# *INTRODUCTION*

# CHAPTER I

## Introduction

With the advent of Green Revolution in mid 1960's, technological revolution in agricultural sphere has started. Consequently, high to very high input technologies to increase the nutrient and water use efficiencies were developed for different agro – ecosystems. A rational approach to improve crop productivity by using inorganic fertilisers and pesticides was framed under sole or multiple cropping systems and resulted in higher productivity by involving fertiliser and water responsive genotypes. The use of chemicals to control pests improved many folds. Similarly, the use of chemical fertilisers increased indiscriminately to meet the target productivity and to improve the food grain production of the Nation to 300 M tones, to meet the food demand of the exploding population. The improved agricultural practices with high input technology at farmer's level did not consider the long run disadvantages of high cropping intensity that accrued to soil degeneration.

The organic carbon content of the soil showed a steep decline and dwindled the rhizosphere micro flora. The soil biological system could not tolerate the high degree of chemical residues that would react with the soil elements resulting into toxicants / non available forms by complexing with the changed soil chemical composition. Hence, the biological activity in the soil became to a stand still. The soil health deteriorated by resulting into salinity/ alkalinity or saline - alkaline bringing down the productivity. Since, the soils were chemically exploited, the buffering capacity was altered and available toxicants and other harmful materials had greater negative impact on the crop productivity.

The Indian soils have rapidly degraded in their nutrient status. Motsara (2002) estimated that 90% of the soils were deficient in available N, 80% in P and 50% in K. Of late, it is realized that organic manures are the potential sources to sustain the microbial activity and to improve the physical characteristics of the soil while they can partly substitute the requirement of N, P and K fertilizers. Bridges (1978) described the importance of organic manures on soil health. Application of inorganic plant nutrients, results in larger undecomposed biomass in soil after harvesting the crop is larger than that in the unfertilized land. But, Dhar (1962) showed that nitrates produced in the soil from the added nitrogenous fertilizers could react with the organic matter and deplete even the native humus. This situation can be avoided only by adding additional amounts of organic residues and manures. He had also cautioned that by adding large doses of nitrogenous fertilizers in modern agriculture without the use of organic manures, there would be the danger of humus depletion and fall in crop production.

In soils which receive high levels of nitrogenous fertilizers, especially in nitrate form, 40 to 50 per cent of the applied nitrogen is lost due to leaching causing nitrate pollution of water bodies. Nitrate pollution of drinking water is a serious health hazard. In general, organic manures do not cause serious soil health problems. The extent of nutrient loss from the soil system is less when organic manures are applied. Crop residues such as straw, plant stubbles, grasses etc., on incorporation into the soil, not only improve the physical properties of the soil but also fix atmospheric nitrogen and protect the soil nitrogen from depletion, Dhar (1962).

In the present scenario, it has become a dire necessity to add organic manures for successful crop production. Organic manure production in India is a great constraint. The total availability of NPK per annum through all the potential organic sources is estimated at 6.24 M tone by 2010 as against an estimated NPK requirement of 26.0 M tones by 2011-2012 to meet the target food grain production of 250 M tones (Tandon, 1997). Thus, the available organic manures would meet only 25-30 % of the nutrient needs. The rest of 70-75 % of the nutrient needs are to depend on inorganic sources .In order to improve organic resources, non conventional organic manures such as municipal solid/liquid waste, sugarcane press mud, fruit / food processing waste, willow waste, paper and pulp waste, should be bio-degraded and put to use for crop nutrition. In the Indian context, bio-gas, slurry and press mud cake are important non conventional energy resources to use in the farming sector. It is also not possible to depend totally on organic sources for crop production as its degradation is time consuming process and build up of the nutrients and rhizosphere micro flora is a slow process. The benefit of organic manures however, could be obtained by application of manures partially to an extent of 30% of nutrient needs and rest by meeting through inorganic nutrition in order to improve the soil health and ensure sustained nutrient supply to the crop, The organic sources benefit the crop in many ways by acting as a buffer material to fluctuating temperature , a source of carbon to the soil microflora,reducing the bulk density and increasing the porous nature of the soil for easy root proliferation and root aeration, retention of soil moisture, releasing the soil enzymes, acts as a substrate to the developing antagonist agents and for the over all development of crop in a given situation.

Bio organic manures are time tested ones to support the system for improving quality of the produce, especially the flavor and aroma components. Besides this, the toxic principles in food crops that cause allergy are reduced. Since, the produce is toxic free with good shelf life, it commands premium price to compensate the loss in income due to low yield in organic farming in early period.

