CHAPTER II
In a country with limited resources, where the nutrition level of population has to be maintained under inhospitable situations, Potato can play a vital role in augmenting our food resources for a considerable extent. As a source of human energy, no agriculture crop can compete with Potato in respect of per day per unit area production.

In India Potato covers about 825.5 thousand hectare area with a production of 12,731.4 million tonnes (A.S.I. 1988) and thus occupy a very important role in economy of our country. The average yield /hac. in India is 152.1 Quantal. However, the gap between the average yield of Potato in advanced countries and that of India is too great. Therefore, there is a tremendous scope of increasing Potato yield in India provided the farmers adopt efficient management practices and use healthy seed potatoes of proven varieties.

Uttar Pradesh has got highest acreage under Potato when compared to other states. The plains of U.P. enjoy the greatest advantage, planting time can be extended from mid September to mid January i.e. for about 4 months. It has been established that fluctuations of metrological factors within any one climatezone together with variation in cultivation measures, affects Potato plant more than in
other crop (Goncarik, 1961). Variation in planting within the same year cause variation in factors like temperature, humidity rainfall, day length etc, which ultimately affects the Potato yield.

Turmeric and Zinger are important commercial root crops grown in different parts of the world, chiefly in tropics. The practice of intercropping is important especially Ginger and turmeric because the initial growth of Ginger and turmeric is rather very slow. Hence the space between the roots Ginger and turmeric could be efficiently be utilized by growing some short duration crops like vegetables, cereals and pulses. Earlier work done at coimbatore had indicated that turmeric-onion combination was the most profitable and viable cropping system (A.O.A.C.1960). Digiraj (1975) has indicated that the highest additional return was obtained when french bean was grown as intercrop followed by radish and turmeric. Sekar and Muthuswami (1985) reported that among the different intercropping systems, Turmeric-fenugreek-onion combination was found to be best treatment in net return (Rs.9,850/hac) and return per rupee invested (2.92). It was due to higher turmeric yield and high grain yield of fenugreek and high onion yield. Least return was reported in Turmeric-radish combination.
Umate et al., 1984 studied the performance of seven turmeric varieties and recorded the highest yield of 334.7 quantal/hac. from 'Rajapuri' clone. On the other hand Amala puram clone yielded lowest (121.10 Q/hac.).

Philip and Nair (1983) by using 19 turmeric types, recorded the maximum yield of green turmeric in 'Chayapasupa' (500.86 Q/hac.) type, whereas maximum yield of cured produce per hectare was recorded in 'Mannuthy vocal' (85.58 Q/hac.). Plant height, number of leaves per tiller, length of finger and girth of mother rhizome were positively correlated with the yield whereas number of tillers per plant and number of leaves/plant showed no correlation. Philip (1983) recorded the maximum yield of green turmeric from Armoor clone among 32 promising types where as the aromatic types 'Dindrigam' and 'Amalapuram' recorded comparatively high curing percentage and high yield of cured produce per hectare. Rao (1979) recorded higher yield from 'Mannuthy local' than the clone 'Kodur'.

India is the largest producer and exporter of turmeric in the world and it plays a promising role in the national economy. Among the spices it ranks 4th with regards to the foreign exchange earning next to black pepper, Cardamom and ginger. Among the agronomic factors, nitrogen plays direct influence on yield and yield components of turmeric.
Umate et al. (1984) obtained the highest yield of fresh turmeric by the application of 120 kg nitrogen per hectare and further increase in nitrogen dose decreased the yield. They observed that major factors contributing to yield in turmeric are the variety of crops grown and the nutrition. Ashokan and Radhakrishnan (1979) were of the opinion that nitrogen and varieties have significant effect on the yield and yield supporting characteristic in tomato. But other conditions should be suitable.

Murlidharan and Balakrishna (1972) reported that a dose of 100 kg N/ha (1972) was recorded sufficient for production of the maximum yield. Rao (1975) and Ramrao and Reddy (1977) have reported better response to higher dose of 189.0 and 312.5 kg N/ha which yielded economic production.

Shah and Muthuswami (1981) conducted a trial consisting of 4 nitrogen levels (30, 60, 90 and 120 kg N/ha) and obtained the maximum yield of 26.7 t/ha from 120 kg nitrogen/ha. In other experiment with 5 nitrogen levels they recorded the highest yield of 22.91 t/ha by 160 kg N/ha and further increase in nitrogen cause reduction in yield. Nitrogen was recorded useful for growth and yield.

