CHAPTER V

DISCUSSION
DISCUSSION

The result of the present study is discussed in this chapter under the following headings.

5.1 Growth and instability of potato
5.2 Cultivation aspect of potato
5.3 Resource use efficiency, Allocation Efficiency and Technical Efficiency of Potato
5.4 Marketing channels and price spread
5.5 Opinion survey of production on production and marketing of potato
5.6 Growth and trade direction of potato export
5.7 Behaviour of arrivals and price in Hassan and Bangalore market

5.1. GROWTH AND INSTABILITY:

5.1.1. Growth Performance of Potato:

Potato production in India has increased from 4.8 million tonnes in 1970-71 to 24.08 tonnes in 2001-02. India is now the world’s third largest producer of the potato in terms of both area (1.23 million hector) and production. In spite of this, potato is grown in almost all states of India under diverse climate conditions.
Karnataka is one of the major potato producing states of India. Area and production increased from 5300 hecter in 1950-51 to 39.60 thousand ha during 2001-02. The major potato growing districts are Bangalore, Belgaum, Chikmagalure, Dharwad, Hassan and Kolar.

Hassan district is the leading potato growing district of Karnataka. This district alone contributes more than 40 percent to total production in Karnataka.

The result of the performance of this crop is presented in three levels, country as a whole, Karnataka as a whole and Hassan district as a whole specified in terms of area, production and productivity are discussed as follows.

At country level the growth in production increased significantly in major states except Bihar and West Bengal at different significant level during the period mainly due to considerable increase area as well as yield. The result is in close agreement with Hosmani et al.[2000]. In that study new cultivation of potato in Karnataka is not just remunerative. It helps to maintain and improve soil fertility and productivity without any repercussion on environment. The analysis revealed that the growth rate of the area under the potato crop also increased significantly in almost all states. The growth rate was 1.58 for country as a whole. The figure (4.01) also confirmed that the trends in area increasing trend over the last three decades in country level.
The rapid expansion of area and increase in production of potato was also due to its flexibility in times of planting and harvesting, its adaptability in diverse agro climatic condition, its relatively high remunerative prices which are as good as other vegetable crops initiating farmers to allocate more land for potato production.

The state and district wise long term trends in productivity were positives and significant [table 4.3&4.4 ] and showed a mild increasing trend in all the states during the period (fig.4.01 to 4.06 ). This might be due to the efforts of the potato research projects at national and state level in improving productivity of the potato over years. Availability of true potato seeds minimizes the incidence of soil borne diseases and availability of package of practices. Sharma et al [1988] found similar results where growth in yield of potato, wheat and rice with negative growth rate during pre-green revolution period increased significantly during post green revolution periods in India. Although the positive and significantly increased in the growth rate of productivity for all states and country as a whole encouraging, the need for more efforts in stabilizing and improving the productivity of potato at states and country level.

The significant growth rate of production was quite impressive at country as a whole.[5.48%] during the study period. The increase in demand for potato consumption, better prices, relatively higher income with improved management practices and production technology in recent years may encourage the growth in potato production.
For most of the states the area under potato increased significantly during the period as it was portrayed in table 4.3 and fig 4.1 the growth rate for area was highest in West Bengal [5.08] followed by Assam [4.23], Karnataka [4.13], M.P [3.74] and UP [3.13]. On the contrary productivity of the crop showed positive but insignificant growth rate during the study period. This might be due to the preponderant dependence of agriculture on weather, poor quality seed supply, inadequate control of pests and diseases, the high cost of inputs and high post harvest losses.

All the states showed a positive and highly significant growth rates in production during the period. This might be because of the introduction of high yielding varieties like 'kufri chandramukhi', kufri jothi' etc in the seventies. This is also due to its agronomic flexibility, good remunerative prices, and wider market availability, better utilization of fertilizer and plant protection chemicals.

In general, it is clearly evident that farmers of the country have expanded area under potato significantly and for which its production has increased to a significant extent during the entire period. Although the growth rate for productivity is comparatively lower than area and production in country as a whole.

At state level also the growth performance of potato increased significantly during the period. As like country production of potato increased significantly in the period mainly due to considerable increased
in area as well as yield. The analysis revealed that growth rate in production was 5.42 percent in the state as a whole. (table 4.4 fig 4.3)

Area also increased significantly at 4.17 percent per annum in the state which is comparatively higher than country as a whole. Higher income yielding influence the farmers to extend area on this crop. Productivity level also comparatively better in Karnataka which is 2.56 percent per annum. For most of the districts except Chikmagalure the area under potato increased significantly during the period [table 4.3 fig 4.3). The growth rate for area was highest in Dharwad District [7.04], Followed by Belgum [6.35], Kolar [4.8] and Hassan [4.07].

Growth rate in production also increased significantly in all the districts. This growth rate was higher in Dharwad [10.44] followed by Hassan [7.62], Kolar [5.67] and Belgaum [4.68].(table 4.5 fig 4.6)

As country as a whole C.G.R for productivity also comparatively lower than area production in all the districts of the state.[table 4.5] [fig 4.5]. Higher dependence of weather, lack of technical knowledge might be the reason for this slow growth

From the above discussion it is clear that as country as a whole, growth performance was significant for area, production and productivity during the period in the state.
In case of Hassan district as a whole, growth performance was increased significantly in all the taluks except Arkalgodu and Channarayapatna. In this district also growth rate in production [7.22] was higher than area [4.07] and yield [3.10].

