TRENDS IN COST STRUCTURE OF RICE PRODUCTION IN KONKAN REGION (M.S.)

By

MISS. EKAMALLI PRIYANKA CHANDRAKANT

B.SC. (AGRI.)

DEPARTMENT OF AGRICULTURAL ECONOMICS

FACULTY OF AGRICULTURE,

DR. BALASAHEB SAWANT KONKAN KRISHI VIDYAPEETH,

DAPOLI - 415 712, DIST. RATNAGIRI (M.S.)

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A thesis submitted to the

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(Agricultural University)

Dist. Ratnagiri (Maharashtra State), India

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Approved by the Advisory Committee

: Chairman and Research Guide:

Dr. J. M. Talathi

Head,

Department of Agril. Economics,

Dr. B.S.K.K.V, Dapoli.

Members :

Dr.V. A. Thorat

Associate Professor,

Department of Agril. Economics

College of Agriculture, Dapoli

Dr. R. M. Joshi

Field Officer

Cost of Cultivation Scheme

Department of Agril. Economics

College of Agriculture, Dapoli.

Dr. J. S. Dhekale

Professor,(CAS)

Department of Agril. Economics,

College of Agriculture, Dapoli.

Dr.V. G. Patil

Professor,

Directorate of Extention Education

College of Agricuture, Dapoli

Dr. J. M. Talathi

M.Sc. (Agri.), Ph.D.
Head,
Department of Agril. Economics,
Dr.B.S.K.K.V, Dapoli – 415 712,
Dist. Ratnagiri (Maharashtra)

CERTIFICATE

This is to certify that, the thesis entitled **"TRENDS IN COST STRUCTURE OF RICE PRODUCTION IN KONKAN REGION" (M.S.)** submitted to the Faculty of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (Maharashtra), in the partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL ECONOMICS**, embodies the results of a piece of *bona-fide* research carried out by **MISS. EKAMALLI PRIYANKA CHANDRKANT (Reg. No: 2515)** under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma or published in other form. All the assistance and help received during the course of investigation and the sources of literature have been duly acknowledged by him.

Place: Dapoli
Date: / /2018

Dr. J. M. Talathi
Chairman,
Advisory Committee
and
Research Guide

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CHAPTER I
INTRODUCTION

Rice (*Oryza sativa*) is one of the most important cereal crop of India belonging to Poaceae (Gramineae) family. It is the most widely consumed staple food for a large part of the world's human population. India stands first in rice area and second in production after China. It can survive as a perennial and can produce a ratoon crop for up to 30 years. Rice cultivation is well-suited to countries and regions have high humidity, prolonged sunshine and an assured supply of water. of the crop ranges from 21°C to 37°C and maximum temperature which the crop tolerate 40°C to 42°C . The average temperature required throughout the life period.

Rice is a nutritional staple food for more than 60 per cent of the world people which provides instant energy as its most important component is carbohydrates (starch).The introduction of semi dwarf, high yielding varieties was instrumental in increasing the rice production. The steady increase in rice production over the years transformed the country from food deficit to net surplus. The agricultural universities in the State has released total 65 rice varieties including 5 rice hybrids and developed the improved package of practices for cultivation of rice crop since theyear 1971. Therefore, the rice production of the state has been increased from 24.07 lakh tones (1990) to 50.09 lakh tonnes (2017).It is a very essential part of the daily meal in the southern and eastern parts of India. Over the period of time structural changes in costs are due to changes in quantity and quality of inputs associated with technological changes and also due to preveling prices. As a result there is a change in relative shares of operational cost in total cost of production of rice.

In Konkan region of Maharashtra the area under rice has

in decreasing trend. In year 2017 the area under the area under rice was 3.79 lakh ha, with production 16.10 lakh tonnes and productivity 42.5 q/ha. The maximum area is in Raigad (1.09 lakh ha) followed by Palghar (0.764), Ratnagiri (0.753), Sindhudurg (0.625) and Thane (0.550 lakh ha). The productivity of rice was maximum in Sindhudurg district (47.69 q/ha) followed by Ratanagiri (45.46 q/ha), Palghar (42.26 q/ha), Raigad (39.37) and Thane (39.40 q/ha).

The long term compound growth rate of production of food-grains between 1973 and 2011 is 2.1 per cent, which is below the national average of 2.7 per cent. The last four decades were divided into four sub-periods: the Green Revolution period during 1973-83 the post-green revolution period between 1983-91, early reforms period of 1991-2001 and the latest-reforms decade (2001-11) to understand the temporal dimension of growth in the production of food grains. In these subperiods, the compound growth rate of food-grain output was placed at 2.86 per cent, 0.53 per cent, 3.55 per cent and 3.08 per cent, respectively. In the two sub-periods in post-reform decades, food-grains recorded impressive rates of growth of above 3 per cent (Ramana Murthy and RekhaMisra). Global rice production more than tripled between 1961 and 2010, with a compound growth rate of 2.24% per year (2.21% in rice-producing Asia). This increase was slightly greater than that for wheat (2.02% per year), but substantially less than that for maize, which grew at 2.71% per year. Most of the increase in rice production was due to higher yields, which increased at an annual average rate of 1.74%, compared with an annual average growth rate of 0.49% for area harvested. In absolute terms, paddy yields increased at an annual average rate of 51.1 kg/ha per year, although this rate of increase has declined in both percentage and

absolute terms. With 140.22 lakh tonnes of rice production, Uttar Pradesh ranks 2nd position in the country. West Bengal ranks no. 1 with a total rice production of 146.05 lakh tons. It is the highest rice producing state in India with a yield of 2600 kilograms per hectare.

The policy related to exports and imports of rice and wheat operates within the framework of food security and food management policy. From situation of heavy dependence on imports of basic staple food in the middle of 1960s, India steered itself to a comfortable situation during the 1990s. Between 1990-91 and 1994-95, ;India exported an average of 0.5 million tonnes of cereals (mainly rice and wheat). Net exports went up to 2.6 million tonnes per year during 1995-2000,and further to 6.4 million tonnes during 2000-2005. During 2008-09, 62 per cent basmati rice exported from India. The share of basmati rice in total rice exports went up to 94 per cent in 2009-10 and further to 96 per cent 2010-11. As mentioned in the preceding section, during the last years, exports of non-basmati rice export was allowed only at a price higher.

The MSP has been increasing year after year. For paddy the MSP increased from Rs. 105/quintal in 1980-1981 to Rs. 530/quintal in 2001-2002, and for wheat the MSP increased from Rs. 130 quintal in 1980-81 to Rs. 580/quintal in 2001-02. The rise in the MSP since the mid-1990 has been sharper than the rise in consumer and wholesale price indices. Another factor in the escalating MSP is that government announces the support prices at a premium on the prices recommended by the designated Commission on Agricultural Costs and Prices (CACP) under pressure from the powerful farmer's lobby. The excessive rise in the MSP has led to accumulation of stock and contributed to rise in market prices of wheat and rice. These are among the staple crops in India and the resultant price increase affects the purchasing

power of agricultural labours, small farmers, and cash crop growers who depend on market purchases, besides that of urban consumers. These can significantly affect poverty levels among low income earners who are not fully covered by the PDS, which provides subsidized food-grains to the identified poor (Ray, 2009). It is projected that India needs to produce 115 mt of rice, 225 mt of food-grains and agriculture GDP growth 4 per cent by the year 2020 to maintain the present level of self-sufficiency. The future increase in rice production requires improvement in productivity and efficiency. There is a need not only to increase rice production but also the efficiency to sustain self-sufficiency and to maintain national food security.

This has been due to a steep rise in the cost of cultivation not matched by commensurate increase in the paddy prices. The predicament faced by the farmers was rendered more acute during the year of bumper harvest of 2010-11 when the market prices of paddy ruled at a level below the minimum support price (MSP). Moreover, this problem is further compounded in a scenario which prevailed in the State during 2010-11 when the market prices were below the MSP and the actual procurement by the millers was also at prices which were lower than the MSP.

On the one hand, the cost of cultivation has risen in the recent times and on the other market price of rice has ruled at a level below the cost of cultivation as well as the minimum support price (MSP). Procurement operations by the State have also not provided much succour to the farmers as majority of them did not receive MSP for their produce. In the year of bumper harvest of 2010-11, the gap between the cost of cultivation and the market prices widened further. The unavailability of paddy cultivation in the State is a peculiar phenomenon as the market and institutional

support which is supposed to exist for paddy much more than any other crop, except may be for wheat, is not to the desired extent.

In view of this study was under taken with following specific objectives :

1. To study the structural changes in input utilization.
2. To compare the growth rates of farm harvest price, minimumsupport price and actual price of output.
3. To assess the temporal and structural changes in cost structure of rice cultivation in Konkan region.
4. To study the price parity of paddy.

CHAPTER II

REVIEW OF LITERATURE

A brief review of previous research relating to the various dimensions of the present study has been made and presented in this chapter. The review is presented as below under various subsections in accordance with the objectives of the study.

2.1 To study the trends for input utilization and output.

2.2To compare the growth rates of farm harvest price, minimum support price and actual price of output.

2.3 To assess the temporal and structural changes in cost structure of rice cultivation in Konkan region

2.4 To study the price parity of paddy.

1. Input utilization and output.

Ahearn (2005) studied the cost of production of Rice in Kegalle and Kurunegala Districts of Shrilanka.The study showed that in paddy cultivation, cash cost represents about 50 percent of the total cost on average. However, labour cost was over 60 percent of the total cost in major irrigated areas because of high wage rates and high level of fertilizer application. Labour and material cost contributed to nearly 80 percent of the cash cost with regard to the total cost, which included both cash, and imputed cost for family labour, labour cost is the highest cost representing over 50 percent of the total cost and 40 percent of the cash cost. Labour requirement for cultivation per acre, varied from 38 to 60 man-days depending on farming practices. The amount of labour used was high when the exchange labour was used because of low productivity. On average the labour requirement is around 50 man-days per acre. Harvesting of paddy accommodate 36-40 percent of

the total labour cost and 25-30 percent of the total paddy production cost. Further, it was timely to study the feasibility of adopting mechanization in paddy farming, especially for harvesting with special attention to the land size topography, soil condition, labour opportunities and gross social return.

Basavaraja*et.al.* (2008) studied technological change in paddy production: A comparative analysis of traditional and SRI methods of cultivation. The expenditure on human and machine labour accounted for the highest share (22.24 per cent and 13.93 per cent) in the total cost of cultivation of Rs. 31,773/ha in traditional method. The cost of cultivation in SRI method worked out to be Rs.33,103/ha in which the share of human and machine labour was 28 per cent and 14 per cent. The estimated production functions were significant with high R^2 for both the SRI method and traditional methods. The output elasticity coefficients for seeds, labour, fertilizer and FYM were positive and statistically significant in both the methods.

Navadkar (2012) studied that Economics of Production and Marketing of Kharif Maize in Ahmednagar District of Maharashtra State.The findings of the study showed that the male and female human labour utilization were 77.19 and 106.45 man days per hectare. The bullock labour utilization was 10.68 pair days. Per hectare use of nitrogen was 110.80, 110.18 and 112.10 kg per hectare in small, medium and large size groups, respectively.

Rahman*et.al.*(2013) studied the Farm size and productivity in rice farming: recent empirical evidence from Bangladesh. The study shows that the landless farmers incur more costs (i.e.Tk. 17,735.27/ha) and the small farmers incur less costs (i.e.Tk. 16297.22/ha) for their input use. The expenditure pattern reveals that small farmers are more rational in their expenditures on inputs

as mentioned earlier small farmers are major share-holder in all aspects. In order to maximize their output, the landless irrationally incur more cost for inputs. and in case of labour the per hectare labour requirements ensure that the small and medium farmers are more rational. But landless farmers use more labours for different activities of farm but the small and medium are in convenient situation in this regards.The study shows that medium and small farmers higher yield (i.e., 6818 kg and 6359 kg respectively) and their profit is comparatively higher than other farm holders. In the similar fashion the study also reveals that medium and small farmers tend to be more productive and profitable than large farmers. The findings of this study indicate positive relationship between farm size and profitability except landless and large farmers.

Bhandari*et.al.*(2014) studied that Cost of Production and price spread of Cereal Crops in Nepal: A Time series Analysis 2071/2072 (2014/2015). This report has concluded the major inputs prices and outputs prices including some value added products. Human labor, bullock labour, tractors, power-tillers, harvesters, pump sets and sprayers, seed, manure, fertilizers & interest on variable costs were taken as the prime inputs for crop farming in Nepal. Likewise, the outputs/products such as rice, wheat, maize, different vegetables, spices, pulses, oils, sugarcane, seeds, etc were also taken in account. The study was useful in throwing some light in farm inputs outputs prices.

Parshurmkar*et.al.* (2014) studied the Economics of production of paddy in Gondia district of Maharashtra. The degree of management of the resources could be judged for the utilization of resources, the choice and the decision making.It is seen that, on an overall basis per hectare human labour utilization was highest i.e.

