CHAPTER  I

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Mango \((Mangifera indica \text{ L.})\) is a member of \textit{Anacardiaceae} family (Lizada, 1993) is a unique species with respect to growth, nature and diversity. It occupies relatively the same position as that enjoyed by apple in temperate regions. This fruit crop is grown in 85 countries, among which 63 countries produce more than 1000 metric tonnes in a year. In these countries, mango serves as an integral part in human life since it is not only a rich source of nutrients but also a common good shared in culture, life style and religion.

Mango ranks first among all the fruits of India in area, production and is distributed throughout the length and breadth of country, except in hilly regions at 915 meters above mean sea level. India is the largest producer and consumer of mango in the world with annual production of 13,154.24 thousand tonnes from an area of 12, 83,030 hectare (Anon, 2010). India is accounting for about 40\% of the global mango production (Hanemann, 2006). The trend on area and production had increased constantly in the recent past.

Out of nearly 1000 mango cultivars existing in the country, only about 20 cultivars are grown commercially. In the state of Odisha (Orissa) the total area under mango cultivation during 2010-11 was 1,90,084 hectare with a annual production of 6,42,010 metric tonnes. (Source: Directorate of Horticulture, Government of Odisha ). Among the mango cultivars the cultivation of ‘Amrapali’ is spread across the districts of Odisha due to its
aroma, keeping quality and adaptability to the local climate. The demand for ‘Amrapali’ mangoes from specific pockets in coastal region of Odisha is high. This cultivar of mango has been planted on large area in the state of Odisha and the production is expected to be increased by many folds in near future in the state of Odisha.

However, in spite of all this, mango yield in Odisha is 5 to 6 tonnes per hectare as compared to the world yield of 25 tonnes per hectare. This gap in yield is due to poor management practices and post-harvest losses as the farmers lack technical know how about the mango production in the state. Production of fruit orchards like citrus, mango, etc. is distinguished from annual crops by the long gestation period, an extended period of output flow, and varying stages of productivity over the lifetime (Chand, 1994). Therefore, it is more difficult to determine economics of growing mango as compared to annual crops. These include yield, prices and cost of production. These factors are also influenced by other variables like soil, climate, market conditions, etc. Having sufficient awareness regarding profitability of any enterprise is needed to make rational decisions at the farm level during various production stages. Economics of various crops enterprises has been estimated at different point of time by various organizations and individuals (Ahmad et al. 1992, 1994, 2003). Unfortunately, little research work has been conducted on finding out economics of growing mango in Odisha.

Now-a-days with growing population and increasing pressure on land, possibility of extensive cultivation is limited. Korikantimath and Manjunath (2008) stated that population pressure on land leading to division and fragmentation of land holding necessitates identification and adoption of suitable cropping systems. The available land has to be intensively utilized for
maximum production. The available space between the rows of mango could be effectively utilized by growing some short duration crops like annual spices, vegetables, cereals etc. Growing different species of crops having different rooting habit will help in utilizing soil moisture and nutrients at different depths of soil. Hence, it is worthwhile to explore the possibilities of growing compatible crops with mango and there is urgent need to find out the suitable intercrops for mango. It requires weed free condition for a long period for better growth and production of fruits.

In this context, biofertilizers have been well accepted as economical, cost effective, renewable and safe organic source of plant nutrients to sustain crop productivity. At this juncture, it is realized that inoculation with good quality inoculants is a must and should be treated as an insurance against failure of nodulation. Fertilizers coming from fermented and decomposed organic materials are very nutritious safe fertilizer materials. They are both enriches the soil plant food nutrients, improves the texture for easier root growth and preserve the soil life such as beneficial bacteria and fungi. These natural fertilizers carry both plant food nutrients and microorganisms with pesticides, fungicides and nitrogen fixing property.

Intercropping is the growing of two or more crops together in proximity on the same land. As a result, two or more crops are managed at the same time. Mango fruit crop provides opportunities of utilizing the land spaces to its maximum, particularly during the initial years of establishment. Inter cropping during the first 3 to 4 years of mango plantation is reported to be commonly practiced. It is a simple and inexpensive strategy which has been recognized as a potentially benefited technology to increase crop production due to its substantial yield advantage than sole cropping (Awal et al., 2006). The demand
of food can probably be met through more intensive crop production with increase in productivity per unit area and time. Mango trees provide enough space even if they are fully grown as they do not cover much area. It is possible to grow a mixed fruit orchard, such as mango intercropped with other fruit crops, vegetables and spices during initial years of establishment. Intercropping in mango with suitable crops bring good income and improves the fertility of the soil. During the first few years, intercropping can be practiced with no shortage of irrigation. Intercropping of some vegetables and spices in plantation can be practiced if sufficient irrigation and manuring facilities are available.

In the state of Odisha massive area has been covered by the state government under mango cultivation by providing substantial input subsidies and motivating farmers. Although the farmers are getting planting materials in low cost from the government but still management of orchard during the initial years is not being practiced properly due to lack of awareness. In this context it is necessary to promote short duration and remunerative fruit crops like pineapple, spices like turmeric and ginger as intercrops which require partial shade for growth there by generating good return and better maintenance of the orchard during the initial years of mango plantation. During 2010-11 the total area under pineapple cultivation in Odisha was 819 hectare with an annual production of 10,493 metric tonnes. Ginger and turmeric two major spice crops are also grown in the state mostly in the district of Kandhamal, undivided Koraput and Mayurbhanj. The total area under cultivation of ginger in Odisha in 2010-11 was 17,117 hectare with an annual production of 1, 26,531 metric tonnes and area under turmeric production was 26,826 hectare with an annual production of 2,02,923 metric tonnes. Turmeric and ginger needs partial shed and mulching materials for better productivity.
The sustainable management of mango plantation need not only protection and reclamation of natural resources particularly soil and land, but also a scientific basis for the management in harmony with environment. These resources should be managed in a sustainable manner so that the changes proposed to meet the needs of development are brought out without diminishing the potential for their future use (Kanwar, 1994). Reddy and Ratnakar (1993) reported that 53.33 % of mango growers of Khammam district of Andhra Pradesh adopted inter cultivation. The practice of organic manuring and plant protection measures was observed with 37.50% and 18.33% of respondents, respectively. Plant architecture allows one intercrop to capture sunlight that would not otherwise be available to others. For intercropping with the main crop, planning should involve selection of crop species, appropriate cultivars, water availability, plant populations timely planting, proper fertilization, pest and disease control requirements throughout the season, tillage requirements and predicted profitability.

Keeping the above points in view, the present investigation was undertaken with the following objectives:

i) To study the effect of intercrops on yield and quality attributes of mango cv. Amrapali.

ii) To find out the best compatible intercrop with Amrapali mango.

iii) To study the pattern of fruit growth and quality attributes with and without application of biofertilizers.

iv) To analyze the benefit cost ratio.