Introduction
CHAPTER I
INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is an important cash crop of India and plays a pivotal role both in agricultural and industrial economy of our country. India occupies the second position in sugarcane production in the world. The share of our country is about 13 per cent of the world and 41 per cent of Asian sugar production. Sugar industry, being the second largest agro based industry in the country, employs over 40 million cane growers and about 0.4 million skilled and unskilled workers (Shahi, 2002). The area under sugarcane cultivation in India is around 4 million hectares with a total production of about 300 million tonnes and a mean productivity of 70 tonnes per hectare. Tamil Nadu stands first in productivity (102 t ha\(^{-1}\)) and the area under sugarcane cultivation is 3.22 lakh hectares. By 2010 the country needs to produce more than 320 million tonnes of sugarcane to cater the crushing requirement of sugarcane factories in our country. Hence, greater attention is needed towards maximizing cane yield per unit area under relatively low cost of production.

The emphasis has been on increased use of fertilizer in the past and the approach has now shifted to educate the farmers in using organic, inorganic, and biological sources of nutrient supply in an integrated way optimally. Plant nutrition in future will require the judicious and integrated management of all sources of nutrients for sustainable agriculture.
Attempts were made in several countries to promote this integrated approach in a more systematic and scientific manner. The investigations carried out in South and South East Asia to complement the use of mineral with organic sources of plant nutrients have generated useful information. Several studies reported complementary and synergistic effects of these materials on the yield of crops. In addition, organic sources of nutrients are also found to improve the soil physical properties like soil structure and soil bioactivity which are not directly improved by mineral sources.

Integrated nutrient management differs from conventional methods in the sense that it more explicitly considers nutrients from different sources, notably organic materials, nutrients carried over from previous cropping seasons, the dynamics and transformations of nutrients in soil, interactions between nutrients and the availability of nutrients in space (the rooting zone) and time (the growing season), in relation to the nutrient demand by the crop. In addition, it integrates the objectives of production with ecology and environment, that is, optimum crop nutrition, optimum functioning of the biosphere (soil health) and minimum nutrient losses or other adverse effects on the environment. Integrated nutrient management has to be considered as an integral part of any sustainable agricultural system.

The objective of Integrated Plant Nutrient System (IPNS) is the balanced and effective use of various sources of plant nutrients and the strategy is the mobilization of all available, accessible and affordable plant nutrient sources in order to optimize the environmentally benign productivity of the whole cropping system and to increase the monetary return for the farmer.
Thus, there is a need for more detailed information on (i) integrated nutrient practices for cropping systems as a whole taking into account the complementary and the synergistic effects of combined use of both mineral and organic/biological sources for sustained crop production, (ii) practices for different agro-ecological situations taking into account of available organic/biological resources, (iii) and finally, transfer of this technology to the benefit of small farmers through the national agricultural extension services. Large-scale demonstration programmes on small farmers’ fields are envisaged, testing and validating farmer proposed, IPNS practices, which should be economically viable, sociologically acceptable and environmentally safe.

Sugarcane produces heavy tonnage and tends to remove substantial quantum of plant nutrients from the soil. Nutrient application is one of the major factors influencing the yield and quality of sugarcane. Among the major nutrients, nitrogen plays an important role in improving the growth, yield and quality of cane. Nitrogen fertilization to sugarcane promotes growth and increases the number of millable canes and cane yield.

In recent years, inorganic nitrogen fertilizers have become costlier. The periodic hike in prices of nitrogenous fertilizers warrants the efficient and economic use of nitrogen. Hence, it is imperative to find out the low cost indigenous alternate sources of nutrients for sugarcane production.

The modern crop production technology has considerably raised the output, but created problems like land degradation, atmospheric and water pollution. Continuous and excess use of chemical fertilizers have created imbalance of nutrients in soil and adverse effects on soil physico-chemical properties, health and ecology. In order to reduce the
cost of cultivation, to keep better soil health by way of increased fertility status of soil and to sustain the productivity of sugarcane, integrated nutrient management becomes a necessary one.

Use of organic and green manures is inevitable for sustained agricultural production. The potential for the exploitation of various organic manures is vast and their nutrient contribution in India is at present over 19 million tonnes year\(^{-1}\) which is sufficient for the present output target (Ghosh, 1981). These organic sources are not fully utilised for crop production.

Green manure crops of leguminous origin fix atmospheric nitrogen in soil and increase the soil fertility further by adding organic matter. Green manures having the capacity to produce about 22 tonnes of green matter that could supply nutrients equal to 100 kg ammonium sulphate or 30 tonnes of FYM. They enhance the yield to the level of 30 to 40 percent apart from increasing nitrogen use efficiency (Kambar et al., 2000). Green manure crops are producing more biomass and nitrogen accumulation with in short span of time. Because of this reason and also the slow decomposing nature, the benefits are more in crops like sugarcane. Intercropping of daincha in two rows between sugarcane increased the cane yield as well as quality (Jayapaul et al., 2000).

There is an indication of saving of ‘N’ up to 25 per cent when sunnhemp was raised as intercrop in sugarcane Nasir Ahmed (1999). There is much research information available on the individual effect of factors like vermicompost, *Azospirillum* and green manure, on sugarcane. However, the research information is seldom available to indicate the effectiveness of combined application of vermicompost, *Azospirillum* and
green manure incorporation on cane productivity. Hence keeping this in view, a field experiment was conducted to evaluate the effectiveness of integrated nitrogen management practices on productivity of sugarcane with the following objectives.

* To study the effect of different organic sources of nutrients and *Azospirillum* on cane yield and quality.

* To assess the suitable combination of N application with different organic sources on sugarcane.

* To study the effect of different levels of N with and without *Azospirillum* on cane yield and quality.

* To work out the economics of integrated N management on sugarcane.