Chapter 7

Conclusions and Policy Implications

7.1 Introduction

Maharashtra is one of the developed state in India having a land of white silver, where cotton crop is grown on large scale. In Maharashtra, cotton, sugarcane, onion, grapes are the major cash crops. This land enrich with black
soil and better fertility factor. Its agriculture is largely commercial, cultivated for profit and mechanized to some extent. However, other weaken states are practicing agriculture to maximize the production, food requirements and cater the financial obligations of the farmers.

State of agriculture refers to structure of crop pattern, which also mean the proportion of area under various crops at a point of time or regional allocation of land under the different crops. An ideal crops plan should not only fulfill requirement of the local people or food for the farmers and their families, but also to meet fodder requirement for farm animals along with an assurance of income for sustaining their livelihood. Maharashtra is one of the most industrialized and urbanized states in India. Paradoxically, it also enjoys the dubious distinction of a state having highest rural – urban disparity in standard of living of its population.

The share of agriculture in the Net State Domestic Product of Maharashtra declined steeply in 1992-93. The share for Indian agriculture was 27 percent. Yet in terms of proportion of labour force engaged in agriculture which was 60 percent in 1991, Maharashtra’s economy continues to be predominantly agrarian. Indeed the share of states in rural labor force employed in agriculture (main workers only) was as high as 63 percent in 1991. Nearly half of the farmers in Maharashtra are agricultural laborer. Thus the crucial dependence of its rural labour force on agriculture is quite evident and is unlikely to diminish drastically in the near future. It is against this scenario that importance of accelerated growth in Maharashtra’s agriculture must be judged.
7.2 Major Findings of the Study

In the present study, statistical and econometric tools have been used for writing thesis. Besides averages, compounded annual growth rate, average annual growth rate, standard deviation, coefficient of variation, log linear model, dummy variable log linear model, mean comparison test and t test have been used for analyzing data and testing the hypotheses in the various chapters. Determinant of cropping pattern are analyzed using linear model. Case study method is also adopted for a study of cropping pattern in the Yavatmal district. Following findings emerged after careful use of the research techniques.

7.2.1 Trends in Cropping Pattern in Maharashtra

1. This study presents levels and growth of aggregate crop output of Maharashtra during 1991-92 to 20012-2013. It brings out several interesting features of the patterns in agricultural developments. For the analysis, 1991-92 to 2012-2013 periods is divided into two sub-periods of 10 years each. In the history of growth of agricultural output, period 1991-92 to 2001-2002 marks as turning point in the Indian economy because of the introduction of new economic programme. However it does not boost the cereal and food gramin production in Maharashtra. On the contrary, the production of food grains fallen by -2.76 CAGR.

2. However, in the latter period (2002-03 to 2012-13) the production cereals and food grains picked up. Cotton crop output accelerated to 11.34%. An interesting feature of the millennium decade (2002-03 to 2012-13) was that agricultural growth permitted to all the regions in Maharashtra. The most
significant development was an acceleration of growth in sugarcane crops due to better and remunerative support prices declared by the government. Total food grains and cereals also recorded a significant acceleration but there was a minor deceleration in production pulses.

3. Cotton crop has made a tremendous stride in growth of production from 3.83% to 11.34% while the cereals have shown poor performance. Above table shows several features of agricultural development in Maharashtra after liberalization for the period II. It reveals that cropping pattern went in favour of cash crops namely cotton and sugarcane. It is therefore the Maharashtra is experiencing the inflation of food grains since 2002 onwards.

**7.2.2 Determinants of Cropping Pattern in Maharashtra**

1. The results appeared from model 1 shows that food grain production in Maharashtra is significantly determined by area under canal irrigation and area under cultivation. But the impact of fertilizer is insignificant in accelerating production of food grain. Model 1 also point out that R2 value is 74% and F test results are acceptable, model is free from autocorrelation problem. In the subsequent models, area under canal irrigation is significant and other determinants are not showing any significant impact in propagating production size of the crop. In the case of crop pulses none of the variable is significant. It is because pulses are grown basically of rainfall.
2. Model 2 result shows that irrigation is an important determinant of cotton crop production. Model 3 reveals that none of the independent factor is significant determinant of pulses crops in Maharashtra. Basically this crop is grown in rain fed area. It is therefore productions of pulses are not picking up despite better supportive prices. Model 4 shows that oilseeds crop production is significantly determined by irrigation facility. The results of Model 5 point out that sugarcane crop production is significantly determined by irrigation facility. This crop requires constant water throughout year. Hence it consumes lot of potential of other crops and it also makes lazy to farmers in Maharashtra. Each models’ R² value is reasonable and f test values are significant at 1 and 5 percent except model-3.

