# CHAPTER 1
## INTRODUCTION

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In India the area under the cultivation and production of oilseeds and pulses remained almost unchanged in the last decade, with some exception in case of groundnut. With the ever increasing population, the gap between supply and demand of pulses and oilseeds has been widening. To meet the minimum requirements, the present level of production has to be increased 2.5 times by 2000 AD. The deficit in production is particularly high in West Bengal where it is more than 50 per cent in pulses and 90 per cent in oilseeds.

Unlike food crops, oilseeds and pulses are generally grown on low level of management and the productivity of these crops is also adversely affected under rainfed conditions due to vagaries of weather, mainly drought. A rapid increase in production (15.0 and 16.5 m tonnes of oilseeds and pulses, respectively, by 1990.) is essential for which the area under dry season cultivation under irrigation has to be increased along with developing appropriate agronomic practices. Moreover, due to introduction of new plant types the prospects of growing pulses, particularly pigeonpea, during winter season have improved considerably in areas where the winter temperatures are relatively mild. This enables to overcome many problems of rainy season cultivation and also helps to exploit all possibilities and full potential of the crop. Further, the yield advantages of intercropping of oilseed and pulse crops are likely to be higher during winter under irrigated conditions because of greater number

of bright sunshine hours and comparatively less shading effect to the associated crop.

Apart from increasing the productivity, extension of the cultivation to non-traditional areas is now considered to be an alternative step in order to minimize the deficit of oilseeds and pulses. In West Bengal, though the soil and climatic conditions are suitable, groundnut and pigeonpea are grown in a limited area. In the rainfed uplands of this state, which occupy about 1/3rd of the net cultivated area, rice is a predominant crop inspite of its low and inconsistent yield. It has been realized beyond doubt that in this warm, humid and high rainfall region, uplands are suitable for groundnut and pigeonpea cultivation. Characteristically, these crops are tolerant to soil moisture deficit. Hence, they are likely to be successful even in the uplands where a normal rice crop often suffers due to lack of sufficient moisture during long drought spells, which is not very uncommon even in this high rainfall region. Cultivation of these crops also holds considerable promise as a second crop after early rainy season rice crop. This is particularly true for areas where irrigation water is limited.

Among the oilseed crops, groundnut (Arachis hypogaea L.) is gaining importance all over the country, especially under irrigation, for its potential yield and oil content. This is one of the most potential crops that may help to achieve the target of self-sufficiency in oilseeds and it is, therefore, considered to be the most promising and needs adequate attention for a consistent and high level of production. Further, it is a

photoneutral crop possessing compatibility with other crops for intercropping.

Pigeonpea (Cajanus cajan (L.) Millsp.) is also one of the important pulse crops of the country, but its potential is not fully exploited to obviate the deficit of pulses in the country in general and in West Bengal in particular. Groundnut and pigeonpea form an ideal intercrop system due to considerable temporal complementary effect on growth of each other and their combination is expected to make better overall use of resources. Groundnut can make reasonably efficient use of resources during early period due to its rapid rate of growth and better canopy cover, while pigeonpea will be able to make use of resources later in the season because of low initial growth rate. The difference in the rooting pattern also makes their combination ideal and productive because different soil layers and greater volume of soil can be exploited.

In view of our limited land resources, an all-out effort has become imperative to increase and stabilize production by efficiently utilizing the available resources to meet the requirement of the teeming millions in the years to come. Intercropping has been recognized as a system for higher and stable yields due to complementary effect and better overall use of resources than sole cropping. It has also been realized that this system would remain as an important and widespread practice and continue in foreseeable future. In intercropping system, there exists a scope of optimizing temporal and spatial aspects as

compatibility, duration differences, population density and geometry of crops etc. These provide possibilities of increasing the production of pulses and oilseeds in many regions having favourable agroclimatic conditions.

Genotypic manipulations of the crop plants in the recent past furnish a choice of plant types differing in height, growth rhythms, maturity period and response to high plant density. However, there may be particular need for identification and selection of suitable plant types within the actual intercrop situation because their performance in intercropping may not be very closely related to that in sole cropping. The situation becomes further complicated as a given genotype needs to be judged not just by its own yield but also the extent to which it competes with the other crop. Therefore, the genotype which minimizes intercrop competition and maximizes complementary effect will be an ideal plant type for intercropping.

Although groundnut and pigeonpea are temporally complementary to each other, the latter becomes dominant and causes considerable shade to the former during later stages of growth. In additive series, where 100 per cent population of both the component crops is maintained, sowing in the normal recommended uniform row distance may not give substantial yield advantage. In such situations alleviation of competition becomes necessary by changing the crop geometry and also by selecting suitable plant type of dominant crop to make the intercropping feasible and more remunerative.

Though the light-textured lateritic soils possess the desired physical conditions, crops often fail to respond to normal fertilization and cultural practices due to either deficiency or toxicity of some of the essential nutrient elements, besides the basic inherent characterisitics of low cation exchange and water holding capacity. In these soils, periodic liming remains the most practical short-term solution to correct the pH for increasing nutrient availability and supplying the crop with calcium. Moreover, the crop yield responses to lime and phosphorus application are often interdependent.

The lateritic soils are low in available P and most grain legumes require a large amount of P for good growth and nodulation. This in turn requires a high concentration of available P in the root medium, usually induced by fertilizer application. The P requirement of groundnut and pigeonpea is fairly high so that phosphate fertilization becomes necessary for higher production of these crops, particularly in intercropping. For these light-textured soils, which are poor in water holding capacity, development of an efficient water management practice considering the critical growth stages is very essential.

All available information on genotypes, fertilizer use and irrigation emanates from sole cropping and are applied as such on intercrops. Although some yield advantage is achieved in this way, production is not at its best when results obtained from sole cropping are directly applied to the intercropping situation. Meagre attempts have been made to identify suitable genotypes and to find out the irrigation and fertilizer requirements in

intercropping involving pigeonpea and groundnut.

Keeping the above points in view, an investigation was planned under the acid lateritic soil condition of West Bengal during monsoon and witner seasons. The objectives of the study are as follows :

* To evaluate the performance of some promising groundnut and pigeonpea genotypes in intercropping.

* To study the effect of degree and duration of shading on growth and yield of groundnut.

* To find out suitable planting pattern of pigeonpea for intercropping with groundnut during monsoon.

* To determine the phosphorus and irrigation requirements of the intercrop system during winter.