The growth rate for area was highest in Alur [11.89] taluk followed by Belur[9.68], Holenassipur [6.01] and Hassan [5.44], while in case for production also growth rate is higher in Alur (15.16) followed by Belur (13.21) and Arsikere taluks.

As country level and state level growth of yield was comparatively lower [3.10%] than area [4.07] and production [7.22] in district as a whole, it is also same for all the taluks.

Form the foregoing analysis it is clear that the growth rate of production increased with high significance compared to area and yield both in country as a whole, state as a whole and district as a whole during the study period.

Better prices, relatively higher income with improved management practices and production technology in recent year may encourage the growth in potato production. Area under potato also increased significantly in the country. It shows high level of yielding and good price would influence the farmers to expand the area for potato. While considering yielding, it is also increasing slowly; it really is a happy matter though has to concentrate to increase the yield level in the country as a whole.
5.1.2. Instability in the production of Potato:

In this section the instability of the potato crop is discussed at both country, state and also at district level. The discussion is based on the Hazels decomposition analysis. As a prelude to the analysis of instability in the production, the sources of change in mean production are also examined.

Sources contributing to the change in average production of potato:

An attempt is made to discuss the results of analysis in respect of potato in country wise, states as whole and district as a whole.

The results indicated that change in the mean area was the major component (49.17 percentage ) contributing to the increase in average production of Potato followed by changes in mean yield ( 31.62 % ) and Interaction ( 19.67 %) during in the period in the country.

The increase in area levels of potato was the main responsible factor in all states of the country. Similarly Sharma and Malhotra (1988) reported the same findings where area variability was more in crop like tobacco, sugarcane, potato and jute compared to variability in yield in most of the states under study.

As regards to individual states change in the mean area cause to change in the production of potato in all states of India during the study period. Change in mean area was highest in West Bengal followed by Uttar
Pradesh, Bihar and Punjab. Utter Pradesh is the major potato growing state which stands first in production of potato. In this state yield level was comparatively higher than in other states. Change in mean yield and change in mean area almost both together contribute came to increase the production in the state. Introduction of new quality of seeds, good fertilizers technology of scientific cultivation method would help to increase the yield level in this state. In remaining states including Karnataka change in mean area contributes more than change in yield level.

In Karnataka also change in the mean area is the cause to change in production level. Area contributes 52.39 percent yield contributes 23.11 percent and the Interaction was 24.36 percent. Mean yield and Interaction were marginally and almost equally contributed for the increase in the Variance of potato production at state level. Similar results were provided by Singh and Mathur (1978) at all Indian level as it was opined that potato production was unstable in nature but instability was relatively higher in the states where the production of potato increased at a faster pace during 167-68 to 1984-85.

However, their finding that the fluctuation in yield constituted as the major sources of instability than interaction in most of the states was in sharp contrast to the findings of the present study. Similarly Sharma and Malhotra (1988) reported the same findings where area variability was more in crops like tobacco, sugar cane, potato and jute compared to
variability in yield in most of the states under the study. But Veena’s findings revealed that change in yield variance has contributed more towards increased variation in the state followed by change in mean area under horticultural crops where incongruence with the present results regarding potato production.

The high instability in variable of yield in potato has resulted in the increased instability in its production at state level. This stresses the need for the adoption of yield stabilizing policies in the state. The reasons for the increased instability of production variance could be the erratic nature of monsoon rainfall, availability of improved varieties resistant to diseases like potato late blight and variation in input supply.

It is worth mentioning that the major producing districts of potato (Hassan, Dharwad, Kolar, Belgaum) have contributed more towards the increased mean yield and yield variance in the state. Similarly Hassan, Belgaum and Dharwad districts which have registered high growth rates of production (table 4.51) accounted for large share in increased variability in production at state level. Hence it can be said that in most of districts a growth and variability in production are complementary rather than competitive.

Change in mean area contributed considerably to the total increased production in all the districts except Chikmagalure. Change in mean yield considerably contributed to the increased instability of production in all
district of the state expect Chikmagalure. Similar results were obtained in Orissa by Behura et al (1995) indicating that area under potato crop and productivity had been bringing instability in production in almost all districts. This calls for yield stabilizing policies such as stable price policies, extension and efficient management of irrigation development and adoption of less risky technology and assured timely application of farm inputs needs to be supplemented in order to increase potato production at state and district as a whole in view of maximum variability of yield. The sources of change in the variance of production in the other districts were found to be negligible account indicating that the sample districts of Hassan, Dharwad, Kolar, Belgaum, Chikmagalure were all in all are representative and responsible for the increased in production as well as its instability in the state. This is quite in line with the result reported by Veena (1996) that all the above mentioned districts are specialized in potato production.

Hassan District contributes more to total production of potato in Karnataka. In this district also change in mean area contributes more to change in the production. Here also variability in yield response to increase instability in total production in the district as a whole.