7.2. 3 Cropping Pattern Region Wise: Statistical Analysis

1. Cropping pattern of Konkan region shows that AAGR of cereals production recorded in Ratnagiri and Sindhudurg is 2.51 and 2 percent respectively. However, the coefficient variation of cereal is 8 and 7 percent. It shows that there is not much variation of production in the cereal crops of both districts

2. Nashik region comprises five districts. However, we concentrate on two prominent districts for observing cropping pattern. As it is shown in the table, production of cereals AAGR is almost same in both the districts in the range of 8-9 percent. Coefficient variation rate is 35 to 30 percent which is quite high. It shows that the area under cereal crops and growth rate of cereals are uneven during the period of study. Nashik is leading district over Jalgaon in terms of AAGR of other crops due to irrigation potentials.
3. Cropping pattern in Pune region reveals AAGR of production all the crops in Pune district is less than 1 percent whereas in Solapur district the AAGR of cereals production is less than 1 percent. However, the total pulses production grown by 3.77 percent but oilseeds production is suffered by -3.47 percent. One of the positive parts is that sugarcane production grown by 16.41 AAGR. CV in both the districts found higher under the production of major crops that points the unstable cropping pattern.

4. Cropping pattern in Aurangabad region shows that AAGR of the crops such as sugarcane and cotton is in Aurangabad district is recorded as 17.46 and 31.11 percent respectively whereas in the Jalana district, AAGR is observed as 10.91 and 22.28 percent for the same crops. AAGR of these crops is much higher than other crops in both districts. This tendency shows that farms prefer that cash crops in which they have good margin and better prospectus. The CV for all the crops in both districts are observed much higher, that shows that instability in the cropping patterns.

5. Cropping pattern in Nagpur region shows that the performance of Nagpur district is poor in all the major categories of the crops. In Bhandara district, the AAGR of cereals, pulses, oilseeds and recorded as 17.7, 15.7 and 2.3 percent respectively. AAGR of oilseeds is found as less than 1 percent in the Nagpur district. The CV rate of sugarcane crop in both districts is very high that shows last variations in the crop. The cereals AAGR is good in both the district are 9.47 and 17.7 which is fairly good due to rice crops is grown on large scale in the region.
7.2.4 Mean Comparison Test and Dummy Variable Regression Used for Observing Cropping Pattern in Yavatmal District

1. It can be seen in the Table 6.1 that production of rice has been declined from mean value 40.4 to 12.1 in the period 1991-2010 and that change is significant. However, the production of wheat has increased during the same period as shown by mean value 212.8 to 347.7 is also significant change supported by t test at 8% level of significance. One of the striking changes is that the production of Jowar crop has drastically declined from 2206.3 mean values to 990.4 and its place has been taken over by soybean and sunflower crops in the recent past.

2. The good supportive price has attracted farmers for growing Maize in the period of study. This argument has been supported by the mean values of maize production has increased from 2.6 to 7.6. This change is also supported by t test. The overall production trends in the cereal are a cause of concern for the government in particular and public in general. The mean values of cereal are declined from 2515.6 to 1266.7, which is significant change at 1% level of significance.

3. In the category of pluses the production of Gram has significantly increased but the production of Tur has not increased at all the span of 10 years. The production of Mung and Udid crop are significantly declined during the study period. The aggregate production of Pluses has also declined from mean value 1482.8 to 979.8. This change is also matter of worry of the government and also public. The price level of pluses has been increasing because of shortfall in the production.
4. Major Cash crop comprises sugarcane, cotton, sunflower and soybean. Among these crops production of cotton and soybean has been significantly increased during second period 2001-2010. However, the production of sugarcane has been suffered but not significantly. Another noticeable change is that the production of sunflower crop has declined mean value 20.9 to 0.9. In the cash crops, the production of cotton and soybean were scaled up due to the use of BT Cotton seeds and better support prices declared by the government.

