UGC MAJOR RESEARCH PROJECT

SUMMARY OF THE FINDINGS OF THE STUDY

CONTRIBUTION OF ELECTRIFICATION IN THE AGRICULTURAL DEVELOPMENT: A COMPARATIVE ANALYSIS OF WESTERN MAHARASHTRA AND VIDARBHA

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ANNEXURE - III

SUMMARY OF THE FINDINGS OF THE STUDY

"CONTRIBUTION OF ELECTRIFICATION IN THE AGRICULTURAL DEVELOPMENT: A COMPARATIVE ANALYSIS OF WESTERN MAHARASHTRA AND VIDARBHA"

Introduction:

Electricity plays a vital role in the rural development as well as agricultural development. Use of electricity leads to expansion of irrigated area and ultimately it leads to more output and employment opportunities. It also brings about a change in cropping pattern. Farmers can shift crops from low value to high value, which in turn helps to increase in the level of output.

Statement of the Problem:

The statement of the problem entitled "Contribution of Electrification in the Agricultural Development: A Comparative Analysis of Western Maharashtra and Vidarbha" has been considered the development process of electricity in general and electricity use by the rural area for various activities related to agricultural sector and rural development in particular.

Significance of the Study:

This study focuses on the comparative analysis of the various factors to explain the backwardness of agrarian economy of the Western Maharashtra and Vidarbha. Inspits of the all natural resources, the farmers of Vidarbha region are lagging behind than the farmers of Western Maharashtra region. Lack of electrification in the field of agriculture can be hypothetically granted as the prime reason of this backwardness. So the study can help in finding the real problem and provide the right solution to tackle them.

Hypothesis of the Study:

Electrification has brought the significant change in the cropping pattern, production, productivity and also helped in improving the living standards of farmers.

Objectives of the Study:

The main objectives of this research work are as follows:

(1) To study the pattern of consumption of electricity in Maharashtra State.

(2) To find out the impact of electrification on cropping pattern.

(3) To study the impact of electrification on production and productivity.

(4) To examine the impact of electrification on standard of living of the farmers.

Research Methodology:

The present study is limited to the survey of Western Maharashtra and Vidarbha regions only.

- **First stage of sampling (Selecting Districts)**

The Western Maharashtra region comprises of 6 districts and Vidarbha region consists of 11 Districts. In Western Maharashtra region, there are 6 Districts out of which 2 districts have been selected. In Vidarbha region, there are 11 districts out of which 2 districts have been selected for this study. The present study covers two Districts i.e. Kolhapur and Solapur from the Western Maharashtra and Nagpur and Yavatmal from Vidarbha. **(i.e. 04 Districts)**

- **Second stage of sampling (Selecting Tahasils)**

For the purpose of selecting Tahasils from selected sample Districts, Random Sampling Method has been used. Three (03) Tahasils have been selected from each selected District of Western Maharashtra and Vidarbha.

The present study covers selected Tahasils from the Kolhapur District viz; Karveer, Aajra and Hatkanagale and Akkalkot, Pandharpur and Barshi from Solapur District. The study also covers Narkhed, Hingna & Kalmeshwar from the Nagpur District and Arni, Digras and Pusad from Yavatmal District. **(i.e. 12 Tahasils)**

- **Third stage of sampling (Selecting Villages & Farmers)**

For the purpose of selecting villages, Stratified Random Sampling Method has been used. From the selected Tahasils five (5) Villages from each Tahasils has been taken as sample. **(i.e. 60 Villages)**

In order to study the impact of electrification on agricultural development, 10% farmers out of total farmers available in the respective villages have been selected. The selection criteria of the farmers are according to the size of their landholding, i.e;

1. Marginal Size (Below 1.0 Hectare)
2. Small Size (1.0 to 2.0 Hectare)
3. Medium Size (2.0 to 10 Hectare)
4. Large Size (10.0 and above)

The data will be collected from the farmers. It is based on the pre-structured questionnaire and information collected from the sample farmers.

In short, the methodology used for this study can be categorized as Multistage Stratified Random Sampling Technique and for selecting villages Cluster Sampling Technique will be used. The data will be collected with the help of using primary as well as secondary sources.

Keeping in view the objectives of the study, some appropriate statistical techniques such as percentages, average, standard deviation, co-efficient of variation, correlation, regression etc. will be used for this study. The multiple regressions will also be calculated in order to study the cause and effect relationship.

Reference Period:

The study will cover the period of 2001 to 2011. During this period the government introduces many changes. The privatization of electricity is one of them which would show various changes in the various sectors of the economy. The period under consideration for this study will cover the major changes made by the government through its economic policy at national and state as well as local level. The present study is limited to the survey of sample villages selected from sample districts particularly. This study would be restricted only to study the impact of electrification on agricultural development in the selected sample area.