In the social back ground, increasing awareness about conservation of environment, health hazards associated with agro chemicals and the consumer preference for safe and healthy food are the major factors that led to growing interest in alternative crop husbandry practices all over the world.

Organic agriculture is one among the broad spectrum of production methods and supportive system of the environment. The demand for organic food is steadily increasing both in the developed and developing countries at an annual growth rate of 20-25%.

Organic production systems are formulated for quality food production and aim at achieving socially acceptable and ecologically sustainable agro-eco systems over a period of time. It is based on minimizing the use of external chemical inputs to a larger extent through use of on-farm resources efficiently *viz.,* green manure, animal dung, crop residues and bio-fertilisers are some of the potential sources of nutrients for organic farming.

India's National Agricultural Policy (NAP) 2000, envisaged that agriculture sector should be sustainable technologically, environmentally economically and

conserve soil, water and biodiversity to get maximum benefits from export of agricultural products. Organic farming is appropriate technology for this purpose. In fact, promotion of organic farming and utilization of organic wastes has been one of the thrust areas of the tenth five year plan. Purohit (2006).

Pulses are major sources of protein for large vegetarian Indian population. Being rich in amino acids and proteins, pulses form an indispensable component of cereal-pulse dietary pattern. As per WHO standards, per capita per day availability of pulses should be 85 g to adequately meet the nutritional requirement. At the present level, the pulse production was 15.19 M tones in 2007-09 and per capita pulse availability in India is just 45 g per day. Evidently, there is a large gap between the availability and requirement. Chickpea being the most important pulse crop grown in the country holds promise to bridge the gap owing to wider adoptability, availability of a number of suitable varieties for location specific condition, low requirement of the resources and amenability to fit into different cropping systems both under rainfed and irrigated eco systems. Keeping this as a back drop and in the changed world scenario of tobacco cultivation, this crop residue has been utilized as source of organic manure and waste leaf as botanical insecticide for chickpea production.

India is the largest producer and consumer of the pulses in the world, accounting for 33% of the world's cultivated area and 22% of the world production. Chickpea is the premier pulse crop of India, grown in about 7.49 M ha producing 6.33M t accounting for about 40% of the National Pulse Bank. Chickpea production has increased from 3.65 to 6.33 M t. from 1951 to 2007 with an annual growth rate of 0.58%. Six states of India *viz.*, Madhya Pradesh,

Maharashtra, Rajasthan, Andhra Pradesh, Uttar Pradesh and Karnataka together contribute about 90% of the production as well as the area of the chickpea in the country. In Andhra Pradesh, Chickpea is sown in an area of 0.60 M ha with 0.65 M t production and productivity of 1085 kg/ha. Anon , (2009).

In vertisols of Andhra Pradesh, soybean-chickpea or Maize- Chickpea is getting importance as an alternate cropping system to growing sole crop *viz.,* tobacco, cotton and chilies especially in northern black soil & central black soil zones and parts of southern black soil zone. Andhra Pradesh stands first with highest productivity of chickpea (1085 Kg/ha) and third in total production (0.65mt) from chickpea producing states of India. Anon (2009) most of the tobacco dry stems and tobacco leaf waste producing from 1,50,214 ha of fcv tobacco area from different parts (Northern light soils: 28,810 ha , Southern light soils: 73,229ha, Southern black soils 41,552ha and Northern black soils 6,623ha) in Andhra Pradesh alone. (Tobacco board (2009-10). It is estimated about 1,87,767 Metric Tones of dry tobacco stems and waste leaf are either discarded or burnt out. As such, the available material is not being exploited for beneficial purposes. Therefore it is essential to conduct experiments to evaluate the efficiency for utilizing the available huge quantity of tobacco waste as organic manure and pesticide.

Objectives:

With this back drop, two separate experiments were conducted taking into tobacco waste as test material and compared with other sources of organic manures and bio pesticides with the following objectives.

1. To assess the relative advantage of tobacco waste as organic manure in relation to other organics in terms of crop growth, yield and quality improvement in chickpea.
2. To assess the relative performance of tobacco waste as botanical insecticide for the control of major pests on chickpea.
3. To work out the economics of all these systems for deriving at an economically viable package of integrated nutrient and pest management system for increasing the productivity and to suggest a package of integrated forming module to the former.