Change in mean area was highest in Hassan taluk (41.79) followed by Alur (9.84) and Belur taluk. It was interesting in Hassan taluk, change in area was positive (41.79%) while yield (-0.14) and interaction (-0.11) was negative.
5.2. CULTIVATION ASPECTS OF POTATO AND RAGI:

5.2.1. Analysis of Input Output and Cost Return Structure:

The results of the cost and return analysis presented separately for Small, Medium, Large And Pooled category farmers in both Rainfed and Irrigated condition are discussed in this section.

The results showed in Table 4.9 to 4.24 indicated that cost of cultivation was highest Rs.11784.19 for Large farmers, followed by Medium (Rs. 11383.43) and Small Irrigated (Rs.11234.24) category of farmers. Total cost also was the highest for large farmer in both crops which have growth in both irrigated and rainfed condition. This indicates the positive relationship between the size of holdings and costs aspect. It means that costs would raise as for increase the size of holdings.

The marketing cost also high for large Irrigated farmers (Rs.2207.89/acre)followed by Medium (Rs.1773.62 acre) and Small farmer Rs. (1531.31 / acre). Large farmers grow comparatively large amount of potato, while they are selling their product in Bangalore, Puna, Bombay, Markets to get more profit. Because of this their cost for marketing comparatively was higher than other two categories of farmers.

The cost of seeds for potato was highest for both categories of farmers while it is 27.54 percent for Irrigated pooled categories and
33.22 percent for rainfed pooled category. For individual category it was highest for both categories of small farmers.

A study conducted by Shashidar (1987) also found that cost of seeds was (27.53% of the total cost of cultivation) the major item of cost among all categories of farmers.

Cost of fertilizer was another important item which occupied 11.19 percent (irrigated pooled) and 11.99 percent (rain-pooled) in the total production cost. Irrigated farmers used 4.12 qtal of NPK which costs to Rs. 1492.27, while it is 3.34 qtal. (Rs 1282.09) for rainfed farmers. It means irrigated farmers used more fertilizer compared to rainfed farmers. In case of individuals, large farmers used more fertilizers compared to medium and small farmers in both irrigated and rainfed farmers.

Another important item was cost of human labour and bullock labour. On an irrigated average producer employed 37 Man days of human labour and 6 pairdays of bullock labour per acre. While it is 34 mandays 6 pairdays for rainfed farmers. These items together cost Rs. 2182.27 (15.73%) for irrigated potato. Arunkumar et al (1980) found that the cost of human and bullock labour together accounted for 23 percent of the total cost of production of potato. Shashi Kumar (1987) found that the human labour and bullock labour together accounted for 28 percent of the total cost of production of potato.
It was observed that the irrigated average producers spent Rs 1234.35 (9.26%) for farm yard manure, while it is Rs. 1105.65 (10.34%) for rainfed farmers. In case of irrigated farmers small producers comparatively uses more quantity of Farm yard manure, compared to other categories of farmers.

Potato crop is highly susceptible to pests and diseases. Irrigated producers in general, spent Rs. 718.8 (5.39%) on PPC and pesticides per acre while rainfed farmers spent Rs. 405.84 for pesticides. Irrigated farmers use comparatively more PPC than rainfed farmers.

Irrigation cost is also one of the important costs for irrigated farmers. They spend Rs. 1119.82 (8.40%) for irrigation purpose. In case of individual categories large farmers spent more money on irrigation Rs.1260 (9.0) compared to other two categories.

Potato growers also spent money on Humus (mud). No studies are considered in this aspect. They spend Rs. 362.44 (2.72%) for Humus per acre.

The average yield of potato per acre was 42.44 quintal 44.12 quintals and 44.82qtl for small, medium large and pooled categories of irrigated-farmers respectively, while it is 3.132 quintal, 33.98 quintal, and 33.79 quintals per are for rainfed farmers. The yield level is different for different categories of farmers who grow in both Irrigated and rainfed condition.
Irrigated farmers are getting more yields compared to rainfed farmers, because they are using comparatively more inputs and irrigation in time to time. As compared to individual categories large farmers are getting higher yield than other two categories in both irrigated and rainfed farmers.

The findings of the study indicated that gross and net income per acre of potato increased as area under the crop increased. It was also observed that the cost of cultivation including the marketing cost also showed an increasing trend as the area under potato increased. So, it could be inferred that large producers, were not only efficient in production but also in marketing their potato as compared to small and medium producers, who grow potato in both condition. On average large producers received higher prices of Rs. 488.73 per quintal. This was mainly due to the fact that large producers sold major portion of their produce in Bangalore market for a relatively higher prices. Thus, the difference in the net income received by different categories of potato producers was due to differences in yield per acre and also the prices received.

Ramanna et al (1973) found that, the per acre net returns obtained from potato crop was Rs. 1379.03 and from maize it was Rs. 1198.40. They concluded that production of potato was risky and capital intensive as compared to maize. Arunkumar (1976) found that the net return per acre of potato was Rs. 1734.65 shashi kumar (1987) found that the net return per acre of potato was Rs. 2.288.82.
From the above analysis it is confirmed that cost of cultivation of potato was comparatively higher (Rs. 11494.47) for average Irrigated farmers than rainfed (Rs.9299.08) farmers. Yield level also was more for irrigated farmers compare to rain fed farmers. In case of individual categories large farmers invest more and also get more from potato cultivation (both irrigated-rainfed). Costs and returns increased as per increase in the size of holdings. From this it is clear that Irrigated farmers gain more from potato cultivation compared to rain fed farmers.