172.62 human day (Rs.15521.21) followed by machine 6.51hrs. (Rs. 2932.94) and fertilizer 90.86 kg N, 37.81 kg P and 14.85 kg K (Rs.1453.78, Rs. 869.81 and Rs. 460.52). Per hectare human labour utilized in small farmers was 170.15 human days (Rs.15290.44) and in medium and large farmers it was 168.11 (Rs.15110.12) and 176.46 (Rs.15867.96) human days. As regards the seed utilized, it was 54.35 kg (Rs.1086.90) in small farmers, 56.11 kg (Rs.1122.21) in medium farmers and 55.64 kg (Rs.1112.86) in large farmers. In study area protective irrigation was given to the crop, in large and medium farmers. Three protective irrigation was given (Rs.264.30 and Rs.222.32) and in small farmers two protective irrigation was given (Rs.208.94). Adhikari (2011) worked on economics of organic rice production.

Guptha*et.al.*(2014) studied the Comparative Trend Analysis in Cost of Paddy Cultivation And Profitability Across Three States of India.It was observed that the factors like hired machine and human labour, fertilizer were all growing in varying proportions leading to anincrease in the cost of cultivation. Over theyears, the increase in cost of cultivation seems to be stable in contrast with the increase in value of paddy produced by farmers. The APM project has appropriately addressed issues of increasing cost of manures through introduction of vermicomposting. In order to analyze the trends in the cost of cultivation, the major contributing factors notably hired human labour, hired machine labour, fertilizer, manure, insecticides and interest on working capital were identified. These major contributing factors were compared to the cost of cultivation in terms of (i) actual values and changes over the years and (ii) percentage to cost of cultivation. Profitability was analyzed as percentage of profit or loss made over the cost by the formula: [{(Value of Produce/ Cost of Cultivation)-1}*100]. The percentage

contribution of cost on hired human labour to CC has reduced from 43% in 2000 to 31% in 2011 for Kerala, and has increased from 15% in 2000 to 22% in 2011 for Odisha and has relatively been constant at around 20% for Tamil Nadu. The percentage contribution of cost on hired machine labour to CC has increased from 6% in 2000 to 17% in 2011 for Kerala, it has increased from 1% in 2000 to 2% in 2011 for Odisha and it has increased from 7% in 2000 to 13% in Tamil Nadu. The increase in cost on hired machine labour correspondingly lead to reduction of cost on other labour forms.The percentage contribution of cost of fertilizer to CC has been relatively constant and has slightly reduced from 5% to 4% in Kerala, from 6% to 4% for Odisha and 8% to 7% for Tamil Nadu from 2000 to 2011. The percentage contribution of cost of manure to CC has reduced from 5% to 2% in Kerala, from 3.12% to 2.81% in Odisha and increased from 1.98% to 2.23% for Tamil Nadu from 2000 to 2011.

Sangeeta*et. al.*(2015) studied to Estimate the Trend Scenario of Selected Inputs and outputs of Agricultural Sector in Haryana, India. The present study tried to estimate the trend scenario ofselected inputs and outputs agricultural sector in Haryana and the study was based on secondary data collected from differentpublished issues of 'Statistical Abstracts of Haryana' for the selected period.The results of the study have been complied bycompound growth rates. The present study revealed that two common crops i.eGram and Groundnut showing thenegative trends both in production and productivity and all the remaining crops expect (production of Maize and Massar andproductivity of Moong) have shown positive growth rates. These showed that production and productivity of some cropsincreased due to adoption of new technology, farmer's more attention towards competition crops and

positive contributionof these inputs like electricity, fertilizers, HYV area of Bajra, Rice, Wheat, Irrigation area and Tractors.

More *et al.* (2015) studied structural change in cost of cultivation in Sugarcane crop in Maharashtra state. The major input i.e. hired male labour, hired female labour, bullock labour, machine labour, seed, manures, nitrogen, phosphorous and potash were critically analysed. In recent time many farmers' organisations are debating that, cost of cultivation of the crop was increased mainly because of increase in price of input. This observation was analysed for long term and results were reported under. Cost of input use was increased in all cases, but maximum increase was recorded in female labour followed by bullock labour, manures and male labour. The rise in cost of input use was primarily because of increase in price of input especially for male labour, female labour, manures, nitrogen and potash. Human labour gets substituted for machine labour and use of sugarcane sets was increased with the development of new planting methods. Prices of all inputs were increased but more increase was observed in wages of male labour. The share of female labour cost, bullock labour cost, machine labour cost *etc.* in total cost of cultivation was increased over period of time.

Adsul(2016) studied the temporal and structural changes in Agricultural labour in Konkan region.In Maharashtra labourforce participation rate during 1990-91 was 64.54 per cent which decreased to 53.04 per cent during 2010-11. Similar trends were observed in Konkan region as whole. During 1990-91 the labour force participation rate in Konkan region was 62.87 per cent which declined to 55.22 per cent in 2010-11. The change in labour force participation rate in all the districts was at par with Konkan region.The gender wise occupational distribution of workforce in

Maharashtra indicated that agricultural labour force which was 10.53 per cent in 1990-91 increased to 12.00 per cent in 2010-11. The proportion male agricultural labour increased from 9.57 per cent in 1990-91 to 11.63 per cent in 2010-11. While, female agricultural labour increased from 11.57 per cent in 1990-91 to 12.40 per cent in 2010-11. The agricultural labour force in Konkan region was 4.46 per cent in 1990-91 increased to 5.22 per cent in 2010-11. The household industry and other workers in all district of Konkanregion increased during the period under study.

Hazarika*et. al.* (2016) studied the growth and instability of rice production in Assam where rice is grown over an area of 26.46 lakh hectares occupying around 74.25 per cent of the grossed cropped area. While the need for increasing agricultural production to feed state population or growth was obvious, the increasing in instability in agricultural production was considered adverse for several reasons. Instability in production affected the consumers and the price stability, and it increases variability of low-income households to market. This paper tries to find out the growth and instability of different rice and identify the sources of instability of production and productivity of rice in Assam. From the analysis of growth and instability in area, production and productivity, it was found that there existed a considerable variation in the production of different types of rice in the state. Rice is consumed by about 90 per cent of the state population and is grown over an area of 26.46 lakh hectares occupying around 74.25 per cent of the cropped area. The share of HYV area to total rice has been increased from 10 per cent in 1971-72 to 43 per cent in 1994-95. The share of irrigated area to total rice area was found to be increasing from 1.2 per cent in 1971-72 to 9.6 in 1986-87; however, it has been gradually decreasing from 8.5 per cent in 1991-92 to 6.0 per cent in 1994-95. Fertilizer

consumption per hectare of rice area was 3.96 kg in 1971-72 that increased to 10.2 kg in 1994-95 and further increased to 65.41 kg in 2010-11. However, the recommended dose of fertilizer is 40:20:20 kg N: P: K per hectare. The growth of rice production has not kept pace with the population growth, resulting in an overall decline in per capita availability.

2. Growth rates of farm harvest price, minimum support price and actual price of output.

Bastine*et.al* (1994) analyzed the trends in growth rates over the period 1965-66 to 1989-90 and the decadal changes in growth rates of area, production and productivity of major crops of Kerala. Despite the fact that the value of the agricultural product per unit of land in Kerala was one of the highest in the country because of diverse crop combination.

Maheshwari (1996) assessed the agricultural growth in Karnataka. She used the kinked exponential estimates of rates of growth to arrive at more complete picture of trends, it was found that in Karnataka the yield increased brought about by HYV seeds were not really revolutionary. These findings pointed out the importance of water management in a semi-dry area like Karnataka in maintaining growth in the agricultural sector.

Singh *et.al.* (2002) studied the Minimum Support Prices on the Agricultural Economy of Madhya Pradesh. The MSP of paddy in the state in 1985-86 was Rs.142 per quintal. It increased from year to year and was Rs.490 per quintal in 1999-2000. For each year the percentage variation between MSP and FHPs were calculated. It was noted that the percentage variation was least (12.34) in 1996-97 and highest (204.44) in 1991-92. As regards area of paddy it was observed that although the overall trend was increasing the extent

of increase was very low as the index increased from 100.00 in 1985-86 to 106.32 in 1999-2000. As regards production of paddy similar trend although slightly higher one was noticed. The index increased from 100.00 in 1985-86 to 117.92 in 1999-2000.Firstly the FHP was higher than MSPs in all the years and secondly the percentage variation between MSP and FHP was more than 100 in most of the years except 5 years. It could be said that the impact of MSP on FHP was positive and quite high in most of the years.

Deshpande(2003) studied that impact of Minimum support prices on agricultural economics. Most of the farmers were aware of the policy of Minimum Support Prices. However, they were not very conversant with the administrative mechanism. There was need felt by the farmers for covering other crops which would help them to diversify into other areas of farm enterprises. The declaration of MSP was always delayed and that makes decision-making difficult for the farmers. Due to the increasing trend in Minimum Support Price there had not been no major problems and welfare loss. However, if the cropping pattern was to be maneuvered through Minimum Support Prices, it was essential that the declaration of Minimum Support Price should be before the sowing season. The trends in input prices were increasing at a faster rate than the trends in prices. That raises an alarm which needs to be set right through price policy. Therefore, in the case of Haryana, MSP indicated a tight rope walking with stock piling on one side along with focus on two crops whereas time of declaration, cropping pattern and the increasing input price trends on the other side.

Thanh (2006) studied the trend in rice production and export in Vietnam. Astudy on rice production trend and export in Vietnam last 40 years (from 1965 to 2004) has conducted. Compound Growth Rates (CGRs) for overall period (1965-2004), of rice area,

yield and production in Vietnam were positive and significant growth at the rate of 1.34; 2.60 and 3.97 per cent per annum, respectively. The instability analysis for overall period (1965-04), showed that overall area, yield, and production were high instability as compared to each sub-period in which most high instability was found in rice production (CV= 48.13 %); followed rice yield (CV = 31.81 %) and rice area (CV = 16.28 %). The contribution in rice production was reduced by both area effect and yield effect in overall period as compared to each sub-period, and the interaction effect had increased (28.18 %). Therefore, it could be said that rice production for total period was interaction of both yield effect and area effect, which explained for one-third of contribution but more contribution was of yield effect (52.77 %), followed area effect (19.09 %). In rice export, growth rate from 1965-2004 was very high at 25.39 and 26.09 per cent per annum for export quantity, and value, respectively.

Benke*et.al.*(2010)studied An economic analysis of soybean arrivals and price behavior in Akola district of Maharashtra. It showed that Compound growth rate for the total period of study was positive and significant for the soybean This was 21.34 per cent and positively significant. It is interesting to note that the annual compound growth rate of arrivals for soybean was positively significant in the period II (1997-06) of the study, also in overall period (1987-06) it was positively significant.

Gupta (2010) studied the Reserve Prices, Minimum Support Prices and Farmers' Revenues and Government Grain Policy through the Prism of Rice Auctions in North India. This paperundertook semi-nonparametric estimation of an ascending auction model for paddy (rice) auctions in a North Indian paddy market, with 2 principal objectives. First, it computed optimal

reserve prices and simulated farmers' revenues from auctions at these reserve prices and compared these to the observed reserve prices (and corresponding farmers' revenues) in the sample. While the optimal reserve prices were significantly different from the sample reserve prices, the farmers' revenues under the two sets of reserve prices were strikingly similar. Second, it undertook reassessment of government policy on minimum support prices. It shows that government purchases of processed rice through a levy, at an appropriately chosen levy price, could achieve the objective of providing price and farmer revenue support as effectively as direct government purchases of paddy at the minimum support price, and at a significantly lower cost.

Ashok and Sasikala (2011) studied the trends in production and comparison of cost of production and Minimum support price of coarse cereal. This study estimates the Compound Growth Rate (CGR) of area, production and productivity of major coarse cereals and analyzed the trends in cost of production of coarse cereals and Minimum support price (MSP) announced by the Government. The study based on time series data on area, production and productivity of coarse cereals (Bajra, Maize, Ragi, Jowar) from 1970-71 to 2007-08 in Tamil Nadu. The 38 years data were classified at decadal intervals and the decadal trends in area, production and productivity were analyzed through CGR. The annual Compound growth rate in Maize crop was 6.32 percent in area, 9.47 percent in production and 2.00 percent in yield. In case of bajra, despite the increase in productivity by 1.91 percent, the production of bajra declined at the rate of 2.95 percent.

Acharya(2012), studied that Market integration and rice transmission in India :A case of rice and wheat with special reference to world food crises of 2007/08. It was in this context that

the hike in MSPs of rice and wheat during the period of 2006-07 to 2009-10 need to be seen during 2006-07, a hike of around nine percent was found necessary on account of lower procurement which forced the government to go for huge imports of wheat at much higher prices (compared to MSPs) to meet PDS commitments. The hike in subsequent two years i.e. 2007-08 and 2008-09 at around 20 percent each time was even higher. Even during 2010-11, the hike was around 11 percent in MSP of paddy and 8 percent in that of wheat.

