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6.1 INTRODUCTION

The present study evaluates the agricultural and economic changes in area under Kukadi canal irrigation project in Pune, Ahmednagar and Solapur Districts in western Maharashtra. The study area falls in sub-tropical climatic zones having an annual rainfall 200 to 450 mm. the study area lies under rain shadow area and known as drought prone zone. Due to the Kukadi canal irrigation project so many agricultural changes occurs in Junner, Parner, Shrigonda, Karjat and Karmala tahsils. The study is based on the Field Survey Method of research. Micro level information was collected from the benfeiter farmers of kukadi canal irrigation and other by different techniques like as interviews, records, gazetteers, internet etc. the data on various aspects of Canal irrigation and agricultural practices was collected before canal irrigation and after canal irrigation for the period of 1990-91 to 2010-11.

The present investigation has been carried out to assess, analyze, describe and interpret the pattern of land use, patterns of crops, economic changes, and agricultural changes of the five tahsils were covered under Kukadi Left Bank Canal. With a view to investigate the influence of certain variables and provide an in depth study for adjudging scientific, proper and efficient land use to meet the demand of food from the increasing population.

6.2 FINDINGS

There are several factors that influence the growth performance in agricultural sector. Irrigation is one of the important devices in modern agriculture, in recent years; the irrigation is affected due to unfavorable rainfall conditions. The area under irrigation is changing continuously over a period of time. Here, Kukadi canal irrigation project plays an important role in changes in agricultural and economic sectors of study area. The study highlight on the major agricultural and economic changes occurs due to canal irrigation in the study area. The following are some of the significant findings of the study.
1. The Kukadi irrigation Project providing irrigation benefits mainly to the scarcity area from Pune, Ahmednagar and Solapur Districts.

2. Kukadi project made up by major Five Dams Yedgaon, Manikdoh, Wadaj, Dimbhe and Pimpalgaonjoge dam.

3. The lands in study area are fertile and capable for growing variety of crops.

4. After independence, through the Kukadi Irrigation Project of Pune district, the Junner, Parner, Shrigonda, Karjat and Karmala tahsils has obtained Canal Irrigation and it has caused to take place some fundamental changes in the Agriculture and Cropping Patterns.

5. Through the Kukadi canal irrigation project 27115 hectares area in Junner, 14740 hectares in Parner, 30616 hectares in Shrigonda, 29990 hectares in Karjat and 24562 hectares areas in Karmala Tahsils are comes under irrigation.

6. The World Bank considered Eighth monthly cropping pattern for Kukadi Project.

7. Kukadi project consisted 52 percent cropping intensity in 75948 hectares irrigable area for Kharif Crops and 55 percent cropping intensity in 80330 hectares irrigable area for Rabi crops.

8. Farmers are not having access to information about Kukadi canal water. The information about storage of water, opening and closing daters of canal rotation and quantum of water flow are not available to the farmers.

9. The total projected irrigation capacity of Kukadi project is about an area of 156278 hectares. Out of them 96396 hectares area of these five tahsils are irrigated.

10. Agriculture is the Primary occupation of the Beneficiers and 90.03 percent of the beneficiers except agriculture there is no secondary occupations.

12. The study reveals that, 38.04 percent farmers are less than 2 hectares land holder, 37.05 percent are 2 to 4 hectares, and 24.91 percent farmers are more than 4 hectares landholders.

13. In kukadi command area about 33.06 percent farmers are illiterate, only 11.96 percent farmers are learnt till graduation, nobody can take agricultural degree.
14. The farmers are using well, tube well, and other sources along with canal.

15. The land use patterns changed due to canal irrigation. The Gross cropped area and Net sown area in Command area is increased. In 19990-91 Net sown area is 72.54 percent it increased to 73.71 percent in 2010-11 in Junner Tahsil. It increased from 71.96 percent to 73.32 percent in Shrigonda tahsil.

16. The area under forest has been reduced after the arrival of Kukadi Canal Irrigation in study area. In Shrigonda tahsil, the land under forest was 10.10 percent in 1990-91 it become reduced to 9.47 percent in 2010-11.

17. The sustainable source of irrigation is made available for drought prone areas through Kukadi canal so, the culturable land increased in study area. The total Culturable command area is 224699 hectares.