As compared to ragi the total cost of cultivation was Rs.3466.95 and Rs. 2664.51 respectively for Irrigated farmers and rainfed average farmers.

For ragi crop human labour and bullock labour were the major item of cost, which both together account for Rs. 1792 and 51.69 percent . For irrigated average farmers Rs1640 and 61.54 percent to rainfed farmers. Irrigation would come next to this, which accounts for 17.69 percent for irrigated farmers.

Farm yard manure was also one of the important items which cost Rs. 434.35 (13%) per acre for irrigated farmers and Rs. 487.50 (18.29%) for rainfed average farmers. In case of individual categories cost was comparatively high for large farmers in both categories.

The average yield of ragi was 11.15 quintal for 3.23 average categories of irrigated farmers and 7.73 quintal for rainfed farmers.
By product were cart load for average categories of irrigated farmers and 2.56 cartload for rainfed farmers.

The net income received by Irrigated-farmers (Rs.1867.59) comparatively higher than rain fed farmers (Rs.1103.47). In case of individual farmers large farmers get more benefit compared to other categories that grows in both conditions.

The findings of the study indicated that gross and net income per acre was comparatively higher for potato crop than ragi. Potato growers get nearly 1.44 times more net income than ragi. Irrigated farmers benefit was comparatively higher than rainfed farmers.

It is observe from the above analysis of costs and returns that the cultivation of potato is decidedly more remunerative than the cultivation of ragi. However, while taking decisions about producing the potato and also the area to be allocated, the farmers have to consider other factors like availability of capital and inputs, distribution of rainfed technical know-how and marketing facilities. Potato cultivation required managerial ability of a relatively higher order besides a considerable amount of capital as compared to ragi under irrigated conditions.

5.3.1. Resource Productivity in Potato Production:

In this section, the productivities of various resources used in the production potato and ragi in both Irrigated and rainfed condition are
discussed. The relationship between the yield from Irrigated potato farm and its determinates in the small, medium, large and pooled category producers are presented in tables.

The analysis of the resource productivity for irrigated potato produced by the pooled category producer indicated that Human Labour, Bullock labour, Pesticides contribute higher to production of potato, while Seeds and Farm Yard Manure shows the negative effect on the crop. In case of small farmers, land, human labour and irrigation contribute significant while, bullock labour, FYM and pesticides show negative effect. For medium farmers seeds and fertilizer contribute significantly. Incase of large farmers, human labour, bullock labour and plant protection chemicals, contribute more to potato production.

From the table it is clear that only a few inputs show significant effects of potato production for all categories of farmers. Many inputs show negative effects. It shows the over utilization of the inputs in case of Irrigated Potato.

The resource productivity for irrigated ragi for pooled categories of farmers indicated that seeds only contribute higher to production. For small farmer also seed only contributes significantly for production. Incase of medium and large farmers land, fertilizer and bullock labour contribute much to production.
The returns to scale were constant for almost all categories of farmers in both the crops while decreasing returns were observed for large and medium farms for irrigated ragi crop.

The variables selected for the study significantly explained 91 percent and 99 percent of the variations in production of irrigated potato and ragi crop respectively (table).

The results of resource productivity of rainfed farms for both categories are presented in tables. The table indicates that land and fertilizers contributes more to production of potato for pooled categories and medium category of farmers. In case of small farmers land and bullock labour contribute more to production. For large farmers seeds and fertilizers contribute more to production of rainfed potato.

In case of rainfed ragi crop, land and seeds contribute significantly for pooled category of farmers while it is only seeds for small categories of farmers. For medium and large farmers land, FYM, fertilizer and seeds, human labour contribute higher to production of rainfed ragi.

The sum of square or returns to scale were constant for both crops for small and pooled categories of farmers and show decreasing returns for both crops for medium and large rainfed farms.
The above analysis indicates that there are only a few inputs which show the higher significance. Most of inputs show the negative contribution. It means that most of the inputs are over used for both crops.

5.3.2. ALLOCATE EFFICIENCY:

The results of the marginal productivity analysis (table) for small irrigated and rainfed indicates that the ratios of MVP to MFC is positive for almost all factors but less that unity. It indicates the over use of factors in both categories of farms. Bullock labour pesticides and FYM shows a negative sign for irrigated farms which indicates the loss from additional rupee spent on these factors. The MVP to MFC is negative for FYM and fertilizer for rainfed crop.

For medium farmer MVP to MFC ratio was positive for all factors except FYM (irrigated farmers) human labour and pesticides (rainfed farmers)

For large farms MVP to MFC ratio was negative for both categories. It indicates that large farmers used excess of inputs compared to other two categories of farmers.

The MVP to MFC ratio was positive and non significant for pooled categories of the farmers. The ratio was negative for seeds, FYM, bullock labour and fertilizer.
The above discussion indicates that MVP an MFC ratio was almost positive for both categories of farmers. But it is below unity, which indicates the excess use of inputs. The ratio was negative for some inputs like, FYM seeds, Bullock labour in different categories of farmers, which indicate loss from additional rupee spent on these factors.