Shayequa*et.al.* (2012) studied the Effectiveness of minimum support price policy for paddy in India with a case study of Punjab. The effectiveness of minimum support price (MSP) for paddy has been examined in different regions of India and its role and contribution towards production in surplus states like Punjab have been studied. Based on the secondary data spanning from 1980-81 to 2006-07, the deviations of farm harvest prices from the MSP have been used as a measure of ineffectiveness and the impact of prices and technology on rice productivity has been examined by using the simultaneous equation model. The Commission for Agricultural Costs and Prices (CACP) recommends Minimum Support Price (MSP)for 25 agricultural crops, the most important of which were paddy, wheat, cotton, oilseeds and pulses. The study was based on the secondary data on farm harvest prices and minimum support prices of paddy for various paddy-producing states. Based on the data availability, the time period chosen was 1980-81 to 2006-07. The time-series data on prices of paddy (1980-81 to 2006-07) were divided into three sub-periods, The period-I was regarded to be a normal growth period when output prices were incentivized to promote modern production technology and production, while period-II represented an era when the growth in

prices was influenced more by political factors. In period- III, the changes in MSP were largely determined by the international prices rather than the economic factors. The trends in farm harvest prices with respect to minimum support price were studied with the help of graphs and growth rates.

Prabakaran*et.al* (2013) studied the analysis of growth rates of rice and sorghum in AndhraPradesh. The growth rates of rice for three distinct administrative and agro-climatic regions of Andhra Pradesh were studied using the time series data from 1970-71 to 1999-2000. The growth pattern was examined by fitting on exponential function ($Y=AB^t$). The growth pattern in area, production and yield of rice showed an upward trend at state and Telangana region showed highest growth rates in area, production and yield during the study period. Rice and sorghum account for nearly 66.5 per cent of area and 81.7 per cent in production of total cereals in Andhra Pradesh during 1999-2000 hence selected for the study.

Sanusi (2014) studied the empirical growth rate analysis of rice production in Nigeria and its implication on food security: Comparative assessment of three economic reforms phases in Nigeria. This study was carried out to provide empirical evidence on the growth rates of rice production in three sub – periods in Nigeria namely pre – Structural Adjustment Programme period, Structural Adjustment Program period and post – Structural Adjustment Programme period.A growth rate model was used to estimate the growth rates in the three sub – periods. The results of the analysis showed that the instantaneous growth rates of maize production are 5.8%:7.8%; 9.2%:11.6% and 2.4 %:1.1% and the compound rates of growth of maize production are 106%:108%; 110%:112% and 102%:101% for the pre – Structural Adjustment Programme, Structural Adjustment Programme and post – Structural

Adjustment Programme periods respectively. The average annual rates of growth in rice production in Nigeria have declined in recent years (Goni and Amaza, 2006). The Federal Ministry of Agriculture (2012) estimated that the annual supply of food crops (including rice) would have to increase at an average annual rate of 5.9% to meet food demand, and reduced food importation significantly.

Chopde*et. al.*(2015) studied Relationship between the farm harvest price index and general price index of Amravati division. In Amravati district price behavior of wheat was slightly fluctuated, the farm harvest prices were less than the general prices from year 2002-03 to 2009-10 and more in 2010-11 in wheat, jowar and maize slightly difference in the prices of farm harvest and general year to year. In gram general prices were more than the farm harvest prices, from year 2000-01 and 2010-11. In Tur farm harvest prices were more than the general prices except in 2006-07 and 2007-08. In cotton general prices and FHP had less difference. In the district soybean farm harvest prices were less than the general prices from year 2004-05 to 2010-11.

Benke*et.al.*(2015) studied An economic analysis of green gram arrivals and price behaviour in Akola district (Akola APMC) of Maharashtra. The growth trend for green gram production was negatively significant (-0.61%, significant). Also it showed negative trends for arrivals in Akola (-2.74%, significant)seasonal indices of monthly arrivals and prices of green gram crop in Akola market showed that the arrivals peaked in the month of September in Akola (502.64) and after that it declined and remained below the arrivals which was observed in the month of May (11.32). The prices observed peaking in the month of April (108.56) in Akola. Then it declined throughout the year till September when the arrivals at its

highest and the lowest were seen in the post-harvest months of September 86.89 in Akola APMC.

Thakre*et.al.*(2017) studied Changes and trends in arrival and prices of agricultural commodities in APMC Kolhapur market. It was observed in case of paddy arrivals were 1908.1 q in 2001-02 it decreased up to 1118.7 q in 2005-06 while in the year 2011-12 arrivals increases 89869 q. In case of prices variation is also same as pattern of arrivals i.e. in 2001-02 the prices were Rs. 443.95, in 2005-06 was Rs. 631.25 and in 2011-12 was Rs. 1216.67.

3. Temporal and structural changes in cost structure.

Gurjar and Varghese (2005) studied the Structural changes over Time in Cost of cultivation of Major Rabi Crops in Rajasthan. The results showed the structural changes in the cost of cultivation of wheat in Rajasthan. The total cost of cultivation of wheat has gone up from Rs.3,321.60 in 1981-82 to Rs.17,607,57 per ha. in 1999-2000 depicting an increase by 5.3 times during a period of nineteen years. The cost of human labour as a whole has increased at a faster rate. Among operational cost items, family labour recorded the maximum share in the cost of cultivation over time. In terms of annual growth rate of estimated parameters of wheat during the period. The cost of production of wheat has increased by 15.31 per cent per annum whereas the gross return on unit area basis has increased by 23.57 per cent per annum.

Celia *et.al.*(2009) studied that the analysis of the impact of changes in the prices of rice and fuel on poverty in the Philippines. They reported that in the case of rice price increase, results revealed that most of the households in the Philippines were net consumers rather than net producers of rice. It was soon that is that urban households would be the more adversely affected as compared to those living in the rural areas. In addition, the poorest households were the most vulnerable to price changes. In fact, they would be the most adversely affected by rice price increases. Given this, policy interventions should focus on providing safety nets to poor households. Another important result, although a large proportion of rice farmers would benefit (73.7%) from rice price increases, a significant proportion (26.3%) was still expected to lose. On the whole, it was the poorest farmers who tend to be the most adversely affected by the rice price increase.

Binswanger et.al.(2012) studied the Structural transformation of the Indian economy and of its agriculture. The growth of agriculture in India appeared almost to be decoupled from the rapid economic growth. This growth slowed down between the 1980s and the 1990s, and did not yet exceed 4 per cent in the decade of 2000s. Until the early-1990s, the more advanced states had a higher economy-wide growth and agricultural growth, but the association has disappeared for agriculture, suggesting sharp improvement in economy-wide and agricultural growth opportunities.

Sharma and Burark (2015) studied A study of seasonal price behaviour and market concentration of maize in Rajasthan. The values of highest price indices for maize were found in the month of July (108.55) and the lowest price index was found during October (91.66) in Nimbahera market. The price indices of maize were lower than 100 for only four months i.e., September to December.

Thorat*et. al.*(2017) studied the temporal and structural changes in cost of cultivation of rice in Konkan region.Over a period if time structural changes in cost were due to changes in the quantity and quality of inputs associated with technological changes and also due to prevailing prices. The decline in prices of fertilizer could be attributed to shift in fertilizer price policy from product based policy to nutrient based policy as well as subsides provided by Government for fertilizer. The sharp increase in the labour cost index could be attributed to increase in average per hectare labour use from 149.4 during period I & 209.36 periods II.Rising index of labour cost is likely to give impetus to farm mechanization. The farm harvest prices moved very close to MSP over time. In 2001-02 the price becomes equal to MSP.The deviation in price realized and FHP ranged between -46.12 % to 30.85%.The increase was seen in all the major items of costs like human labour,bullock

labour,machine, seed and fertilizers.The human labour cost and machine labour cost increased at a faster rate. The increase in yield was to the tune of 18.85 %.The share of human labour increased from 52.47%in period I to 71.78% in period II. The share of bullock labour decreased from 16.96 to 10.19%. The share of machine labour increased from 2.19 to 4.06% whereas, share of inputs like seed, manures and fertilizers decreased during period II.Urea ,a key source of nitrogen was kept out of nutrient based subsidy (NBS)regime when the Government shifted from product based subsidy (PBS) to NBS regime with effect from 1.4.2010 with a view to promote the balanced application of fertilizers.While, the phosphatic and potassic fertilizers are decontrolled Urea was sold at statutory notified uniform sale price. Lower price of urea in relation to other fertilizers have led its heavy use at the expenses of P&K.

More *et. al.*(2015) studied Structural change in cost of cultivation in Sugarcane crop in Maharashtra state. Structural changes in costs are due to changes in the quantity and quality of inputs associated with the technological progress and also due to their prices(Gurjar and Varghese,2005).They reported that, this was not because of low yield but due to increase in cost of production. Cost structure was analysed by working out the share of input cost in the total cost of cultivation. The changes in the structure of cost of cultivation were assessed by comparing the cost structure. The valuation of main product was made using the support price announced by government of India and profitability was worked over Cost-A, Cost- B and Cost-C out by subtracting respective cost from Value of Product. The cost of cultivation and profitability of sugarcane cultivation were presented in revealed that, cost 'A', cost 'B' and cost 'C' was increased around five time higher than its base year cost. Human labour get substituted for machine labour and

use of sugarcane sets was increased with the development of new planting methods. Prices of all inputs were increased but more increase was observed in wages of male labour. The share of female labour cost, bullock labour cost, machine labour cost *etc.* in total cost of cultivation was increased over period of time.

Tingare*et.al.*(2015) studied the Temporal variation in input cost and output prices of major crops in Vidarbha. In this study an attempt has been made to study the trend in cost of production and minimum support price. Growth rates were calculated for input prices and MSP. Land Concentration Ratios was worked out to determine the adventitious crops. The overall period for analysis was split in to two sub periods i.e. 1989-90 to 1998-99 as period I,1999-2000 to 2008-09 as period II and overall period from 1989-99 to 2008-09.Results of over the years, it might be due to relative changes in prices of input. The proportion of cost of inputs in total cost i.e. Hired Human Labour, Bullock Labour was highest than the others like seed, manure for all the crops.The Rate of change of Rice were the growth rates for MSP, Cost A, Cost B &Cost per Quintal were 4.9%,5.9%,6.0%,5.1%respectively .Likely the rate of changes at current prices for selected crops reported the growth rates for MSP, Cost-A, Cost-B&Cost per Quintal i.e. paddy 8.8%,9.2%,8.1%,7.9% respectively at current prices at increasingrate for overall period. The study of effect of prices on variable cost revealed that in case of soyabean and jowar the one year lagged value were found to be non-significant whereas cotton,tur and paddy received the significant growth over cost A for the paddy period.

4. To study the price parity of paddy.

Ranade(1981) studied the Strategy for Stabilising the parity between prices of Groundnut and finished manufactured goods from Groundnut. The findings of our research revealed that in most of

the years groudnut production declined not only the 'farmers share' declined but even the ratio of farm harvest price to all price had declined. That is not only the prices of all the manufactured goods from groundnut increased faster than groundnut price but even the oil price in these years increased faster than increase in farm harvest price. To sum up, by simply assuming higher price of groundnut, the growers'would not benefit since their share in the total value generated in the groundnut system could still remain stagnant.

Gavali (2015) studied Economic analysis of price parity of Major crops in Maharashtra state of India. The indices of parity between FHP of cereals and average input prices of Jowar was less than 100 during the 18 years of study, indicating thereby relatively higher increase in farm harvest prices of Jowar as compared to rise in the prices of inputs used by the farmers in its production. The parity indices between output prices and input prices decline continuously and it ranged between 43.79 to 75.38 in case of Wheat and 40.04 to 80.51 per cent in case of Jowar, respectively. The parity indices between FHP of cereals and input prices were not favourable because market prices of Jowar and wheat were not sufficient to cover the increased prices of inputs. The parity indices of gross income to per quintal cost of production of jowar and wheat affected the profitability adversely.

Bhaskar*et.al.*(2015) studied the Impact of minimum support prices on Agriculture crops: A Study in Amravati division. The effect of MSP on area indicated that MSP significantly influenced the area under wheat, tur, gram and soybean whereas the no impact was observed on area under cotton and jowar of MSP in the study area indicating. The major contributing area to the tune of 30-35% was not influenced by the MSP,while the farmer were taking decision for

changing area for the remaining 60-65%.Also studied the district wise monthly indices of prices of selected crops. Wheat crop showed peak period of price indices was highest in the pre harvest months and lowest price indices in post-harvest months.The Seasonal index of prices of sorghum crop showed the highest price in the month of July in all market and lowest price in month of January. As regards crop seasonality was noted in arrival,while it was nearly absent in prices. As regards Seasonal price indices of cereals,pulses and cotton it fluctuated significantly over monthly.

Thakare*et. al.*(2015) studied the structural changes in cost of cultivation of cotton in Vidarbha. In this study an attempt has made to study input-output, their parity and income from cotton in Maharashtra. The present study used cross sectional cum time series data of Vidarbha region for cotton for the ten years i.e. from 1999-00 to 2008-09.Every year 100 farmers were selected for the present study. The study revealed that, prices of all inputs showed an increasing trend during the period 1999-00 TO 2008-09 .The compound growth rate of input prices for cotton were highest seed prices (13.80%per annum) followed by prices of Farm Yard Manure (10.51%).The study also revealed that, the gross return for cotton crop has recorded an increase of 156.44% during the period study. This is attributable to the increase of man product. The cost of production of cotton has decreased from Rs.2069.79 in 1999-00 to Rs.1969.52 in 2008-09.

