SUMMARY

Studies of the cultural practices in the cultivation of upland paddy, comprising of three experiments were conducted to ascertain the lower limit of soil manipulation, depth of tillage, spacings between crop rows and levels of fertilization providing thereby vigorous stand of crop to combat weeds. The experiments were conducted at Agricultural Engineering Experiment Farm, Indian Institute of Technology, Kharagpur, India during 1961, 1962 and 1963. The major weed species present in the experimental field were, Panicum crusgalli, Panicum capillare, Paspalum sanguinale, Cyperus rotundus, Cyperus iria and Cyperus compressus.

Experiment 1 Effect of varying degree of soil manipulation on yield of upland paddy and on associated weeds

Eight levels of soil manipulation broadly classified in three groups, (I) Dibbling, (II) Plough planting and, (III) Ploughing, harrowing and planting, were tried over a 2-year period during 1961 and 1962, to find out the minimum level of soil manipulation required for upland paddy, without sacrificing the yield.

The soil manipulation brought by ploughing, harrowing and planting under treatment of group III,

significantly increased the grain yield and number of fertile tillers per meter row over the treatments of dibbling (group I) and plough planting (group II). The latter treatments did not reduce the weed infestation effectively, while the former fully manipulated the land surface and brought better control of weeds. Comparatively weed free crop under the treatments of group III could attain better growth by producing more leaf area, height and dry matter, which would lead to the production of higher number of fertile tillers per meter row, weight of grains per tiller and grain yield per hectare. A significant correlation and linear regression relationship has been found between yield contributory characters (fertile tillers per meter row and weight of grains per tiller) and grain yield per hectare. Among the three treatments of group III, the treatment of one ploughing with mouldboard plough and one harrowing with disc harrow and planting gave yields very close to conventional tillage, i.e. ploughing four times with country plough, harrowing and planting. Hence, the former is considered to be the minimum requirement of soil manipulation for this crop.

Experiment 2 Effect of depth of tillage on yield of upland paddy and on associated weeds

The four treatments of depth of tillage were

given by ploughing the land to 7 cm. depth with country plough and 14, 21 and 28 cm. depth with a mouldboard plough. A split plot design was followed with four depths of tillage as main plot treatment and weeding and no weeding as sub plot treatment. The experiments were conducted for two years, 1962 and 1963.

The study of the soil profile revealed that, soil at 20 to 30 cm. depth contained more clay than at surface to 20 cm. depth. 28 cm. deep tillage brought sub surface soil on the surface and increased the clay content of the surface soil. Significant decrease in the bulk density of soil was noted due to 21 and 28 cm. deep ploughing. The bulk density of soil and significant negative correlation and linear regression relationship with dry matter of crop roots and grain yield of crop per hectare separately.

The dry matter of crop roots under 28, 21 and 14 cm. deep tillage was significantly more than that under 7 cm. tillage. Significant correlation and linear regression relationship was found between dry matter of roots and grain of crop per hectare.

The effectiveness of 28 cm. deep tillage in

spacings with 140, 70 and 46 kg. seed per hectare respectively. During 1961 and 1962, three levels of fertilization, low (control), medium (30 kg. N + 30 kg. P_2O_5 per hectare) and high (60 kg. N + 60 kg. P_2O_5 per hectare) were maintained. During 1963, the experiment was modified by introducing 5 levels of fertilization (0, 20, 40, 60 and 80 kg. N per hectare) with nitrogen only.

Increase in spacing between crop rows from 15 to 30 and 30 to 45 cm. increased the dry matter and population of weeds. The weeds under fertilized plots produced more dry matter than that under control but, the successive increase was noted only upto 60 kg. N per hectare. There was no further increase with 80 kg. N per hectare. The response was quadratic in nature. The total uptake of nitrogen by weeds was significantly more under 40, 60 and 80 kg. N per hectare than that under control and 20 kg. N per hectare. The population of Cyperaceae weeds per unit area was more than the grassy weeds, but their dry matter was less. Both the nitrogen content and its uptake by grassy weeds, were more than that by Cyperaceae weeds.

The upland paddy sown at 15 cm. spacing between crop rows yielded more grain than at 30 and 45cm.

spacings but the differences were significant only during 1963. The response of crop to the different spacings was quadratic for grain yield and total dry matter per hectare. There was no evidence of intra-crop competition or crowding of seedlings due to increase in seeding rates and decrease in row width under 15 cm. spacing. The final stand of the crop plants as judged by the number of tillers per unit area was nearly similar under 30 and 45 cm. spacings, but it was significantly more under 15 cm. spacing. The crop sown at 15 cm. spacing with 140 kg. seed per hectare gave requisite plant population which smothered weeds, attained better growth and produced higher grain yield.

The application of 40 kg. N per hectare brought significant increase in nitrogen content of crop plant over control. The application of nitrogen at levels lower than that failed to do so. The increase in phosphorus content was affected with the application of 60 kg. P_2O_5 per hectare. In comparison to control, the uptake of nitrogen by crop plants was significantly more under medium and high fertility during 1961 and 1962, and that under 60 and 80 kg.N per hectare during 1963. The crop plants under high

fertility removed more nitrogen from weedfree plots than from weedy plots.

During 1961 and 1962, the crop yielded significantly more under high and medium fertility than under control. The response of crop to the increasing levels of fertilization was quadratic for grain yield. During 1963, application of 80 kg. N per hectare increased the grain yield significantly more than other levels of fertilization. The response of crop to the increasing levels of nitrogen was linear for grain yield. For upland paddy in this region, 30 and 80 kg. N per hectare were found to be the minimum and maximum levels of fertilization respectively.