5.3.2.(a). Technical Efficiency:

The production function does not distinguish between the allocative efficiency and technical efficiency. Efficiency would be relevant when it is studied by taking the surrounding environment into consideration. Frontier production function is one such approach wherein the efficiency is studied on a relative basis. The farmers in a particular area are evaluated for their efficiency by comparing with the best in their group. This is done by shifting the intercept of the average Cobb-Douglas production function upwards to coincide with the most efficient farmer and the rest are compared with this. Both in terms of output and inputs. Thus, there is no absolute standard of efficiency. The assumption here is that a farmer may be inefficient because of certain constraints within the region.

In this study, farm specific technical efficiency was measured from the stochastic frontier production fitted separately for Irrigated and rainfed farmers.

The results (table) shows that the average level of technical efficiency appeared to be bit high in case of irrigated farms. Only
0.83 percent (1) farmer was below 40 percent efficiency. This implies that more than two thirds of the respondents had yield levels, which was more than 40 percent to 92.5 percent of farmers had achieved more than 70 percent of efficiency. Only 8 members (6.67%) would come under 40 to 70 percent efficiency level. In the irrigated farms, the efficiency levels were much better with all the farmers, more than 92.5 percent of the people achieved more than 70 percent of efficiency. It is natural that in the irrigated farms, the farmers care better for their crop because the choice of taking up potato under irrigated condition is motivated by the profitability of the crop.

The results show that the efficiency of the rainfed category was generally low; The average efficiency level was 0.87 for rainfed farmers while it is 0.88 for irrigated farms.

5.3.2.(b). Actual and Frontier Usage Of Inputs:

The KOPP measure of technical efficiency indicates the actual and frontier level of usage of every input used by the farmers. Frontier level is that level which the farmers would have used if they were located on the frontier. By comparing the two levels of extent of over use can be determined. If the efficiency of the farmers is higher, the percentage excess inputs are lower and vice versa.

It is found that the inputs like seeds, FYM and fertilizer were over used. There is scope for only human labour and plant protection chemical.
Farmers can extract these inputs up to 51.37 mandays and Rs.2.18 respectively for human labour and plant protection chemical.

5.3.3. Decomposition of Output Growth:

The results of decomposition of output growth were analyzed by using kalirajan model with the help of frontier production function.

The table shows the contribution of input growth, technology change and technical efficiency change for the output growth for potato. From the table it is clear that input growth contributes more for both irrigated and rainfed potato than Technology Change and Technical Efficiency changes.

Technology change was positive 1.80 percent for irrigated potato and negative for rainfed potato (-1.4%). While it is opposite in case of Technical Efficiency Change it is negative -12.02 for irrigated potato and positive 11.30 percent rainfed potato.

From this analysis it is clear that both irrigated and rainfed potato input growth contribute more it is 111.22 percent and 90.12 percent respectively for both irrigated and rainfed potato. For irrigated potato this input growth comparatively was higher than rainfed potato. It shows that use in more inputs would cause to increase the yield level. Technology change and technical efficiency change was very less.
The same result was found in the study of K.P. Kalirajan & R.T Shand (1997) for Indian Agriculture.

5.3.4. Logit Analysis:

It can be perceived from the table education, age, family, size and land holdings are considered as factors influencing on potato cultivation. From these factors land holding has a significant effect on the potato cultivation.

It means that increase in land holdings would help to increase the productivity. Age level education and family size are showed a negative influence on the cultivation of crop.

5.4. MARKETING OF POTATO:

5.4.1. Costs and returns of different market intermediaries:

5.4.1.(a). Village Level Traders:

During post harvest season of potato, village level traders visited the villages and purchased the produce. They transported the potato procured and marketed in different centers like Hassan and Bangalore.

On an average, these traders handled 2696.10 quintal of potato during the study period. They paid Rs 474.85 per quintal of potato to the farmers which was the lowest and sold at the price of Rs. 520.24 per quintal in various marketing centers. The cost of marketing per quintal
worked out to Rs. 12.48 including the value of wastage. They realized a net return of Rs. 32.91 per quintal. Thus on an average each village level trader earned a net profit of Rs. 32.91 per quintal during the study period.

5.4.1. (b). Commission Agents:

The Commission Agents play an important role in potato marketing. As indicated earlier they help the producers to store the produce, bargain for a better price and assured payments by the buyers.

On average commission agents in Hassan and Bangalore markets handled 6887.4 quintals and 8336.70 quintals respectively. The per quintal cost and net profit in Hassan market worked out to Rs. 5.68 and Rs. 15.95 respectively. In Bangalore market the per quintal cost and net profit accounted for Rs. 5.9 and Rs. 16.17 respectively. Commission agents of Bangalore market incurred a high cost per quintal and earned higher net profit per quintal as compared to those in Hassan market. This is because of the huge quantities they handle. It appears that the profit he made was really high for the service he rendered.