Gavali(2015) studied the input and output Prices, their parity and income from Major Cash crops in Maharashtra. The result presented those parity indices between farm harvest prices to average input prices, farm harvest prices to cost of production and income to cost of production of major cash crops. The parity indices between FHP of sugarcane and average input prices of cash crop

were more than 100 except for years 2000-01 to 2003-04, 2005-06 to 2008-09 out of 18 years of study period. This indicated relatively higher increase in farm harvest prices of sugarcane as compared to rise in the prices of inputs used by the farmers in its production. The parity indices between FHP's and average input prices of cotton were less than 100 in cotton during 18 years of study period. This indicated relatively lower increase in farm harvest prices of cotton as compared to rise in the prices of inputs used by the farmers in its production. It implied that level of harvest prices of cotton crop not sufficient to cover the increased prices of inputs during most part of study year. It was also observed that, parity indices of farm harvest prices and per quintal cost of production of sugarcane was less than 100 for 9 years out of 18 years of study. The parity ratio of FHP to cost of production of cotton crop was favourable during 2009-10 and 2010-11. In the remaining years, ratio was not favourable i.e. it was less than 100. It was inferred from the parity ratio that increase in the farm harvest price was less than its cost of production.

Gavali(2016) studied the Input-output prices, their parity and income from major pulses in Maharashtra. The result presented that the parity indices between output prices and input prices declined continuously and it ranged between 36.231 to 88.65. It implied that level of harvest prices of green gram not sufficient to cover the increased prices of inputs during most of study year. It was also observed that parity indices if farm harvest prices and per quintal cost of production of green gram and black gram was less than 100 per cent during the entire study period except in the case of black gram during year 2007-08. This indicated for green gram was declined indicating relatively that relatively higher increase in the per quintal cost of production of than the farm harvest prices. The parity indices of gross income to per quintal cost of production

for pigeon pea, chick pea and green gram were greater than 100 per cent for most of the years under study. This indicated over the period of time, the gross income of pigeon pea, chick pea and green gram increased at a higher rate as compared to per quintal cost of production. In remaining years, ratio was not favourable i.e. it was less than 100, this indicated that over the period of time, the per quintal cost of production increased at higher rate as compared to the gross returns of pulses and thereby adversely affecting the level of profitability.

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CHAPTER III

SOCIO-ECONOMIC BACKGROUND OF KONKAN REGION

The socio-economic background of a study area has a direct influence on various agricultural activities carried out in that region. Various physical factors, like agro climatic conditions, soil type, irrigation facilities, transport and communication and other infrastructural facilities decide the suitability of a particular enterprise to that area. A brief account of geographical and socio-economic conditions prevailing in the selected area is given so as to have good understanding of the region and also to help in the interpretation of the results and drawing inferences.

3.1 Location

The Konkan region of Maharashtra falls under West Coast plains and Ghat region (Zone No. XII). It has a long narrow strip stretching from North to South along the West Coast of India. Its position on the world map is given by 150 37' to 180 04' North latitude and 730 19' to 740 13' East longitude. The region comprises Greater Mumbai, New Mumbai, Thane, Palghar, Raigad, Ratnagiri and Sindhudurg districts of Maharashtra State. The total geographical area of Konkan region is 29.41 lakh hectares. The region has a hilly terrain and receives heavy rainfall ranging from 3000 to 4000 mm mainly during June to September. The climate is warm and humid almost throughout the year. The soils are mainly lateritic and medium black.

The Konkan region shows variation in agro-climatic features, soil types, crops and cropping pattern. Based on these variations, the region is broadly divided into two agro-climatic zones viz., South Konkan Coastal Zone (SKCZ) and North Konkan Coastal Zone

(NKCZ). SKCZ includes Ratnagiri and Sindhudurg districts, whereas the NKCZ zone includes Raigad, Palghar and Thane districts.

3.2 Boundaries

All the five districts are surrounded by Sahyadri hills to the East, beyond which there are boundaries of six districts of Western Maharashtra region, Gujarat state towards north, Arabian Sea to the west and Goa to the south. The Konkan region has a coastal line of 640 km (excluding Mumbai).

3.3 Topography

The Konkan region can be divided in to three natural zones from the point of view of topography viz., (i) the coastal zone which is marked by rice cultivation on hill slopes, coconut and arecanut along seacoast. (ii) The plateau surface, which is used for cereal crops like rice, nagli etc. and cashew nut on hill slopes and (iii) the hilly zone, which has good forests. The Sahyadri ranges on the eastern boundary have highly uneven natural surface and are agriculturally poor and natural vegetation is negligible.

3.4 Soil

Soils constitute the physical basis of an agriculture enterprise and play a vital role in the agricultural economy. Soils of Konkan region are found in several grades, depending on their location and admixture of different rocks. The predominant soils in south Konkan are lateritic which vary in colour from bright red to brownish. They are acidic and fairly well supplied with nitrogen and organic matter, while the soils of north Konkan are made up of “Deccan Trap” which varies in colour from brownish to black.

On hill slopes, the soils are coarse, sandy in nature while in valleys they are clay loams. The soils of the hill slopes may be only 9 to 45 cm in depth while those of the flat lands and valleys are

deeper than 60 cm. Their pH is slightly on the acidic side. Paddy is the main *Kharif*crop while in*rabi* season, crops like pulses are taken on deeper soils.

The lateritic soils have three varieties of soils, viz., rice soils, *varkas*(light) soils and garden soils. The rice soils are generally found in low lying areas which receive the eroded soils from the upper reach and are usually rich in organic matter. The *varkas*soils which are on hill slopes are shallow and eroded soils, coarse in texture and yellowish red in colour. *Nagli (Eleusinecoracana)* is the principal crop grown on these soils; it responds well to N and P fertilizers. The garden soils are light, easily workable, and yellowish to brownish in colour and mostly support arecanut and coconut plantations.

3.5 Climate

The climatic conditions in the region are strongly influenced by its geographical conditions. It is distinctly different on coastal strip, where it is very humid and warm. On the other hand, the climate on the eastern slopes and plains at the foot of slopes is comparatively less humid. The per cent humidity ranges from 50-80 throughout the year. On an average, temperature ranges from 16 °C to 40 °C. The summer season from March to May is followed by the south-west monsoon season from June to September. The period from December to February is winter. Being the coastal area the variation in temperature. During the day and through the season is not large. Maximum temperature at the seacoast rarely goes beyond 38 °C and in the interior; it seldom crosses 40 °C, owing to the proximity of the sea.

3.6 Rainfall

Rainfall is the most dominant single weather parameter that influences plant growth and crop production because of its uncertainty and variable nature. Rainfall is not uniform in all parts of the Konkan region. The Konkan region gets assured rainfall ranging from 3000 to 4000 mm from the southwest monsoon during the months from June to September. Generally, the highest rainfall is in the month of July. It is less towards the north than south.

3.7 Area and population

The total geographical area of Konkan region is 30,125 sq. km. According to 2011 census, total population of Konkan region is 161.51 lakhs, out of which, male population is 84.03 lakhs and female population is 77.47 lakhs. The density of population per sq. km. is 471 as against 365 for Maharashtra state. The proportion of urban population is higher than rural population. Rural population is 43.80 lakhs and urban population is 104.27 lakhs.

3.8 Land utilization

The land utilization information of Konkan region is presented in Table 3.1. It is observed from Table 3.1 that the net sown area in the region is only 35.63 per cent of the total geographical area. The area sown more than once is only 1.83 per cent. Barren and uncultivable land constitutes 16.68 per cent. It shows that the topography of the region makes large part of its land unsuitable for cultivation. The proportion of colourable waste land in the Konkan region is 13.03 per cent. The current and other fallow land accounted to 10.85 per cent. This shows that there is good scope to bring the fallow land under plantation crops, particularly mango and cashew.

This is being done by the government of Maharashtra through Employment Guarantee Scheme (EGS), which provides a good amount of subsidy to the farmers for undertaking plantation of horticultural crops. The area under forest is 18.66 per cent, which is also less than the recommended level of 30 per cent of the total geographical area. Efforts need to be made to increase area under forest and protect the available forest by following strict

Table 3.1.Land utilization in Konkan region during 2014-15

Sl. No.	Land use category	Area (00. ha)	Percentage to total geographical area
1.	Total geographical area	28251.84	100.00
2.	Area under forest	5439	19.25
3.	Barren and uncultivable land	4863	17.12
4.	Land put for non-agricultural uses	1424	5.04
5.	Culturable waste land	3800	13.45
6.	Current fallows	1316	4.65
7.	Other fallows	1847	6.53
8.	Net sown area	9187.84	32.51
9.	Area sown more than once	348	1.23
10.	Gross cropped area	9535.84	33.74

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15). The gross cropped area accounts for about 33.74 per cent of the total geographical area.

3.9 Cropping pattern

As the Konkan region is situated near the sea coast, there is heavy rainfall during monsoon. Paddy are the major cereals grown in the region. Paddy cultivation is done on lowlands and the varkas lands are utilized for cultivation of hill millets. Varkas lands on hill slopes in heavy rainfall area provide good drainage and hence mango and cashew orchards thrive well on such lands. On coastal plains, coconut and arecanut gardens are well established.

It can be seen from the Table 3.2 that cereal crops dominate the cropping pattern of Konkan region. Paddy is a major cereal crop occupying 35.38 per cent of the gross cropped area. The area under food grain crops is 54.20 per cent, which includes the area under pulses accounting for about 3.59 per cent. Area under oilseed crops is less than one per cent. Fruit and vegetable crops are occupying about 38.52 percent of the gross cropped area having further scope of increasing area under these crops by bringing culturable wasteland under cultivation, which stands about 13.45 per cent of the total geographical area. The area under fodder crops is about 1.43 per cent. In fact, there is no much commercial cultivation of fodder crops in the region, except few patches in Thane and Raigad districts. The area shown in cropping pattern gives an idea about area under natural grass lands from where mostly dry grass is harvested.

Table 3.2 Cropping pattern of Konkan region

Sl. No.	Crops	Area in (00 ha)	Percentage to gross cropped area
1.	**Cereals**		
	a) Paddy	3250.78	35.38
	b) Other cereals	1399.01	25.23
	Total cereals	4649.79	50.60
2.	**Pulses**		
	a) Tur	34.61	0.38
	b) Gram	23.16	0.25
	c) Other pulses	272.52	2.97
	Total pulses	330.29	3.59
3.	Total foodgrains (cereals and pulses)	4980.08	54.20
4.	Total oilseeds	46.52	0.51
5.	Total fruits and vegetables	3539.41	38.52
6.	Fodder crops (natural grass lands)	131.39	1.43
7.	Gross cropped area	9187.84	100

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15)

3.10 Fishery

The marine fishing is practiced all over the coastline of 640 km Konkan region (excluding Mumbai). Fishing is carried out with the traditional boats, as well as, mechanized trawlers. The fishery trade has flourished in Thane district, as there is always demand for fish in Mumbai market. Fishing trade is increasing gradually and still has vast potentialities. Total marine fish production during 2014-15 from four districts was 298775 MT.

3.3 Marine fish production

District	Coastal length (km)	Production (MT)	Production MT/km length
Thane (including Palghar)	112	120924	1079.68
Raigad	240	41249	171.87
Ratnagiri	167	115042	688.87
Sindhudurg	121	21560	178.18
Konkan region	640	298775	304.64

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15)

There are 152 fisheries societies working in the region. The details about coastal length and fish production in each district during 2014-15 are given in Table 3.3. It is seen from Table 3.3 that the production per km length in Thane district was highest (1079.68MT), followed by Ratnagiri (688.87MT), Sindhudurg (178.18MT) and Raigad (171.87MT). In the Konkan region, per km length fish production is 304.64MT.

3.11 District wise milch animals in Konkan region

The information regarding district wise milch animals is presented in Table 3.4. It is observed from Table 3.4 that in Konkan region, there are 68,289 milch animals of which maximum (34.35 Per cent) in Ratnagiri district, followed by Sindhudurg (28.53 Per cent),Raigad (20.86 Per cent) and Thane district (16.26 Per cent). Among different types of milch animals, the proportion of crossbreed cows is maximum (41.69 Per cent) in Ratnagiri and it is minimum (**8.88** Per cent) in Thane district.

Table 3.4 District-wise milch animals in Konkan region

Sr. No.	District	Category			Total milch animals
		Cow		Buffalo	
		Crossbreed	Indigenous		
1	Thane (including Palghar)	1749 (8.88)	3003 (13.15)	6351 (24.65)	11103 (16.26)
2	Raigad	4788 (24.31)	5495 (24.07)	3962 (15.38)	14245 (20.86)
3	Ratnagiri	8209 (41.69)	8693 (38.08)	6556 (25.44)	23458 (34.35)
4	Sindhudurg	4946 (25.12)	5639 (24.7)	8898 (34.53)	19483 (28.53)
	Konkan Region	**19692 (100)**	**22830 (100)**	**25767 (100)**	**68289 (100)**

(Figures in parenthesis indicate percentages to Total livestock)

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15)

As regards indigenous cows, the proportion is maximum (38.08 per cent) in Ratnagiri district and is minimum in Thane district (13.15 per cent). In respect of milch buffalo, maximum proportion is in Sindhudurg district (34.53 per cent), followed by Ratnagiri district (25.44 per cent), Thane district (24.65 per cent) and Raigad district (15.38 per cent). The analysis revealed that Ratnagiri and Sindhudurg districts are having leading position in respect of number of milch animals. This is particularly true in respect of number of milch buffaloes.