18. In study area there have been cultivated crops like Jowar, Bajra, and Pulses before canal irrigation, but after the irrigation facility was made available, the cropping pattern changed in to Sugarcane, Fodder, fruits and vegetables and wheat crops.

19. According to crop combination regions in command area, in 1990-91 eight crops like Food grains crop combination was ideal in Junner, Parner, Shrigonda, Karjat and Karmala tahsils. But, in 2010-11 this crop combination regions changed in to Five, Six, and Seven crop combination.

20. The area under Jowar crops in command area decreased from 46.18 percent to 9.83 percent in 1990-91 to 2010-11 respectively. In other hand, the area under Sugarcane, fodder, and fruits and vegetables become increased in this period.

21. There is found low crop diversification in Shrigonda, Parner, Karjat and Karmala tahsils in 1990-91. While in 2010-11, found high diversification in Parner and Karjat tahsils and moderate crop diversification in Junner and Shrigonda tahsils.

22. In 1990-91 Jowar, Bajra and Pulses crops are in competition for diversification in command area, while in 2010-11 sugarcane, Jowar, Fodder, Fruits and vegetables, Wheat crops are in competition for diversification.
23. Before the canal irrigation nearly 87.04 percent farmers were practicing traditional farming. Now 74.25 percent farmers are using modern technology and methods in farming.

24. There were only 12.80 percent farmers using hybrid seeds before irrigation, while after canal irrigation nearly 83.38 percent farmers are using hybrid seeds in agriculture.

25. Before the canal irrigation 87.90 percent farmers were using only Bio-fertilizers, now after irrigation, 40.20 percent farmers are using Chemical and 33.80 percent are using mixed fertilizers for crops.

26. Nearly about 22.58 percent farmers are facing to water logging problems. This problem caused mainly due to over irrigation, canal leakages and low level of land.

27. In command area nearly 74.58 percent farmers are using flow irrigation method while only 21.93 percent farmers are using drip irrigation and 3.49 percent use sprinkler irrigation methods.

28. There are 62.96 percent farmers are members of Water Users associations. Also found that no losses or water wastage where there are such Water users Associations.

29. If canal water is not adequate, Wells and tube wells are the major alternative source of irrigation for farmers.

30. Nearly about 59.13 percent farmers in command area are getting agricultural advice from various Medias like Agricultural officers, Radio, Television, Internet and Mobile etc.

31. There is not found very high agricultural efficiency in any part of the study area in 1990-91 and in 2010-11.

32. Before canal irrigation 86.88 percent farmers were taking only production of food grain crops but it is totally changed to cash crops, nearly 74.58 percent farmers taking cash crops due to availability of irrigation.
33. In commercial farming 81.56 percent farmers are taking Sugarcane crop in their farm.

34. Due to irrigation facility the attitude of farmers in command area are turned toward the farming of horticulture, and floriculture.

35. Majority of farmers in command area are not aware about environment, only 11.12 percent farmers are taking crops according to ecological-balance and 44.02 percent farmers are found selecting their crop pattern according to suitable soil quality.

36. The farmers in command area doing many Agro-complimentary occupations. Mostly 60.96 percent farmers are doing Dairy farming.

37. Canal irrigation increases crop production but other factors like atmosphere, soil quality, types of seeds, fertilizers also effect on agricultural production.

38. About 86.88 percent of the farmers opine that canal irrigation has increased crop production and simultaneously the diseases on crops have increased.

39. It is found that the farmers of the command area do not prefer to process their agro-produce.

40. The canal irrigation has increased the employment opportunity to the farm-labours in command area. There are 55.48 percent peasants are available at local level.

41. The irrigated area is increased in five tahsils in 2010-11 as compare to 1990-91.

42. The percentage of cash crops has been increased. In 1990-91 it is 30.22 percent, 10.00 percent, 8.35 percent, 26.33 percent and 5.18 percent in Junner, Parner, Shrigonda, Karjat and Karmala tahsils, it became increased by 41.23 percent, 26.33 percent, 35.42 percent, 13.15 percent and 20.41 percent in 2010-11 respectively.

43. In 1990-91 the Parner and Shrigonda leads in Moderate agricultural development but in 2010-11 Shrigonda tahsil goes in to high agricultural development category because of irrigation cropping intensity increased. In Karjat and Karmala tahsils
are found low agricultural development in both 1990-91 and 2010-11 because of very low percentage of cash crops and less irrigated area.