A study conducted by Pawar & Patil (1976) showed that in the marketing of sweet oranges the commission charged was 4.77 percent of the consumer rupee. A study by Lohar & Diskalkar (1979) also showed that the commission agent margin formed 11.31 percent in marketing of dry chillies. Shashi Kumar (1987) also showed that the commission agent margin formed 19.3 percent in the marketing of potato.
5.4.1.(c). Wholesalers:

The wholesalers formed the essential link between producers and Retailers in Hassan. In Hassan and Bangalore markets, the average quantity handled by each of them was 8642.2 quintals at Hassan and 96.29 at Bangalore during the study period. The cost of handling per quintal of potato worked out to Rs. 10.98 and Rs. 8.24 and the net returns per quintal realized by them was Rs. 17.25 and Rs. 19.16 at Hassan and Bangalore, respectively. This shows that the wholesalers at Bangalore were keeping higher margin than their counterparts at Hassan. The difference Rs. 1.91 in net return per quintal was due to high turnover and higher unit price in Bangalore market the margin were nearly 2 folds higher than their costs. There is a scope to reduce the margin of these intermediaries.

Gill and Johl (1969) found that in marketing of Gram the wholesaler’s margin ranged between 3.6 & 5.3 percent of the consumer rupee. Balwinder Sing and Sindu (1980) observed that in the potato trade the margin retained by primary and secondary wholesalers were 2.5 and 3.2 percent of the consumer rupee. Shashikumar (1987) found that in marketing of potato the wholesalers received a margin of 3.86 and 3.83 percent of the consumer rupee in Hassan and Bangalore markets respectively. The findings of these studies also uphold the observations of the present study.
5.4.1.(d). Retailers:

Retailers who sell potato in their established shops, handled relatively less quantity when compared to car vendors, they supplied potato mainly to individual consumers.

The average quantity handled by each retailer of Hassan and Bangalore during the study period was 23.80 quintals and 32.57 quintal respectively. The average cost incurred to handle a quintal of potato worked out Rs. 6.69 and Rs. 11.12 and the net return realized was Rs. 45.41 and Rs. 57.14 per quintal at Hassan and Bangalore respectively.

The net profit per quintal at Bangalore was higher (Rs 57.14) when compared to Hassan. Tyde & Patil (1981) revealed that the retailer's share in consumer rupee was 33 percent. Shashikumar (1987) also found that the retailers share in the consumer's rupee was 29 percent. In this study also it was found that retailers shared nearly 31 percent.

5.4.1.(e). Cart Vendors:

The Cart vendors owned or hired a four wheeler small cart. They purchased potatoes form the wholesalers in small quantities and along with other vegetables like onion, tomato, cabbage etc sell to consumer in residential areas.

In this study it was observed that on an average each cart vendor at Hassan and Bangalore handled 38.68qt and 47.67 quintal of potato and
incurred a total marketing cost of Rs. 389.89 and Rs. 542.87 respectively. The per quintal net profit worked out to Rs. 93.20 and Rs. 115.56 respectively.

5.4.2. Channels of Potato Marketing and Price Spread:

Potato producers of Hassan taluk adopted for various marketing channels to market their produce. The important marketing centre for these respondents was Bangalore and Hassan and also a considerable portion of the produce was sold in villages to village level traders.

Four marketing channels of potato have been identified and they are as follows.

Channel I – (Hassan)
Producer-commission agent-Retailer-Consumer.

Channel II- (Hassan)
Producer-Village level trader-Wholesaler-Retailer-Consumer.

Channel III (Hassan)
Producer -Commission Agents - Wholesaler-Retailer-Consumer

Channel IV (Bangalore)
Producer -Commission Agents-Wholesaler-Retailer-Consumer
The total quality of potato sold by the sample farmers was 75398 quintals (table 4.48) of this percent moved through the channel –I 39.30 percent through channel II 5.93 percent through channels and 12.4 percent through channel –IV 38.4. The remaining percent was marketed in others centers. Hence among these four channels, major portion of the produce was marked, especially in channel IV in Bangalore, most popular among the producers.

The price spread is one of the important measures of the market efficiency which indicates the share of produce in the consumer rupee. Besides this, it also indicates the share of various market intermediaries in the consumer rupee, for the services rendered by them in canalizing the commodity from the producer to the consumer.

The analysis of the price spread indicated that farmers who sold their potato through in channel-I in Hassan market, could realize 46.85 percent of per consumer rupee, with a net price of Rs. 483.75 per quintals. The remaining 23.15 percent was shared by the various marketing intermediaries. The retailer in this channel accounted for the largest share of the consumer rupee (16.33%) where as the consumer sale price was (629.50). The marketing cost accounted for percent of the consumer rupee. The costs incurred by commission agents and retailers allowed for 3.43 percent and 16.33 percent of it respectively.
In channel II of the Hassan market the produce's share in the consumer rupee (73.17%) which is relatively lower as compared to channel-I. The net price received by the producers was (Rs. 460.6) lower than that of channel -I market intermediaries in this channel share 26.83 percent of the consumer rupee. The marketing cost incurred by the producer accounted for 2.26 percent of the consumer rupee. In this channel the retailers accounted for the largest share in the consumer rupee (7.21%). Whereas village level trader share was 4.58 percent and wholesalers share was 2.74 percent in the consumer rupee.

In channel III of Hassan market the price spread analysis indicated that producers revived 76.85 percent of the consumer rupee which was equal to channel-I. Price received by the producer was Rs. 483.75. Marketing cost incurred by the farmers accounted 5.76 percent of the consumer rupee. In this channel also the retailer share was high as 7.21 percent.