3.12 Livestock

Livestock makes substantial contribution to the economy by providing subsidiary income to the farmers, food to human

population and employment to labours. The livestock population in Konkan region as per 2012 census is presented in Table 3.5.

Table 3.5 indicated that as per livestock census 2012, total livestock population in Konkan region is 12.90 lakh heads, of which 82.54 per cent is bovine population. Cattle and buffalo population is 61.58 and 20.96 per cent, respectively.

3.13 Transport and communication

The total road length and length of railway route in the year 2014-15 was 39055 km. and 1141 km, respectively. The road length maintained by all authorities per 100 sq. km. of geographical area in the Konkan region in 2014-15 was 80.28 km. A major National highway viz., Mumbai-Goa highway runs lengthwise and serves as an important means of transportation. Most of the villages and towns are connected by small roads to highway. The Konkan railway is also becoming a major source of transport in the region. Telecommunication facilities are also well developed in the region, which helps in fast communication.

3.14 Co-operative societies

Co-operative sector covers various aspects of agricultural needs such as, extension to agriculture credits and provision of agricultural inputs through co-operative societies.

At the end of 2014-15, there were 41520 numbers of all types of co-operative societies in Konkan region in which 1153 (2.78 per cent)

Table 3.5 Livestock population in Konkan region

Sl. No	Category	Thane	Raigad	Ratnagiri	Sindhudurg	Konkan region (No.)
1.	Cattle	103915 (39.01)	223926 (58.50)	319312 (80.47)	147410 (60.36)	794563 (61.5)
2.	Buffalo	90898 (34.12)	68720 (17.95)	43816 (11.04)	66935 (27.41)	270369 (20.96)
	Total bovine	194813 (73.13)	292646 (76.45)	363128 (91.51)	214345 (87.76)	1064932 (82.54)
3.	Sheep	2014 (0.76)	268 (0.07)	127 (0.03)	11 (0.005)	2420 (0.19)
4.	Goats	62461 (23.48)	87439 (22.84)	33071 (8.33)	28125 (11.52)	211096 (16.36)
5.	Horses	819 (0.31)	903 (0.24)	21 (0.01)	15 (0.01)	1758 (0.14)
6.	Donkeys	328 (0.12)	59 (0.02)	156 (0.04)	-	543 (0.04)
7.	Other livestock	5955 (2.24)	1472 (0.38)	296 (0.07)	1732 (0.71)	9455 (0.73)
	Total livestock	266390 (100)	382787 (100)	396799 (100)	244228 (100)	1290204 (100)
8.	Total poultry birds including other birds	2476190	3824751	824703	769151	7894795

(Figures in parenthesis indicate percentages to Total livestock)

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15)

Were co-operative credit societies, 2154 (5.19 per cent) non-agricultural credit societies, 112 (0.27 per cent) marketing societies, 2668 (6.43 per cent) productive enterprises, 35433 (85.34 per cent) social service and other co-operative societies.

Table 3.6 District-wise co-operative societies in Konkan region

Sl. No.	Item	Thane	Raigad	Ratnagiri	Sindhu-durg	Konkan Div. (No.)
1.	All types of co- operative societies	32266 (100)	5022 (100)	2890 (100)	1342 (100)	41520 (100)
2.	Co-operative Credit societies	413 (1.28)	131 (2.61)	381 (13.18)	228 (16.99)	1153 (2.78)
3.	Non-Agril. Credit societies	1159 (3.59)	486 (9.68)	331 (11.45)	178 (13.26)	2154 (5.19)
4.	Marketing societies	26 (0.08)	35 (0.70)	19 (0.66)	32 (2.38)	112 (0.27)
5.	Productive enterprises	1308 (4.05)	466 (9.28)	609 (21.07)	285 (21.24)	2668 (6.43)
6.	Social service & other co-operative society	29360 (90.99)	3904 (77.74)	1550 (53.63)	619 (46.13)	35433 (85.34)

(**Source:** Socio-economic Review and District Statistical Abstracts of the Thane, Raigad, Ratnagiri and Sindhudurg districts 2014-15)

CHAPTER IV
METHODOLOGY

Methodology is a system of broad principles or rules from which specific methods or procedure may be derived to interpret or solve different problems within the scope of particular discipline. Unlike an algorithm, a methodology is not a formula but set of practices.

This chapter deals with the salient features of data collection and methodology adopted in the analysis. The methodology adopted to accomplish the objectives of the study is as under. The first section dealt with the collection and source of the data. Section two depicts of data and analytical tools used in the present study.

3.1 Sources of Data

The study is based on the data on cost of cultivation of rice under the cost of cultivation scheme, Dr. B.S.K.K.V, Dapoli. Dist. Ratagiri for the period from 1990-91 to 2016-17. The time series data on FHP, MSP, AP and cost of cultivation were divided into three sub periods viz. Period I-(1990-91 to 1999-2000) and Period II (2000-01 to 2009-10) and Period III (2010-11 to 2016-2017).

The Period-I represents on era when the growth in prices was influenced more by political factors. The period-IIrepresents the changes in minimum support prices were largely determined by the international prices rather than the economics factors and Period III represents the changes in minimum support prices will largely determined by the international prices rather than the economic factors along with recent policy implications like report of Dr. Swaminathancommision. The data on farm harvest price, minimum

support price were collected from reports of CACP for different years.

3.2 Analytical tools

3.2.1 Growth rates

The trends in growth in input prices, farm harvest price and minimum support price were studied by estimating compound growth rates at nominal and real prices (Base year-2004-05).

The compound growth rates was estimated by using following log linear function,

$Y=ab^t$

Where,

Y=Price of input /FHP/MSP

a=Intercept constant

b=Coefficient

t=Time period

From the estimated compound growth rate was worked out as ,

CGR=[Anti log (log b)-1] x 100

3.2.2 Indices Construction

The indices of the input cost were estimated by considering triennium average for 1990-1993 as base period. Whereas, the composite index for all input was calculated as sum of product of input index and share of individual input in total input cost. The indices for farm harvest price and minimum support price were estimated by taking triennium average for 1998-99 to 2000-01 as base period.

3.2.3 Parity Index

The parity between input costs, output prices and income of paddy crop were judged by using the computed indices.

I. The parity indices between output prices of paddy crop and inputs as a whole were obtained for paddy crop by using the following formulae (Patel et.al.1997)

$$RPIjt = FHPIjt / AIPjt \times 100$$

Where,

RPIjt = Parity index between prices of inputs and output of j^{th} crop in t^{th} year.

FHPIjt =Index of farm harvest prices for j^{th} crop in t^{th} year and

AIPjt = Index of average inputs prices of j^{th} crop in t^{th} year.

II. The parity indices between output prices and per quintal cost of production of paddy were worked out as under,

$$RCIjt = FHPIjt / CPIjt \times 100$$

Where,

RCIjt = Parity index between output prices and per quintal cost of production of j^{th} crop in t^{th} year.

FHPIjt =Index of farm harvest prices for j^{th} crop in t^{th} year and

CPIjt = Index of per quintal cost of production for j^{th} crop in t^{th} year.

III. Parity indices of gross income from paddy (RGII) and per quintal cost of production (CP) were worked out by dividing the gross income index (GII) for the particular crop by per quintal cost of production.

$$RGII_{jt} = GII_{jt}/CPI_{jt} \times 100$$

Where,

$RGII_{jt}$ = Parity index between gross income and per quintal cost of production of j^{th} crop in t^{th} year.

GII_{jt} = Gross income index of j^{th} crop in t^{th} year and

CPI_{jt} = Index of per quintal cost of production for j^{th} crop in t^{th} year.

CHAPTER V
RESULTS AND DISCUSSION

The present investigation focuses chiefly on the analysis of trends in cost structure of rice production in Konkan region. This chapter deals with the presentation and discussion of the results of the study in accordance with the objectives and methodology outlined in the previous chapter under following headings:

1. Structural changes in input utilization.
2. Growth rates of farm harvest price, minimumsupport price and actual price of paddy.
3. Temporal and structural changes in cost structureof rice cultivation in Konkan region.
4. Price parity of paddy.

5.1 Trend Analysis

The trends based on the data on cost of cultivation of rice collected under cost of cultivation scheme for Period from 1990-91to 2016-17.The secondary data were divided into three sub periods viz. Period I- (1990-91 to 1999-2000)Period II- (2000-01 to 2009-10) Period III- (2009-10 to 2016-17). The time series data on farm harvest price, minimum support price, actual price and cost of cultivation of rice cultivation of rice in Konkan regionis given in Appendix-I. Overall period (1990-91to 2016-17) were analyzed with the help of compound growth rates. The results are presented in the following tables.

5.2Structural changes in input utilization for rice cultivation.

The indices for different input costs are presented in Table 1.It was observed that index for human labour costs was increased 51.79per cent in Period I and increased to 223.93 per cent in Period

II and increased to 607.046 in Period III.For the period under study,index of labour cost was 294.25 per cent .

Table 5.2 Indices of input cost

Sr.No	Input	Period I	Period II	Period III	Overall (%)
1	Human Labour	51.79	223.93	607.0	294.25
2	Bullock Labour	16.945	28.29	80.02	41.75
3	Machine	2.21	11.24	46.51	19.98
4	Seed	9.53	14.46	36.93	20.31
5	Manure	6.78	6.69	16.25	9.90
6	N	6.69	10.86	16.92	11.49
7	P	3.83	3.42	6.18	4.47
8	K	0.99	0.8	1.404	1.06
9	Other inputs	1.18	3.37	12.87	5.807
10	Composite Index	99.95	303.06	824.1	409.05

Similar trend was observed in case of bullock labour that increased from 16.94 percent in Period I to 28.29 per cent in Period II and increased to 80.02 per cent in Period III. For the period under study, index of bullocklabour cost was 41.75 per cent. Rising index of labour cost is likely to give impetus to farm mechanization. The machine cost index increased from 2.21 per cent to 11.24 per cent in Period II and increased to 46.51 per cent in Period III and the overall index was 19.98 per cent. The increased in the index of seed from 9.53 per cent in Period I to 14.46 per cent in Period II which increased to 36.93 per cent in Period III and overall index was 20.31 per cent. The decreased in the index of manure from 6.78 per cent in Period I to 6.69 per cent

in Period II which was increased in Period III i.e 16.25 per cent and overall index was 9.90 per cent. The increased in the index of Nitrogen cost was 6.69 per cent in Period I to 10.86 per cent in Period II which was increased to 16.92 per cent in Period III. For the period under study index of Nitrogen cost was 11.49 per cent. The indices for P,K were declined during Period II as compared to Period I i.e 3.83 per cent to 3.42 per cent in case of P which was increased to 6.18 per cent in Period III and 0.99 per cent to 0.8 per cent in case of K, which was increased to 1.4 per cent in Period III. And overall index of P and K was 4.47 per cent,1.06 per cent respectively. In case of other inputs index was increased from 1.18 per cent in Period I to 3.37 per cent in Period II which was further increased in Period III i.e 12.87 per cent.

The composite index for all the inputs initially increased from 99.95in Period I to 303.06 in Period II which was further increased to 824.14 in Period III. At overall level it was 409.05.

5.2.Compound growth rates of farm harvest price, minimum support price and actual price of rice.

The compound growth rate of farm harvest price, minimum support price and actual price of output are estimated in table 5.2. The formula used for converting the values of current prices received into constant prices by (Talathi and Thakare, 1995).From the table it is observed that Compound growth rate at current prices, the farm harvest Price was 6.99 per cent per annum over the period of time which was found to be significant @ 5 % level and the Compound growth rate of Minimum support price was 7.40 per cent per annum which is also found to be significant @ 5 % level and the Compound growth rate of Actual Price was observed Non - significant @ 5 % level i.e 6.29 per cent per annum.

Table 5.2. Growth rates of farm harvest price, minimum support price and actual price of output are estimated in Table 5.2 .

Sr.	Particulars	Current Price	Constant Price
1	FHP	6.99*	1.34*
2	MSP	7.404*	2.8*
3	AP	6.29^{NS}	-2.03^{NS}

(* Significant at 5% level, NS- Non significant)

At constant price, the farm harvest Price was 1.34 per cent per annum over the period of time which was found to be significant @ 5 % level and the Compound growth rate of Minimum support price was 2.8 per cent per annum which is also found to be significant @ 5 % level. And the Compound growth rate of Actual Price was observed Non - significant @ 5 % level i.e -2.03 per cent per annum.

This indicated that the Compound growth rate of Minimum support price was higher at current price and constant price i.e 7.40 per cent per annum, 2.8 per cent per annum respectively than the growth rate of Farm harvest price and Actual price i.e 6.99 per cent perannum and 6.29 per cent per annum respectively at current price. At constant price, Compound growth rate of Minimum support price was higher i.e 2.8 per cent per annum than farm harvest price and actual price. The negative growth rate of actual price was observed at constant price i.e -2.03 per cent per annum which is non-significant.