Dhanwar and Varde (1980) conducted an experiment of 15 selected clones of turmeric under Goa conditions. Maximum yield of fresh rhizome was recorded by the clone '2-'
and the lowest in 3-D. The maximum rhizome girth was found in '9-A' clone and the lower in 24-D.

Ginger is one of the important spices which earns substantial foreign exchange. India still remains as the largest producer and exporter of ginger in the world. Ginger has much potential in the world market provided we are able to market quality produce at reasonable prices.

Planting dates of planting plays an important role on growth, yield and quality of ginger. Sreekumar et al. (1981) planted ginger on three dates i.e. mid January end of January and mid February. They recorded the highest rhizome yield from the crop planted on the end of January and lowest from mid January planting. On the other hand, maximum rhizome weight was recorded from the crop planted on mid February and the least from the mid January planted crop.

Nybe and Nair (1980) grown 25 ginger types and reported that type 'Bajpai' produced the longest primary as well as secondary fingers. Thingpuri produced the shortest primary fingers with the lowest number and valluranad had the shortest secondary fingers. Type wyned Kunnamangalam produced maximum number of tillers/plant. Type valluranad and chernad were on par but significantly taller than the rest.
Lee et al. (1981) reported that the nitrogen applications of 50, 100, 125 kg/ha were tried in ginger crops and found that optimum dose of 50, 100, 125 kg/ha were tried in ginger crops and found that optimum dose of 50 kg N/ha increased the growth and yield. Achar et al. (1984) reported that the basal doses of 50, 60 kg N plus 25 kg P₂O₅/ha gave the maximum yield of rhizome i.e. 112.8 Q/ha.

Ganpat and Gonzases (1975) reported that planting, weed control, manuring, irrigation, crop protection and harvesting etc. factors were responsible for higher yield of ginger. Timpo (1982) compared two local cultivars of ginger i.e. pale yellow and red with various size and weight of rhizome and found that the bigger size rhizome gave more yield than the smaller rhizome.

Fageria et al. (1972) observed that in the experiment during 3 seasons on a sandy loam soils with 3 N.P.K. levels i.e. 0, 50, 70 kg/ha for good yield of ginger.

Evensen et al. (1978) conducted a trial where they reported that ginger rhizome seeds germinated at constant soil temperature at 20, 25, 30 and 35°C and a significant quadratic relationship was observed between temperature and growth. The optimum temperature lying between 20 and 26°C.
Islam et al. (1982) reported that in different solutions culture experiments PH has no direct effects on ginger growth. Ginger was found to have a very low external calcium requirement. A subsequent pot experiment using eight virgin soils obtained from ginger farms showed that the PH optima for growth was broad but that micronutrient deficiencies, particularly copper and zinc, occurred at high PH values.

Mishra and Mishra (1982) reported that in trials of ginger, mulching with dried leaves or straw markedly suppressed the early weed growth and increased the crop emergence growth and yield. The yield without mulch was reduced by 42.8 per cent. Application of 2-4 D at 1 kg a./ha. or atrazine with mulching gave the highest yield and net returns.

Randhawa and Nandpuri (1972) reported that ginger was planted at 12 spacings ranging from 15 x 20 to 30 x 50 cm. The highest yield resulted from 20 x 20 and 20 x 30 cm spacing larger rhizome (150 gm with 4-6 buds) gave higher yields than small ones (60 gm with 2 buds).

Sree Kumar et al. (1981) reported that in 2 years trial seed rhizome of ginger Cv. Rio-de-Janeiro, were planted in mid or end of Jan. on flat ground in furrows of ridges or on raised beds and harvested after 6 months, the highest germination percentage was obtained with
planting the two later dates (Average 80 % ridge planting) which gave poor results with little difference between the other methods. Average weight of rhizome plant was highest with the latest planting date and best with ridge planting.

Shah and Mathaarswami (1981) reported that N as urea 100, 260 kg /ha applied in split doses at planting time of turmeric at 30, 50, 90 and 120 days interval, F.Y.M. was also applied at 100 quintals/ha Babu and Muthuswami (1984) reported that N 120 kg/ha and P$_2$O$_5$ at 60 kg per ha. were applied as basal dressing and K$_2$O was applied as 180 kg/ha in ginger crops.