In channel IV of Bangalore markets the price spread analysis indicated that producers received 75.69 percent of the consumer rupee which was next highest after I and III channel marketing cost incurred by the farmers amounted 6.26. Percent of the consumer rupee.

The gross margin of commission agent was 3.41 percent and of the wholesales was about 2.41 percent of the consumer rupee.
The price spread analysis indicated that the producers recovered the highest net price per quintal in Channel I and III. Hence it was the lowest in Channel II. Thus, farmers who sold potato to commission and wholesaler in Bangalore got the highest net price per quintal.

Thakur and Singh (1971) found that production of onion was getting 32 percent of consumer’s rupee. Chandrasekhar (1973) reported that the vegetable growers who marketed in Bangalore received only 53 percent of the consumer’s price and the wholesalers and net profit accounted for 6 percent and 26 percent of it respectively. Thus the findings of the present study are nearly in conformity with the findings of the other studies.

5.5. OPINION OF THE PRODUCERS ON PRODUCTION AND MARKETING OF POTATO:

The results on the problems faced by the producers of potato presented in the previous chapter being discussed as follows:

5.5.1. Problems in production of potato:

Nearly 95 percent of the farmers were of the opinion that the cost of seed was very high and the quality of seed tuber was also low. Hence to safeguard the interest of the producers, Government and co-operative Institutions must make suitable arrangements for the supply of good quality seed tubers at reasonable rates. State department of Horticulture
may take up the responsibility of obtaining disease free seed tubers from Shimla and Punjab areas and supply to farmers at reasonable prices.

Almost all the farmers expressed that prices of fertilizers were high and inadequate and in time rainfall. Most of farmers depend on rainfall. This untimely rainfall would effect adversely for the crop. High price for fertilizers is also has a major problem. Hence the state department of Horticulture should educate farmers on the importance of soil test and application of fertilizers based on the soil test rests. This would help in the economic use of fertilizers.

More than 60 percent of farmers expressed that the high incidence of pests and diseases. Since some of the diseases were seed borne. Supplying healthy seed tubers will minimize this problem to some extent. Also necessary arrangements may be made by the extension agencies to educate the farmer regarding the proper use of PPC.

Proper guidance related to cultivation aspect also is the major problem related to the cultivation. Most of farmers do not know proper cultivation methods. Nearly 70 percent people response no proper guidance from Government departments. If the dept gives proper guidance it would help to get higher yield. Insurance is also given for potato crop. But farmers are not getting perfect information related to crop insurance (small farmers) These are the major problems related to production of potato crop.
5.5.2. Problems of marketing of Potato:

Most of all farmers faced the problem of cold storage problems. There is no cold shortage for potato growers. One cold storage was there but it is used for seed potato and also cost of the storage was high Rs 130 for quintals of potato for three months. Proper and adequate storage facility would help the producers to avoid possible losses due to storing in unscientific manner. Cold storage would help the farmers to protect both quantity and quality potato and also distress selling.

Nearly 70 percent of the respondents felt that fear of price fall and immediate need for cash were also the reasons for selling the potato immediately after harvest.

Almost all the potato producers express that the cost of transporting potato to distant markets like Bangalore, Puna was very high. The cost of transport accounted for 15 percent of the total marketing cost.

The producer of potato (nearly 95%) was of the opinion that the present commission charges of 5 percent was too high as compared to the service rendered by them. However, the recent Government policy direct the commission agents to collect the commission charges from the buyers. But these commission agents were collected from both producers and commission agents. This would cost produce percent in marketing cost.
Fluctuations in the price level are also one of the major problems faced by potato producer. All the producers are facing these problems.

The above discussion indicates that potato production was faced with the number of problems in production and marketing. Hence, every effort should be made by the government and state department like Horticulture, Marketing and Co-operation to protect

5.6. GROWTH AND TRADE DIRECTION OF POTATO EXPORT:

5.6.1. Growth Rate of potato export:

Compound growth rate for potato export shows a positive significance for both export quantity (5.14%) and expect value (4.64%). This growth rate shows the increasing trend in potato export. LPG policy and establishment of WTO had created more opportunity for our potato globally. There is more opportunity for potato export. Production is also going on increasing trend. The problem is proper storage. With using new technology we can expand our export.

5.6.2. Direction of Trade and changing pattern of exports:

The export promotion policy of a country must be in tune with the fast changing and dynamic international markets for commodities. Hence it would be of interest to document the changes that perhaps aid in export promotion policies. Though it would be difficult to pinpoint the nature of these changes and its directions. Markov chin analysis provides a
probability approach in broadly unraveling the changes. Estimation of transitional probability matrix is central to Markov Chain analysis. It indicates the direction of the changes which helps to decide whether the changes are on the desirable directions or if changes are needed to boost sales to a particular market.

The direction trade in potato export from India was studied using Markov Chain analysis. The probability of market retention, gain or loss is based on the Transitional Probability Matrices presented in the table.