5.3. Temporal and structural changes in cost structure of rice cultivation in Konkan region.

5.3.1 Temporal Changes in Physical Input Use for rice cultivation.

It is observed from Table 5.3 that the use of humanlabour decreased by 13.48 per cent during Period I and decreased by 11.66 per cent in Period II which was further increased slightly in Period III i.e 12.11. For the Period under study use of human labour increased by 178.59 man days.

Table 5.3.Temporal Changes in Physical Input Use

Sr. No	Inputs	Triennium average Base(1990-93) Fig. in Rs.	Period I	Period II	Period III	Overall (Qty.)
1	**Human labour (Man Days)**	172.67	149.4 (-13.48)	192.8 (-11.66)	193.57 (12.11)	178.59
2	**Bullock labour (Pair Days)**	25.33	19.85 (-21.63)	13.4 (-47.10)	8.16 (-67.77)	13.80
3	**Seed (Kg/ha)**	93.15	90.57 (-2.76)	81.61 (-12.39)	71.28 (-23.47)	81.15
4	**Manures (Tonne/ha)**	7.75	6.587 (-15.01)	5.35 (-30.88)	9.00 (16.24)	6.98
5	**N (Kg/ha)**	26.95	57.90 (114.85)	59.57 (121.0)	67.09 (148.95)	61.52
6	**P (Kg/ha)**	10.77	17.47 (62.23)	13.17 (22.29)	10.02 (-6.92)	13.55
7	**K (Kg/ha)**	6.85	6.74 (-1.61)	5.04 (-26.38)	5.55 (-18.98)	5.78

(Figures in parenthesis indicate percentages triennium average change over base year 1990-93)

The use of bullock labour was decreased 21.63 per cent in Period I to 47.10 in period II which was decreased by 67.77 per cent in Period III, similarly the use of seed was decreased by 2.76 per cent in Period I to 12.39 per cent in Period II to 23.47 per cent in

Period III, In case of manure it initially it showed the decreasing trend from Period I to Period II i.e 15.01 and 30.88 respectively and then increased into 16.24 per cent in Period III. Whereas, the use of Nitrogen showed the increasing trend i.e 114.85 per cent in Period I to 121.0 per cent in Period II to 148.95 per cent in Period III. The use of P showed the decreasing trend by 62.23 percent in period I to6.92 per cent in Period III and in case of use of K was decreased by 1.61 per cent in Period I to 26.38 per cent in Period II to 18.98 per cent in Period III.

5.3.2 Temporal Changes in Input cost for rice cultivation

Temporal Changes in Input cost is presented in Table 4. The increase was seen in all the items of cost like human labour, bullock labour, machine, seed, fertilizers.The human labour cost and machine cost increased considerably. It was increased by 20.21 per cent in Period I to 419.73 per cent in Period II and increased by 1308.87 per cent in Period III. And in case of machine cost it was increased by 9.22 per cent in Period I to 453.55 per cent in Period II and 2189.00 per cent in Period III.

Table 5.3.2.Temporal Changes in Input Costs

Sr. No	Inputs	Triennium average Base(1990-93)	Period I	Period II	Period III	Overall (Rs.)

		Fig. in Rs.				
1	Labour	2813.33	3382 (20.21)	14621.6 (419.73)	39636 (1308.8)	19213.2
2	Bullock	1041	1106.4 (6.28)	1847.2 (77.44)	5224.8 (401.91)	2726.13
3	Machine	132.67	144.9 (9.22)	734.4 (453.55)	3036.8 (2189.0)	1305.36
4	Seed	630.33	622.7 (-1.32)	944.7 (49.71)	2411.9 (282.24)	1326.4
5	Manure	411	443.2 (7.83)	437.3 (6.40)	1061.07 (158.17)	647.19
6	N	151	437.4 (189.67)	709.7 (370.0)	1105.0 (631.83)	750.7
7	P	84	250.6 (198.33)	223.4 (165.95)	404.03 (380.99)	292.67
8	K	16	65 (306.25)	56 (250.0)	91.7 (473.25)	70.9
9	Cost A	5022.67	6174.1 (22.92)	14145.9 (181.64)	45137 (798.66)	21819
10	Cost B	7396.67	9689.2 (30.99)	18387.5 (148.59)	53703.5 (626.05)	27260
11	Cost C	9045.67	11516.8 (27.32)	25528.1 (182.21)	79336.3 (777.6)	38793.7
12	Cost C/q	405.45	478.66 (18.05)	929.7 (129.31)	2543.23 (527.24)	1317.1
13	Cost A/q	225.13	256.52 (13.94)	515.33 (128.84)	1446.93 (542.69)	739.59
14	Yield	22.31	24.068 (7.88)	27.457 (23.07)	31.19 (39.83)	27.57

(Figures in parenthesis indicate percentages triennium average change over base year 1990-93)

This was resulted in increase in cost of cultivation as well as cost of production of rice. Similarly N, P, K showed increasing trend. Nitrogen increased by 189.67 per cent in Period I to 370.00 per cent in Period II to increased by 631.82 per cent in Period III. Phosphorus increased by 198.33 per cent in Period I to 165.95 per cent in Period II toincreased by 380.99 percent in Period III.In case of Potassium

the increased was seen 306.25 per cent in Period I to 250.00 per cent II to 473.25 per cent in Period III. For the period under study the cost of N, P,Kwere observed that 750.7, 292.67, and 70.9 respectively. In case of Cost-A it showed that the increasing trend by 22.92 in Period I to 181.64 per cent in Period II to 798.66 per cent in Period III. Cost B and Cost C also showed the increasing trend.

The yield was increased by 7.88 per cent in Period I to 23.07 per cent in Period II to 39.83 per cent in Period III. For the period under study the yield was 27.57.

5.3.3. Structural Changes in Cost of Cultivation of Rice

The relative share of inputs in the cost of cultivation of rice at three points of times is presented in Table 4.The share of human labourincreased to 29.36 per cent in Period I to 57.28 per cent in Period II and decreased to 49.96in Period III. The share of bullock labour decreased to 9.61 per cent in Period I to 7.24 per cent in Period II and 6.59 per cent in Period III. The share of machine increased to 1.26 per cent in Period I to 2.88 per cent in Period II and 3.83 per cent in Period III. Whereas, share of input like seed decreased to 5.41 per cent in Period I to 3.70 per cent in Period II to 3.04 per cent in Period III.

Table 5.3.3 Structural changes in Cost of cultivation of Rice

Sr.No	Input	Period I	Period II	Period III	Overall (Rs.)

1	Human Labour	3382 (29.36)	14621 (57.28)	39639 (49.96)	19214
2	Bullock Labour	1106.4 (9.61)	1847.2 (7.24)	5224.87 (6.59)	8178.47
3	Machine	144.9 (1.26)	734.4 (2.88)	3036.82 (3.83)	1305
4	Seed	622.7 (5.41)	944.7 (3.70)	2411 (3.04)	1326.1
5	Manure	443.2 (3.85)	437.3 (1.71)	1061.07 (1.34)	647.25
6	N	437.4 (3.8)	709.7 (2.78)	1105.06 (1.39)	750.72
7	P	250.6 (2.18)	223.4 (0.88)	404.03 (0.51)	293.67
8	K	65 (0.56)	56 (0.23)	91.72 (0.12)	1137
9	Other inputs	77 (0.66)	220.1 (0.86)	840 (1.05)	193233.1
10	Total Cost	6091.8 (56.69)	19793.8 (77.56)	553813.57 (67.83)	67.36

(Figures in parenthesis indicate percentages to totalCost)

The share of input like manure decreased to 3.85 per cent in Period I to 1.71 per cent in Period II to 1.34 per cent in Period III, whereas, The share of input like N and P decreased to 3.8 per cent in Period I to 2.78 per cent in Period II to 139 per cent in Period III, and 2.18 per cent in Period I to 0.88 per cent in Period II to 0.51 per

cent in Period III respectively. The share of K decreased to 0.56 per cent in Period I to 0.23 per cent in Period II to 0.12 per cent in Period III. The share of other inputs increased to 0.66 per cent in period I, 0.86 per cent in Period II to 1.05 in Period III.

5.4 Price parity of paddy.

Table 5.4.1 Parity between prices of inputs and output prices and income of paddy.

Here in this table we can find out the price index between prices of inputs and outputs, Parity index between output prices and per quintal cost of production, Parity index between gross income and per quintal cost of production.

Year	RPIjt	RCIjt	RGIIjt
2000-01	186.08	0.99	75.86
2001-02	155.29	0.92	80.54
2002-03	158.70	1.10	93.99
2003-04	209.22	0.80	87.54
2004-05	222.56	0.83	71.83
2005-06	205.57	0.85	78.90
2006-07	212.35	0.77	67.11
2007-08	182.07	0.65	64.04
2008-09	182.68	0.71	70.03
2009-10	184.30	0.52	54.99
2010-11	261.81	0.75	51.25
2011-12	247.04	0.61	46.93
2012-13	245.96	0.50	45.18
2013-14	262.34	0.57	40.97
2014-15	260.45	0.55	45.57
2015-16	257.66	0.57	41.52
2016-17	246.58	0.58	51.67

Where,

RPIjt = Parity index between pricesof inputs andoutput of j^{th} crop in t^{th} year.

RCIjt = Parity index between output prices and per quintal cost of production of j^{th} crop in t^{th} year.

RGIIjt = Parity index between gross income and per quintal cost of production of j^{th} crop in t^{th} year.

The parity index between input and output price revealed that during the study period input prices were higher than output price.

The parity index for output price and per quintal cost of production implied that increase in output price was less than cost of production of rice during the period under study.

The parity index for gross income and per quintal cost of production implied that increase in gross income was less than cost of production. This could be attributed to increase in input price more than output price.

CHAPTER VI
SUMMARY AND CONCLUSIONS

Rice (*Oryza Sativa*) is one of the most important cereal crops of India belonging to Poaceae (Gramineae) family. It is the most widely consumed staple food for a large part of the world's human population. India stands first in rice area and second in production after China. Rice cultivation is well-suited to countries and regions have high humidity, prolonged sunshine and an assured supply of water. The long term compound growth rate of production of food-grains between 1973 and 2011 is 2.1 per cent, which is below the national average of 2.7 per cent.The last four decades can be divided into four sub-periods: the Green Revolution period during 1973-83 the post-green revolution period between 1983-91, early reforms period of 1991-2001 and the latest-reforms decade (2001-11) to understand the temporal dimension of growth in the production of food grains. In these sub periods, the compound growth rate of food-grain output was placed at 2.86 per cent, 0.53 per cent, 3.55 per cent and 3.08 per cent, respectively.

In Konkan region of Maharashtra the area under rice is in decreasing trend. In year 2017 the area under the area under rice was 3.79 lakh/ha, with production 16.10 lakh tonnes and productivity 42.5 q/ha. The maximum area is in Raigad (1.09 lakh ha) followed by Palghar (0.764), Ratnagiri (0.753), Sindhudurg (0.625) and Thane (0.550 lakh ha). The productivity of rice was maximum in Sindhudurg district (47.69 q/ha) followed by Ratanagiri (45.46 q/ha), Palghar (42.26 q/ha), Raigad (39.37) and Thane (39.40 q/ha). A research work in this aspect is needed. The present investigation focuses chiefly on the analysis of Thus, the present study entitled, “Trends in cost structure of rice production

in Konkan region" was undertaken to explore this particular aspect with the following specific objectives:

1. To study the structural changes in input utilization
2. To compare the growth rates of farm harvest price, minimum support price and actual price of output.
3. To assess the temporal and structural changes in cost structure of rice cultivation in Konkan region.
4. To study the price parity of paddy.

Methodology:

The present study is based on the secondary data. The trends based on the data on cost of cultivation of rice collected under cost of cultivation scheme for Period from 1990-91 to 2016-2017. The time series data on farm harvest price, minimum support price, actual price and cost of cultivation were divided into three sub periods viz. Period I- (1990-91 to 1999-2000) Period II- (2000-01 to 2009-10) Period III- (2009-10 to 2016-17)were analyzed with the help of compound growth rates. The trends in growth in input prices, farm harvest price and minimum support price were studied by estimating compound growth rates at nominal and real prices.The secondary data used for analysis is given in Appendix II.

The indices of the input cost were estimated by considering triennium average for 1990-1993 as base period. Whereas, the composite index for all input was calculated as sum of product of input index and share of individual input in total input cost.

Findings:

It was observed that index for human labour costs was increased 51.79 per cent in Period I to 223.93 per cent in Period II and increased to 607.046 in Period III. For the period under study index of labour cost was 294.25 per cent. Similar trend was observed in case of bullock labour. Rising index of labour cost is likely to give impetus to farm mechanization. The machine cost index increased from 2.21 per cent in Period I to 46.51 per cent in Period III and the overall index was 19.98 per cent.The increased in the index of Nitrogen cost was 6.69 per cent in Period I to 16.92 per cent in Period III. For the period under study index of Nitrogen cost was 11.49 per cent.The indices for P,K were declined during Period II as compared to Period I. And overall index of P and K was 4.47 per cent,1.06 per cent respectively. In case of other inputs index was increased from 1.18 per cent in Period I to Period III i.e. 12.87 per cent. The composite index for all the inputs initially increased from 99.95 in Period I to 824.14 in Period III. At overall level it was 409.05.

