Chapter VI

SUMMARY AND CONCLUSION

Crop production occurs in a dynamic environment with every growing season, producers must attend to numerous factors that influence their management decision, while some factors are within control of producers; many are not. The whether, soil environment market condition, input prices, govt. policies, new technology and information, technology represent broad categories of externalities that producers must deal with on a continual basis. Moreover, introduction of new technology has bought significant change in cropping pattern of regions. The cropping pattern analysis also paves the wave to improve the productivity and production of region under Rabi and Kharif crops in three agro-climatic zones of Chhattisgarh. Chhattisgarh state, 26th state was carried out of M.P. on November 2000. It covers about one-third of geographical area of undivided Madhya Pradesh. This state has experienced witnessed only new shift in cropping pattern. Whenever a shift occurs in the area of a crop, it leads to either increase of decrease in the area allocation under the crops i.e. area allocation under the crops in not independent. Similarly, identifying the shifts in the cropping pattern alone may not be sufficient. It is essential to observe whether a shift has occurred in production or productivity levels of various crops grown in Chhattisgarh state as a whole and three zones of Chhattisgarh viz., Chhattisgarh plains, Northern hills and Bastar plateau under Rabi and Kharif seasons. The study was based on 33 years of data (1974-75 to 2006-07) on the three zones of Chhattisgarh and Chhattisgarh state as whole.
In the context of identifying the shifts in cropping pattern, the hierarchical approach of cluster analysis, in particular, the Ward's minimum variance method and principal component analysis found to be quite suitable. The time series data of the '33' years was subjected to cluster analysis (corresponding to years). Each cluster, thus represents a period of years with similar year to year fluctuation i.e. each clusters represents a certain level of "shift" in the cropping pattern.

A review of earlier attempts revealed that the principal component approach analysis could also be applied under certain classification studies. However, the approach has the limitation of subjectivity in the cluster formation. Further, when the dimension space exceeds two dimensions, the plotting of scores was not convenient. Hence modification was proposed to deal with present situation to reduce the complexity in plotting the scores in p - dimension, the data on p -variable $Z_j(j=1...p)$ was subjected to cluster analysis, by applying the ward's method. Hence, the periods of shift (cluster) has been identified by applying cluster analysis and principal component analysis approach. Further, it was also found that there was no difference in the cluster formation both these clusters.

The results corresponding to the shifts in crop characteristic in Chhattisgarh plains under Kharif season reveals that under Kharif season rice, maize and pigeonpea recorded a considerable increase i.e. positive shift in the production level. It was observed during the recent years rice crop recorded the top position in the production followed by kodo and pigeonpea. This moves was partly due to maximum coverage and yield potential of crops
The results on the shifts in crop characteristic in Northern hills under Kharif season revealed that rice, groundnut, pigeonpea and sesamum were the crops show continuous positive shift in production level from period I to IV mainly due to convergent nature of area allocation as well as productivity. This region shows divergent i.e. decreasing production level for rice, maize, jowar and kodo require attention for policy makers that effort should be made to improve the production level and improve the agricultural technology to achieve better yield performance. The shift in area, production and productivity of crops in Bastar plateau under Kharif had revealed that Bastar plateau acquired more area than the Northern hills for almost all crops and resulting improved productivity as well as production. Maize crop acquired top position in productivity followed by rice crop. Moreover, this zone also exhibited convergent and divergent productivity level from period I to IV due to fluctuating instability under area allocation to various crops.

The studies of shift in crop characteristics in Chhattisgarh state as a whole registered continuous positive shift from period I to IV and acquiring maximum area resulting considerable increase in production level for maize and rice.

The results of shifts in crop characteristics in Chhattisgarh plains for Rabi season indicate that all crops exhibiting various convergent, divergent trends in production due to fluctuating trends in area and almost convergent nature of productivity. Wheat crop has relatively the high yield potential compared to other crops. The maximum production in the recent years is recorded to lathyrus and gram crops which was mainly due to maximum area occupied and productivity by the crop.
The results of shifts in crop characteristics in Northern hills under Rabi season crops indicate that negative shifts in area under the crops such as gram and lathyrus during the recent years were in favor of dominating crops such as linseed and mustard.

Bastar plateau recorded continuous positive shift in productivity for all Rabi crop from period I to IV inspite of increased area allocation shown by almost all crop under Bastar plateau for Rabi season and none of the crops exhibited continuous positive shift in production. This zone also registered highest wheat productivity with an average 3185.99 kg/ha-1 among all the zones.

It is observed that in the Chhattisgarh state as a whole under Rabi season area under wheat and gram increases. The increased area expansion and partly productivity which is responsible for increasing production level.

It was observed that most of the crops exhibited increase in production level which is mainly due to maximum coverage and not the productivity level except finally rice, which recorded increase productivity level specially in the Chhattisgarh plain zone as well as in the state. The area under different crops during Rabi and Kharif showed that there is a significant jump in the area of maize, gram, pigeonpea and groundnut. The Rabi season crops since grown under rainfed condition, due to which gram, wheat and lathyrus showing slightly increasing yield and still there is enough scope to increase the yield.

Therefore, causes of declining productivity may different (biotic or abiotic) for each crop, which need technological support. This also indicates that there is no technological impact during the recent years in increasing the production level the crops. This is a serious concern for planers farmers, and
technology generator. Hence, there is a need to concentrate on yield improvement measure for most of the crops of Rabi and Kharif in all the zones. Specially production of rice is although increase due to their high productivity and maximum area coverage.

CONCLUSION

The following conclusion are drawn in the present study on periods of shifts in crop characteristic corresponding to Chhattisgarh state as whole as well as the three zones. In the context of identifying the shifts in cropping pattern the procedure of cluster analysis, in particular, Ward’s method and principal component method can be applied.

(1) The shifts identified under the corresponding situation in the present study using cluster analysis are same as those obtained with principal component analysis.

(2) Both the approach found to be suitable in classifying the years, in view of homogeneity of cluster within them.

(3) Rice recorded an increase in area in the recent years in the Chhattisgarh State as a whole as well as all the zones, except few cases.

(4) Rice and maize registered a considerable increase in production level in Chhattisgarh state a whole as well as in the all three zone whereas crop like jowar and kodo have considerable negative shift in production level in Chhattisgarh state as whole as well as all the zones under Kharif season.
Rice, maize, groundnut, and pigeonpea were crops in the recent years showed an increase in yield potential in all the zone, with little fluctuation, and Chhattisgarh state as whole whereas maize also emerge as high yielding crops in Northern hills and Bastar plateau and Chhattisgarh state as whole.

Gram and wheat crop exhibited considerable positive shift in productivity level in new zones; whereas lathyrus recorded convergent is increases in area in all zones with almost stagnate production and productivity.

It was also recorded that production of some crops in all the zones exhibited different trend and not follow any systemic pattern during Rabi season.

The high production level of rice due to productivity and maximum area coverage while in case of lathyrus which show declination in production due to area declination under the crops.

Maize registered continuous increasing trend of productivity in all the zone as well as Chhattisgarh state as whole.

It is also noted that certain crops like jowar, lathyrus recorded high productivity level with fluctuation but it may not be encouraged and not considering due to less monitory gains.