44. The areas of agricultural productivity also changed during the period of 1990-91 to 2010-11.

45. Due to canal irrigation facility 93.85 percent of farmers agricultural income have increased and nearly 78.24 percent of farmers have improved their standard of living.

46. Nearly about 59.97 percent farmers to fulfill their capital requirements from their agricultural yields and 23.92 percent of them taking bank Loans for their capital requirements.

47. Most of the agro product of the command area is sending in domestic/local markets and only 2.16 percent of it is sent to the national/international markets.

48. Mostly, 96.84 percent farmers use electricity for the farming. But ironically they don't get enough and timely power supply.

49. About 60.83 percent of farmers in the command area are seeking the assistance of Government schemes for purchase of seeds and fertilizers, 13.95 percent of farmers take benefits of crop-Insurance schemes and 34.22 percent of farmers to benefits of crop loan scheme.

50. Along with the indicators of agricultural development, the indicators of economic development of the region have also been increased.

51. In 2010-11, the Banking facility, Transportation facilities, Educational and Medical facilities also have radically increased in comparison with the period of 1990-91.

52. Per-Capita Income has also been increased in this period due to the Kukadi canal irrigation.

53. It is clearly indicates, that the Kukadi canal irrigation has inspired/stimulated the agricultural development of the area and ultimately it was an inspiration in financial betterment of the farmers and area.
6.3 Recommendations

The present study on agricultural and economic changes in kukadi command area has led to some vital suggestions and recommendations to benefited farmers. These suggestions are made to enhance the farmers and also to enhance their agricultural income.

1. In order to improve the agricultural productivity the farmers have to plan their cropping pattern well in advance on the basis of water availability.

2. Instead of flow irrigation the modern methods of irrigation farmers can switch on to Drip irrigation for sugarcane and sprinkler for fodder and vegetables.

3. Instead of Jowar and Bajra if the farmers adopt Fruits and vegetables it will improve their income and employment.

4. The farmers must plan well in advance about the cropping patterns for the agricultural year based on the storage position of water in Kukadi project.

5. The World Bank recommended Crops for kukadi project should be cultivated by the farmers in the command area.

6. The water users association is present only in small areas of the command area. Farmers in command area must recognize the benefits of water users association and make efforts to start them. This will help the use of water optimization without any problems.

7. The land use systems are of great value to achieve sustainable agricultural production. Several forms of agricultural system such as Horticulture, floriculture system can be practiced as a major alternative land use system.

8. Farmers must be aware to use of improved verities of Onion, Vegetables, and fodder crops if possible the crops should be replaced with less water consumer cash crops, it is more profitable.

9. To organize workshops for regional level at regular time to exchange ideas and discuss future strategies in agriculture.
10. There is need to increase in awareness of farmers about modern agricultural technologies.

11. There is increased in production of fruits and vegetables but, the majority of farmers were not aware about international markets so, there is necessity of Market information Centre’s.

12. For sustainable agricultural development in command area there is wide scope for agro-processing industries. For Ex. Lemon production is more In Shriginda tahsil if there establish an lemon processing industry it made permanent market for lemon.

13. If Government provides warehouses, Godoun facility to farmers then the quality of agricultural production will be increases.

14. There were wide scope for dairy farming, Pig farming, Beekeeping, aviculture etc. if Government provide capital for these occupations.

15. There is need of strong transportation network in rural areas.

16. The responsibility of canal irrigation is not totally of irrigation department but there the participation of farmers also important.

6.4. Conclusion

The present study reveals that the positive changes occur in agricultural practices in Kukadi command area. The study region has varied topography, soil and climate. Land in river valleys is fertile which resulted to cultivate Sugarcane and Fruits and Vegetables and Fodder crops beside Jowar and Bajra crops. There are needs to be introduce new planning strategies to enhance the knowledge of farmers and for increased crop production. Such study has much potential to attract experts from various fields like planning, agriculture, economics and administrators for further study and to prepare plan for overall development of agriculture for Kukadi command area. There are also scope to separately study on Sugarcane farming, Sugar factories, and Water users Associations, Dairy farming, Trade and Transportation etc.