Krishi Vishwa Vidyalaya, College of Agriculture, Raipur (M.P.) during the kharif season of 1986-87 and 1986-87 with the following objectives:

1) To examine the light use efficiency of rice crop under different weed population at different stages and levels of the crop canopy.

2) To study the moisture use pattern of rice in relation to different weed flora.

3) To find out the phytomass production efficiency and harvest index of rice.

4) To analyse the nutrient uptake efficiency of weed flora.

5) To see the effect of light, moisture and nutrient on the yield and their attributes under different treatments.

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