The compound growth rates of current price and constant price are observed that the farm harvest price and minimum support price registered growth of 6.99 per cent per annum and 7.404 percent per annum which showed the significant growth at current price whereas, at constant price growth in FHP and MSP was 1.34 and 2.8 and actual price showed the negative growth which is non- significant.

Temporal changes in physical input userevealed that use of humanlabour decreased by 13.48 per cent during Period I to Period III i.e. 12.11. For the Period under study use of human labour increased by 178.59 per cent.The use of bullock labour, seed,

manure and K showing the decreasing trend and it was 13.80 per cent, 81.15 per cent, 6.98 per cent and 5.78 per cent respectively.Whereas, the use of Nitrogen and Phosphorus shows increasing trend i.e61.52 per cent ,13.55 per cent respectively.

Temporal changes in input cost was seen increase in all the items of cost like human labour, bullock labour, machine, seed, fertilizers The human labour cost and machine cost increased at faster rate. It was increased by 20.21 per cent in Period I to 1308.87 per cent in Period III. And in case of machine cost it was increased by 9.22 per cent in Period I to 2189.00 per cent in Period III.Similarly N, P, K shows increasing trend. Nitrogen increased by 189.67 per cent in Period I to 631.82 per cent in Period III. Phosphorus increased by 198.33 per cent in Period I to 380.99 percent in Period III. In case of Potassium the increased was seen 306.25 per cent in Period I to 250.00 per cent II to 473.25 per cent in Period III. For the period under study the cost was observed that 750.7 per cent, 292.67 per cent and 70.9 per cent respectively.The yield was increased by 7.88 per cent in Period I to 23.07 per cent in Period II to 39.83 per cent in Period III. For the period under study the yield was 27.57 per cent.

The share of human labour increased to 29.36 per cent in Period I to49.96 in Period III. The share of bullock labour decreased to 9.61 per cent in Period I to 6.59 per cent in Period III. The share of machine decreased to 1.26 per cent in Period I 3.83 per cent in Period III. Whereas, share of input like seed decreased to 5.41 per cent in Period I to 3.04 per cent in Period III.The share of input like manure decreased to 3.85 per cent in Period I 1.34 per cent in Period III, whereas, the share of input like N and P decreased to 3.8 per cent in Period I to 1.39 per cent in Period III and 2.18 per cent in Period I to 0.51 per cent in Period III respectively. The share of K

decreased to 0.53 per cent in Period I to 0.12 per cent in Period III.

The parity index between input and output price revealed that during the study period input prices were higher than output price.

The parity index for output price and per quintal cost of production implied that increase in output price was less than cost of production of rice during the period under study. The parity index for gross income and per quintal cost of production implied that increase in grossincome was less than cost of production. This could be attributed to increase in input price more than output price.

Conclusions:

1. The indices for different input cost were found to be increasing from period I to period II.
2. The composite index for all the inputs was found to be increasing from period I to period III per cent respectively.
3. Compound growth rate of Minimum support price was higher than farm harvest price and actual price at current price and constant price.
4. In case of temporal changes in physical input the use of bullock labour, seed, P, K was found to have decreasing trend over the the period of of time whereas the use of human labour, manure showed increasing trend.
5. The temporal changes in input cost were found to be increasingfor all the major input cost in likehuman labour,bullock labour, machine, seed, manure , fertilizers.Among that human labour cost and machine labour cost was increased at a faster rate.
6. In case of structural changes in cost of cultivation the relative share of human labour, machine was found to be increasing

from period I to period II while the relative share of other major inputs was found to be decreasing from period I to period II.

7. It was found that cost of relative share of all the inputs in cultivation of rice was increasing from period II to period III.
8. The parity index between input and output price revealed that during the study period input prices were higher than output price.
9. The parity index for output price and per quintal cost of production implied that increase in output price was less than cost of production of rice during the period under study.
10. The parity index for gross income and per quintal cost of production implied that increase in gross incomewas less than cost of production. This could be attributed to increase in input price more than output price.

Policy implications:

1. The prudent solution to increasing cost of production of rice lies in enhancing the productivity. More emphasis on research and better farm practices in this regard will go long way. Therefore, it is recommended to provide more funds for research and development of rice.
2. Farmers in Konkan region should be motivated to give impetus on farm mechanization.

APPENDIX I

Abbreviation used

% : per cent

qty. : Quantity

@ : at the rate of

/ : per, or

et al. : and other

etc. : etcetera

Fig. : figure

i.e., :that is

Rs. : Rupee

q . : Quintal

Avg. exp. : average experience

B:C ratio : benefit-cost ratio

cm : centimeter (s)

FYM : farm yard manures

Govt. :Government

ha : hectare (s)

hrs. : hour (s)

ICMR : Indian council of medical research

kg : kilogram (s)

ME : Marketing efficiency

MI : Minor irrigation

mg : milligram (s)

mm : millimeter (s)

^{0}C : degree Celsius

PS : Price spread

APPENDIX II

Table 1. Growth rates at nominal price of farm harvest price, minimum support price and actual price.

Year	FHP	MSP	AP
2000-01	524	510	553.57
2001-02	529	530	669.64
2002-03	570	530	706.05
2003-04	561	550	527.10
2004-05	588	560	519.37
2005-06	616	570	589.06
2006-07	638	620	590.62
2007-08	623	645	672.65
2008-09	774	850	832.87
2009-10	894	950	953.54
2010-11	1234	1000	926.56
2011-12	1259	1080	1001.85
2012-13	1427.5	1250	1140.90
2013-14	1596	1310	1195.93
2014-15	1649	1360	1244.64
2015-16	1660	1410	1266.48
2016-17	1670	1470	1331.36

Log of table 1

Year	LN(FHP)	LN(MSP)	LN(MP)
2000-01	6.26	6.23	6.32
2001-02	6.27	6.27	6.51
2002-03	6.35	6.27	6.56
2003-04	6.33	6.31	6.27
2004-05	6.38	6.33	6.25
2005-06	6.42	6.35	6.38
2006-07	6.46	6.43	6.38
2007-08	6.43	6.47	6.51
2008-09	6.65	6.75	6.72
2009-10	6.80	6.86	6.86
2010-11	7.12	6.91	6.83
2011-12	7.14	6.98	6.91
2012-13	7.26	7.13	7.04
2013-14	7.38	7.18	7.09
2014-15	7.41	7.22	7.13
2015-16	7.41	7.25	7.14
2016-17	7.42	7.29	7.19

Index derived from table 1

Year	FHPI	MSPI	API
2000-01	160.18	217.02	86.08
2001-02	161.71	225.53	104.13
2002-03	174.24	225.53	109.79
2003-04	171.49	234.04	81.96
2004-05	179.75	238.30	80.76
2005-06	188.30	242.55	91.60
2006-07	195.03	263.83	91.84
2007-08	190.44	274.47	104.60
2008-09	236.60	361.70	129.51
2009-10	273.29	404.26	148.28
2010-11	377.22	425.53	144.08
2011-12	384.86	459.57	155.79
2012-13	436.37	531.91	177.41
2013-14	487.88	557.45	185.97
2014-15	504.08	578.72	193.54
2015-16	507.44	600.00	196.94
2016-17	510.50	625.53	207.03

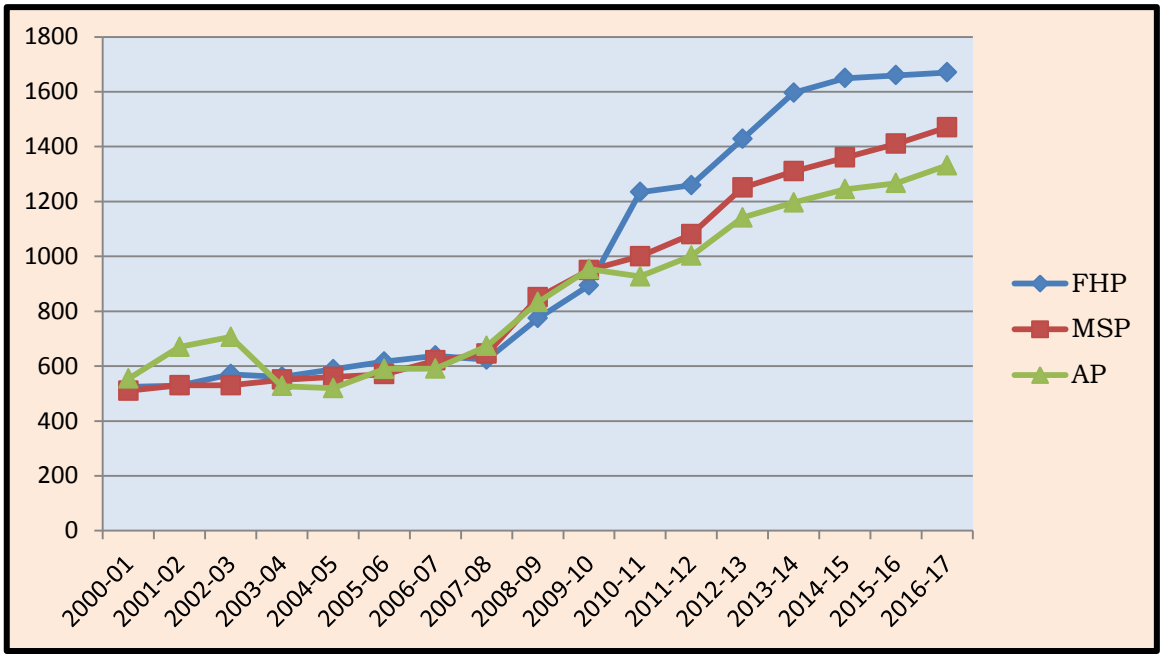
Table 2. Growth rates at real price of farm harvest price, minimum support price and actual price.

Year	FHP	MSP	AP
2000-01	493.31	504.14	553.57
2001-02	602.40	633.76	669.64
2002-03	684.40	668.22	706.05
2003-04	502.89	517.68	527.10
2004-05	519.37	519.37	519.37
2005-06	562.28	578.72	589.06
2006-07	544.33	533.46	590.62
2007-08	634.80	584.00	672.65
2008-09	632.72	548.71	832.87
2009-10	627.16	562.08	953.54
2010-11	441.50	518.87	926.56
2011-12	467.90	519.47	1001.85
2012-13	469.94	511.12	1140.90
2013-14	440.60	511.23	1195.93
2014-15	443.81	512.49	1244.64
2015-16	448.60	502.99	1266.48
2016-17	468.76	507.18	1331.36

Log of table 2

Year	LN(FHP)	LN(MSP)	LN(MP)
2000-01	6.201	6.223	6.316
2001-02	6.401	6.452	6.507
2002-03	6.529	6.505	6.560
2003-04	6.220	6.249	6.267
2004-05	6.253	6.253	6.253
2005-06	6.332	6.361	6.379
2006-07	6.300	6.279	6.381
2007-08	6.453	6.370	6.511
2008-09	6.450	6.308	6.725
2009-10	6.441	6.332	6.860
2010-11	6.090	6.252	6.831
2011-12	6.148	6.253	6.910
2012-13	6.153	6.237	7.040
2013-14	6.088	6.237	7.087
2014-15	6.095	6.239	7.127
2015-16	6.106	6.221	7.144
2016-17	6.150	6.229	7.194