The results revealed that UAE and Srilanka are extremely loyal markets for Indian potato exports as indicated by diagonal element values of 0.3541 and 0.9821. Sri Lanka retained 98.21 percent of its share in addition to gaining 63.14 percent of other countries share. UAE gained 21.72 percent of Nepal and 13.14 percent from Mauritius share in addition to retaining 34.51 percent of its share in Indian potato export. Nepal, Singapore and Malaysia could not retain their share of Indian export. However Nepal gained 43.06 percent from UAE and 14.21 from other countries. Singapore gained 3.90 percent from Mauritius and lost 100 percent of its share to other countries while Malaysia gained 6.47 percent from UAE during the same period. Mauritius in addition to retaining 1.41 percent of its export share also engulfed 23.86 percent of Nepal and 100 percent Malaysia share of India Potato export. Thus it may be concluded that Srilanka and UAE are very loyal markets for Indian potato which may
be due to similar culture and consumption pattern of large migrated Indian population to these countries.

5.7. BEHAVIOR OF PRICES OF POTATO:

5.7.1. Box Jenkins Model:

ARIMA model is an extrapolation method that requires only historical times series data on the variable under study. The box- Jenkins approaches primarily make use of three types of filters; the auto regression the integration and the moving average filter. Indeed, finding the number and the nature of the filters is equivalent of finding the structure, identifying the form and constructing the model for the series. The box Jenkins model provides a verified approach for identifying which filters most appropriate for the series being analyzed for diagnosing the accuracy and reliability of the models that have been estimated and lastly for forecasting.

The singular advantage of this model lies on its ability to quantify random variation that exists in many economic time series data. Box – Jenkins model is a more precise forecasting tool as compared with any trend forecasting tools. Trend forecast is not reliable and precise owning to non-stationary of the series. Hence the monthly average wholesale prices of potato in Hassan and the Bangalore during 1980 to 2005 were subjected to an iterative ARIMA process in order to explain its behaviour.
Since ARIMA models used only to stationary series, there was a need to change the non-stationary series into stationary series by applying the appropriate order of differencing to the series. Applying logarithmic transformation of the series, also effectively stabilized the multiplicative seasonal components exhibited in the series. Therefore the autocorrelation and partial autocorrelation coefficients of the working series were computed and confirmed the absence of the trend component in the series. An examination of all such tables revealed that this is justified by the autocorrelation function of the series dropping to 2 in 1 Hassan and for Bangalore.

In all the cases, the autocorrelation functions (ACF) were turned out to be significant at 95% probability level at fixed interval between lag $K$ and lag $K-1$ indicating the presence of seasonality component of 12 months. However, it is heartening to note that in some cases significant coefficients were also noticed at creating other lags due to spurious correlation coefficients. As a result those coefficients were excluded from the proceeding analysis. Therefore, the seasonal ARIMA model was found to be the most appropriate one among the classes of the model on account of the presence of a marked seasonality component in all the wholesale price series of all the markets under study.

The details of the ARIMA models are present in the methodology chapter in accordance with the four interrelated stages of model
development. Hence, these four stages of box Jenkins models are discussed with respect to potato prices for Hassan and Bangalore District.

Identification is concerned with deciding the appropriate values of p,d,q,P,D and Q. It is done through the use of autocorrelation and partial autocorrelation functions. The auto correlation function (ACF) helps in choosing the appropriate values for order of moving average terms (MA) and partial autocorrelation function (PACF) for those autogressive ACF determines order of MA terms and a number of non-zero coefficient in PACF Plots determines order or AR terms.

The seasonal nature of the series is determined by the significance of coefficients at lag 12 of the autocorrelation coefficient functions.

A perusal of the analysis of the ACF and PACF revealed that in all the wholesale price series of the selected markets, there were non-seasonal and seasonal AR terms of different orders. The AR terms of order 2 were found to be significant at 10 percent probability level.

The analysis of ARIMA suggested a model of the type (0.1,1), (2,1,1)12. The residuals of the estimated model were tested for its randomness and the overall significance was found to be non significant for both Hassan and Bangalore market.

Thus, it could be inferred that all, the price series under study are linearly related to both the previous years error terms and previous year
values. Seasonal moving averages (MA) were found to be significant at 1 percent probability level, while the seasonal AR terms were significant for wholesale price series. As far as the statistical level of significance is concerned, the statistical level of significance is concerned; the AR (1) and AR (2) were turned out to be significant at 10 percent and 1 percent indicating that the present price is linearly related to the previous year prices. With regard to seasonality, seasonal AR process was observed in Hassan market and significant at 5 percent level of significance. The significant seasonal AR process indicated that the value in a particular month of the current year prices in Hassan series influenced by the corresponding month’s value in the previous year.

This model was employed to forecast the month’s prices of potato from 2005 to 2007 for both markets. The Predicted prices were also found to be very close to the actual prices realized by the growers during the same period.

5.7.2. Co-integration:

Co-integration approach was used to determine the extent of integration of the markets for potato viz., Hassan and Bangalore. Both markets were not integrated in the order of Integration one i.e. I(1). No integration was found in zero order. Since both the price series of Hassan and Bangalore were found to be integrated in same order. The Dickey Fuller test statistic tests for residual values were found to be negative and
significant. Therefore, it was concluded that a long run relationship exists between the markets of Hassan and Bangalore for potato prices.