CHAPTER 1

INTRODUCTION

Upland rice is grown on both level or sloping lands, which are either bunded or unbunded and are free from stagnation of water. Out of about 20.4 million hectares of upland rice in the world, India accounts for about 6.15 million hectares, which is approximately 16 per cent of its total rice area. A major portion of this upland rice area is concentrated in the Eastern states of Orissa, Bihar, West Bengal, Assam besides North Eastern states. In West Bengal, this crop is grown in an area of about 0.84 million hectares under direct seeded rainfed condition during monsoon season with short duration varieties (80-110 days duration). The soils are characteristically of high porosity and of low fertility. In these soils, the productivity of the crop is not only low (650 kg/ha) but also inconsistent. Several constraints are cited to be responsible for such low yield of this crop. These include (i) uneven distribution of rainfall and occasional drought in some years, (ii) cultivation of low productive indica varieties, (iii) severe weed competition, (iv) inadequate crop stand and (v) nutritional problems, especially deficiency of major nutrients like nitrogen and phosphorus. Therefore, any technology which could overcome some of these yield limiting factors is considered important to raise the level of productivity.

Plant population is the basic pre-requisite in crop management in the absence of which, full benefits of improved technology cannot be realized. Therefore it is essential to maintain adequate crop stand from the point of view of ideal crop growth and desired productivity besides minimizing weed competition. The existing practice of broadcasting of seed prior to or with the first rain seldom ensures uniform stand. As a result, the weed infestation becomes so severe that at times, the crop is completely smothered. Line sowing is considered a better method which ensures adequate and uniform plant stand and facilitates weed control (Dixit et al., 1979). Thus, working out the seed requirement for a given set of conditions is of prime importance for ensuring a good crop stand.

For increasing the crop productivity, a good crop stand is essentially to be associated with an improved management practice. Farmers of Eastern India generally grow traditional tall indica varieties which are characteristically low fertilizer responsive. Moreover, the upland rice crop being rainfed, is mostly grown under low level of fertilization and poor management condition. But in the recent past, with the development and adoption of modern semidwarf varieties, which are high input responsive, fertilizer application particularly nitrogen has become necessary in soils low in nitrogen content as in upland conditions. However, in view of the risks involved in rainfed agriculture,

low investment ability of the subsistence rice farmers, poor N retention capacity of the upland soils and weed problems, the level of N fertilization is seldom recommended beyond 60 kg/ha. A desired crop response can be expected even at a lower level if a suitable N management practice is developed to minimize the losses and discourage the initial growth of weeds. Due to highly oxidized aerobic conditions, high temperatures and humidity, weeds emerge along with rice plants and offer severe competition resulting in poor crop growth and loss of yield ranging from 43 to 83 per cent (Pillai and Rao, 1974; Rao et al., 1976). High level of fertilization to semidwarf high yielding varieties with erect leaves and greater clearance often induces weed infestation and thus the problem is aggravated.

Hand weeding, though an effective weed control measure, is tedious, time consuming and expensive especially in areas of high wage rates. Besides, weeding operation in upland rice synchronizes with the land preparation and transplanting operations of the main monsoon rice crop. Thus, labour becomes a limiting factor to accomplish the weeding in time. Hence, chemical weeding is considered as an alternative measure in such situations. Requirement of weed free condition during the initial crop growth period necessitates use of pre-emergence herbicides. Research work in the country has led to identification of certain herbicides which have very high weed control efficiency. But over the years, the

performance of these herbicides has not been found to be consistent as they were reported to cause adverse effects on crop germination resulting in mortality of plants and poor crop stand. As a result, the efficiency of the costly inputs drops to a sub-optimal level. The common herbicides - butachlor, thiobencarb, nitrofen and oxadiazon showed such effects on crop due to rains and saturated soil condition after application. As long as herbicides non toxic to rice are not developed, it is necessary to improve the efficacy of the existing herbicides by developing suitable application techniques and adopting measures which can ensure safety of the germinating seeds. Under such situations, use of herbicide protectants holds considerable promise. Information on this aspect in upland rice growing situations in India is, however, meagre.

Keeping the above points in view, an investigation was planned with the following objectives.

i) To evolve a suitable method of weed control with special reference to herbicide use for minimizing crop weed competition and achieving higher productivity.

ii) To find out an appropriate technique for minimizing herbicide toxicity to germinating crop seeds.

iii) To develop an appropriate agronomic practice for attaining desired stand and initial plant vigour to suppress weeds for higher crop productivity.