Fig.1 Comparison of FHP, MSP, AP



At constant price

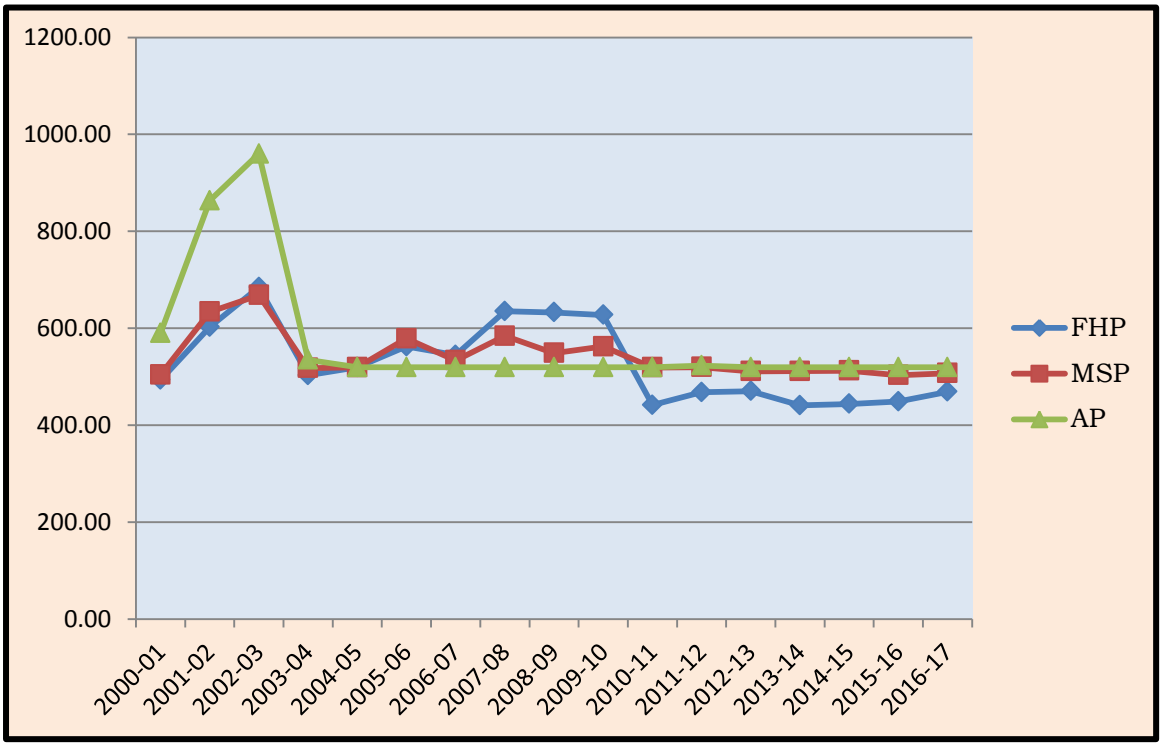
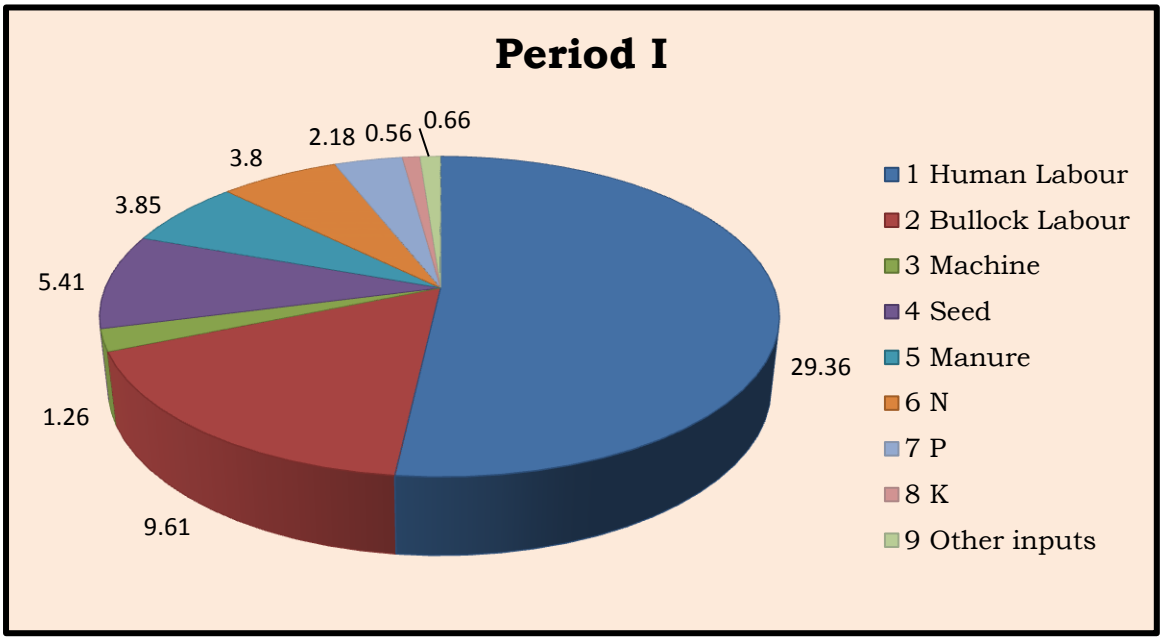
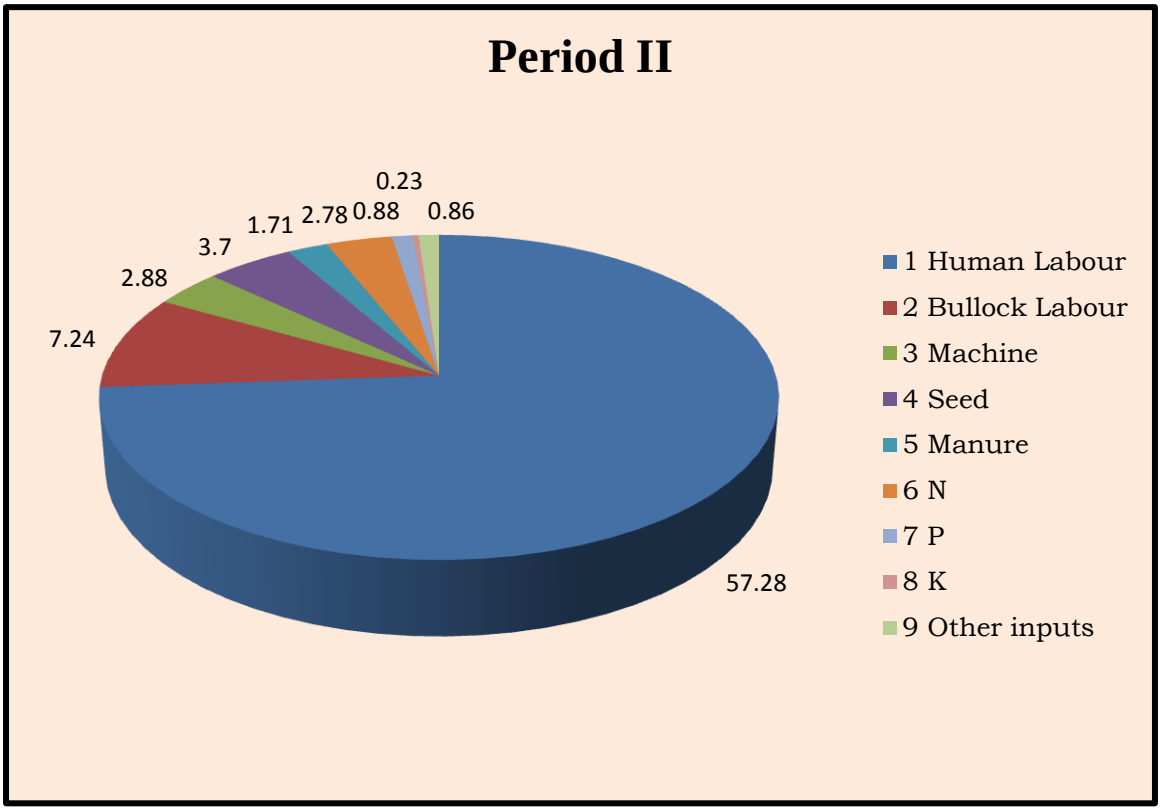
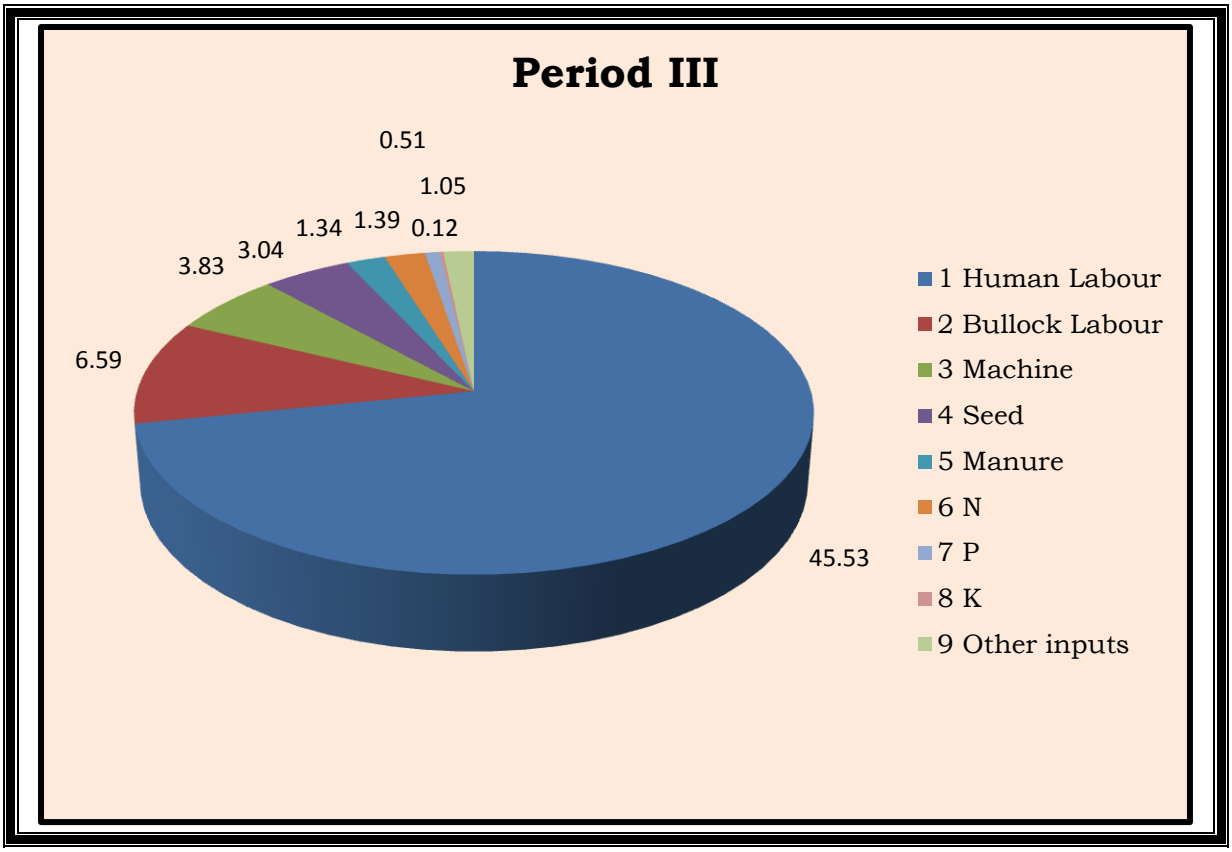


Fig.2 Structural changes in Cost of Cultivation of Rice






Period III
0.51
1.05
1.39
0.12
1.34
3.04
3.83
6.59
45.53
1 Human Labour
2 Bullock Labour
3 Machine
4 Seed
5 Manure
6 N
7 P
8 K
9 Other inputs

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INTRODUCTION

METHODOLOGY

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RESULTS AND DISCUSSION

SUMMARY AND CONCLUSIONS

LITERATURE CITED

ABSTRACT

DEPARTMENT OF AGRICULTURAL ECONOMICS

COLLEGE OF AGRICULTURE, DAPOLI

Title of Thesis	**:**	Trends in cost structure of Rice production in Konkan region.
Name of student	**:**	Ms. Ekamalli Priyanka Chandrakant
Regd. No.	**:**	ADPM/16/2515
Name and Designationof Research Guide	**:**	Dr. J. M. Talathi Head, Department of Agricultural Economics, Dr. B.S.K.K.V, Dapoli.
Degree	**:**	M.Sc. (Agri.)
Degree awarded	**:**	2018
Major Subject	**:**	Agricultural Economics

THESIS ABSTRACT

The study aims at analysis of structural changes in input utilization,Compound growth rate of farm harvest price, minimum support price and actual price, temporal and structural changes in cost structure and price parity of paddy. The present study is based on the secondary data. The trends based on the data on cost of cultivation of rice collected under scheme, Dr. B.S.K.K.V, Dapoli for Period from 1990-91 to 2016-17.The time series data onFHP, MSP, AP cost of cultivation were divided into three sub periods viz. Period I- (1990-91 to 1999-2000) Period II- (2000-01 to 2009-10) andPeriod III- (2009-10 to 2016-17) were analyzed with the help of compound growth rates.

The study revealed that in Konkan region the compound growth rate minimum support price was significant at 7.40 per cent. The growth in actual price was non-significant i.e 6.29 per cent. The significant growth in farm harvest price was significant i.e 6.99 per cent.

The indices for different input cost was found to be increasing from period I to period II. The composite index for all the inputs was found to be increasing from period I to period III, respectively. Composite index for period I was 99.95 which increased upto 303.06 for period II and increased upto 824.14 for period III. For the entire period under study index it was 409.05.

In case of temporal changes in physical input the use of human labour and N at overall level increased by 178.59 per cent, 61.52 per cent respectively and the use of bullock labour, seed, manures, K were decreased by 13.80 per cent, 81.15 per cent, 6.98 per cent, 5.78 per cent respectively.

The temporal changes in cost input was found to be increasing forall the major cost input like human labour, bullock labour, machine, seed, manure, fertilizers. The human labour cost and machine labour cost was increased at a faster rate from period I to period III. In case of structural changes in cost of cultivation the relative share of human labour, machine was found to be increasing from period I to period II while the relative share of other major inputs was found to be decreasing from period I to period II.

It was found that cost of relative share of all the inputs in cultivation of rice was decreasing from period I to period III. The parity index between input and output price revealed that during the study period input prices were higher than output price.The parity index for output price and per quintal cost of production implied that increase in output price was less than cost of production of rice during the period under study.