Anjaneyulu and Krishnamurthy (1979) reported that in 3 year trial, seed material of whole or cut turmeric mother rhizomes or primary finger rhizomes was planted by the ridges furrow method 30, 45, or 60 cm between rows with 22.5 or 30 cm in row spacing yield were highest from plants with whole mother rhizomes. Ponnuwami and Muthuswami (1983) reported that in trials with the turmeric cv. Erode local plants were spaced at 30 x 20, 60 x 20, or 75 x 20 cm. The highest number of mother rhizome (25.3) per mum plant and yield per 4 x 4 m plot (20.91) were obtained from plants spaced at 45 x 20 mm.
In the nutritional trials conducted on various crops, Singh and Tewari (1968) observed the nitrogen applied at the rate of 75 kg/ha exhibited all round superiority for effecting the growth of plant and yield on onion bulb. Singh and Jain (1959) conducted N.P.K. trials on onion during 1961–62 N at the rate of 84, 168 and 252 kg/ha significantly increased bulb yield as compared with control. Bhuiya et al. (1974) reported that the positive response of onion to N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O which were applied separately and in all concentrations at 56.05 kg/ha. Singh (1978) reported that onion cv. Pusa red showed a significant response to N, P and K. The highest yield 260.4 Q/ha was obtained with N and P<sub>2</sub>O<sub>5</sub> at 112.5, 196.9 kg/ha.

Mangual et al. (1979) reported that effects of row spacing at 30, 38, 45, 60 and 90 cm and of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O each at 111 or 222 kg/ha were studied at two localities. Onion yield were 22.30 t/ha at furthana and 25.78 t/ha at Lajas, also with the 30 cm spacing.

Pankov and Pavlova (1984) reported that in onion trial in container and field trials, P deficiency limited plant growth and productivity. However, dry matter, sugar and vitamin 'c' contents rose under light P deficiency but decreased under severe deficiency. Ca was low but K was high in P deficient leaves. Maurya and Lal (1975) observed that boron was added 0, 1, 2 and 3 ppm to poona red onions grown in sand cultures. The
1 ppm rate gave the best response in terms of leaf and root numbers and dry weight of plant height was greatest in response to 2 ppm.

Singh et al. (1974) observed that Onion bulb were planted 10–40 cm apart in rows 30 cm apart at 3 weekly intervals between 1st Oct. and 12th Nov. Total seed yields were highest at the closest spacing with the 2 early planting dates. Seed yield/plant were the highest with a wide spacing, close spacing and late planting reduced seed numbers plant. While assessing the crop yield of Onion. Madan and Saindhi (1984) reported that in 2 years trials with the cv. Punjab. = 48 large and medium Onion bulbs (5 & 3 cm in diameter), planted at 30 or 45 cm between rows, received N at 100, 150 or 200 kg/ha.

Povule (1972) reported that the best treatments of horse radish was a single application of N 240 kg/ha in the spring rather than 2 split application of 120 kg/ha. The treatments reduced the cellulose content in 2 years old roots by Upto 12.59 per cent and increased the production of marketable roots by 8.3 per cent.

Om and Srivastava (1974) while conducting research work on garlic reported that three levels each of N, P and K i.e. 0,75 and 150 kg/ha of Potash in all 27 possible combinations at Chaubattia showed that 75 kg N per hectare exhibited its alround superiority in affecting the height of
the plant, number of leaves, diameter of plant, size of bulb, number of cloves and yield of bulb.

Timpo and Oduro (1977) observed that ginger storage of seed piece for 0, 21, 35 and 42 days showed that the number of days needed to germination were decreased with the length of storage, while percentage germination and yield of fresh rhizome was increased. Shipway and Parkin (1985) observed that a direct harvesting and store dying system produced a premium quality onions in this industry. They reported a high level of store management to reduce a computer controlled unit. It has been developed to monitor and central store environment.

Elkner et al. (1983) found that onion bulbs harvested over 3 years on dates between early August and late September were stored until May. However, the bulbs harvested in mid and late August had the best quality high contents of dry matters and total reducing sugars, which decreased as the harvest date was delayed. Singh and Singh (1973) reported that onion bulbs cvs. Punjab selection and Nasik white were stored in wooden boxes at room temperature on the ground raised on bricks or they were stored at 33.5-35° and the effects were assessed at intervals up to 150 days in cold storage.
Bottcher and Kolbe (1975) reported that the increasing levels of K fertilizers reduced the amount of sprouting of onions, kept in normal storage conditions for 5 months.

In garlic Bartos and Rao (1985) reported the changes in the dry matter content, quality grade and weight of marketable produce. The best storage quality as shown by the spring cv. Japo, the other spring cv. Prim gave poorer results and in the winter cv. labsky was unsuitable for long term storage in the investigations.

It is evident from the above review that many aspects have been covered in a meagre research work. Mostly they are fragmented ones. Therefore, the present investigations have been taken up to have the information on the various crops in different conditions.