5. It can be concluded from the table 6.1 that the production of cereals and pulses went down significantly. It is matter of concern for the government because shortages escalated the inflation of foods and may work as reason not to complying food security right of many poor people. It may perpetuate the poverty percentage due to food inflation in the Yavatmal district and Maharashtra.

7.2.5 Trends in Production of Major Crops of Yavatmal District: Using Dummy Variable Regression Model

1. The regression result of model 1 shown in the Table 6.2 reveals that the production of cereals fallen during the period 2001-2010 and same results are supported by minus sign of t test. R2 value of regression is 53% but the sign of coefficient and t test are making sense. Hence low R2 has least impotence in the present regression model. Subsequent regression number 2 also shows that negative trend in the (ttpa) pluses production in the second period of study and coefficient value is significant at 9 percent.
2. The results of regression number 3 exhibits that the production of cotton has increased significantly, that are supported by coefficient value at 1% level of significance. Last regression number 4 also shown positive trend in the production of the soybean in the period 2001-2010 results thereof are significant at 1% level of significance. One may conclude that production of cotton and soybean is increasing since the 1991 due to better prices for the produce and more yield over the other crops. This trend is being supported by dummy variable regression.

7.3 Policy Implications

We employ statistical and econometric techniques such as averages, compounded annual growth rate, average annual growth rate, and standard deviation, coefficient of variation, log linear model, dummy variable log linear model, mean comparison test t test for analyzing data and testing the hypotheses in the various chapters. After using all these tools, the following policy implications are emerged from the findings of the present study.

1. Regression results shows that food grain production in Maharashtra is significantly determined by area under canal irrigation and area under cultivation. Hence in near future more areas are to be brought under irrigation by implementing micro irrigation and small irrigation schemes, even today hardly percentage of gross irrigated area is 18 percent of the total cultivable land, which can be taken to 35 percent. This aspect should be taken care of in future policy for state development of Maharashtra.

2. Region level analysis shows that production of Pulses, Oilseed and Sugarcane crops are in increasing in entire Maharashtra in the recent years due to
remunerative supportive prices declared by central and state governments and increasing need of cash requirements of the farmers.

3. But this trend is creating threat to food grain crops. Hence, the productivity and area under food grain crops should be increased by working on solution such as micro irrigations, disease free crops and high yielding varieties, low water intake crops, low gestation period crops. For that, the research in plants, crops, pesticides, fertilizer, and extension is essential.

4. In the context of economic liberalization, investment in new technology is must for better scale of production and yield. There is a need to give high priority to investment in research and development and extension services relating to agriculture so that we may give food to everybody in Maharashtra and India at affordable price.

5. Production of Cereals and Pulses has fallen during the period 2001-2010 in Yawatmal district and same results are supported by minus sign of t test. \( R^2 \) value of regression hence government must pay attention to this fact otherwise the food security and protein security programme will come in trouble.

6. Production of Cereals and Pulses has fallen, on the other hand cotton and soybean has increased in Yavatmal district during the period 2001-2010. This uneven cropping pattern should be controlled by devising balanced plan of crops. For that, policy measures such as better marketing conditions, minimum support prices, providing new technology at cheaper cost, training and extension service for sustainable farming to the farmers; this efforts may foster the production of various crops in the Yavatmal district.
7. Government should make publicity to motivate people for cultivating food crops and also offer good supportive prices to these crops then only the shifting would be possible from cash crops to non cash crops.

8. An affordable technology with assure supply of manures and natural fertilizers may boost the production of food grain in Maharashtra.

**7.4 Limitations of the Study**

Present study is focuses on changing trends in cropping pattern in Maharashtra for the periods before reforms and after economic reforms. For that we used an aggregate data of main categories of the crops. However, crop specific study has not been conducted except cotton and sugar cane. District level trends in cropping pattern region, wise two districts have been covered for observing trends in cropping pattern for the period 2000 to 2013. We could not cover all the districts of Maharashtra for this exercise. However, in aggregate level data, all the districts have been covered. Panel data techniques is an appropriate for observing trends in cropping pattern in the Maharashtra but we have not tried panel data techniques due to continuity in the data and data constraints.

**7.5 Scope for Further Research**

The micro level data of all the districts of Maharashtra has not been considered for this exercise. In future, this gap may be filled up by taking data set of the entire district together for the period 2001-2014. The econometric technique such as Panel data methodology can be used for observing trends in cropping pattern in the Maharashtra. Besides this, more advanced techniques and indices can be tried in future study.