Chapter wise Scheme:

Research work has been divided in the following chapters;

Chapter – 1	Research Methodology
Chapter – 2	Review of Literature

Major Conclusions:

One of the important objectives of this study is to find out the impact of rural electrification on agricultural development in sample districts in terms of living standard of farmers, cropping pattern, production and productivity. In pursuance of this objective, an attempt has been made in this study to examine various characteristics of the standard of living of farmers, production, productivity and cropping pattern. In this chapter, the main findings of the study are summarized and recommendations are made. The data were collected from primary and secondary sources.

Followings are the major conclusions:

1. Total selected sample farmers are 680 in present study. Out of these total sample farmers, 49 farmers are illiterate and 631 farmers are literate i.e. 7.21% and 92.79% respectively. Nagpur district was found to be the most literate of the all selected districts under survey i.e. 96.47%. The reason for this is more awareness amongst the people of Nagpur district of education than those of other selected districts of this study. The teachers of the schools have played a vital role in bringing this awareness among them. Various programmes are arranged in bringing out importance of education for common people. Children are inspired to take the path of education.
2. The level of literacy is the lowest in the district of Yavatmal i.e. 90.58% as compared with the sample farmers of other selected districts of Western Maharashtra and Vidarbha regions of Maharashtra state. The people here being less aware of the importance of education do not persuade their children to study. They consider that the cost on education is not profitable.

3. Nagpur district was found to be the low illiterate of the all selected districts under survey i.e. 3.52%. The highest illiteracy level was to be found in Yavatmal district i.e. 9.41%. Kolhapur and Solapur districts were found to be average literacy and illiteracy level of selected sample districts of this study. Literacy level of Kolhapur and Solapur districts was found to be 92.52% and 91.17% respectively; similarly regarding to the illiteracy level of Kolhapur and Solapur districts was found to be 7.06% and 8.82% respectively.
4. The number of people taking primary education is more than those taking under graduate education, i.e. 45.44% and 18.82% respectively. Higher education is not only expensive but it is also not available at nearby places of selected sample districts. These two are the major reasons, which deprive the sample villages of selected districts of taking higher education. Easily, timely and cheaply available primary education can help to increase overall literacy level.
5. In general, it has been observed that the size of landholding and electrification are interrelated with each other. With the increase in the size of landholding, facility of electrification also increases.
6. Total marginal sample farmers are 233. Out of which 94.42% sample farmers are literate and 5.57% are illiterate which is quite low. In case of small sample farmers, 198 are total sample size. From which 88.33% sample farmers are literate and 11.61% are illiterate which is found to be low. Total medium sample farmers are 154. Out of which 94.80% sample farmers are literate and 5.19% are illiterate which is significantly low. Total large sample farmers are 95. Out of which 94.73% sample farmers are literate and 5.26% are illiterate which is significantly low.
7. In general, it has been observed that the size of landholding and literacy level are interrelated to each other with the increase in the size of landholding literacy level also increases. It has been observed that the size of landholding and literacy level of sample farmers is positively associated with each other with the increase in the size of landholding level of literacy increase.
8. As per expectation, it has been observed that, with the increase in the size of landholding level of literacy raises. This could be due to the fact that general awareness and literacy may be at the higher level among these farmers rather than small or marginal farmers.

9. In the year 2001, the average annual income of the marginal farmers' was worked out to Rs. 90460. It is increased up to Rs. 231978 in the year 2014 for marginal farmers. The value of standard deviation of income in year 2001 was calculated as Rs. 71754 but the use of electricity it has gone up to Rs. 205488. The co-efficient of variation in the level of income of sample marginal farmers in the year 2001 was 0.79% and in 2014 it has gone up to 0.88%. In general, it has been observed that the use of electricity for the various activities of agriculture variation in income has increased. The impact of electrification on the level of income of these sample farmers has taken place in 13 years.
10. In the year 2001, the average annual income of the small farmers' was worked out to Rs. 107403. Average income has increased up to Rs. 299110 in the year 2014 for sample farmers. The value of standard deviation of income in year 2001 was calculated as Rs. 100083 but the use of electricity it has gone up to Rs. 251094. The co-efficient of variation in the level of income of sample farmers in the year 2001 was 0.93% and in 2014 it has decreased to 0.83%. In general, it has been observed that the use of electricity for the various activities of agriculture variation in income has decreased.
11. In the year 2001, average annual income of the medium farmers' worked out to Rs. 161350 but in the year 2014, the average annual income has increased up to Rs. 401058. The value of standard deviation of the level of income of medium sample farmers was calculated as Rs. 145599 in the year 2001 but the use of electricity it has gone up to Rs. 351978. The co-efficient of variation in the level of income in the year 2001 was 0.90%. In the year 2014, due to use of electricity it has down to 0.87%. In general, it has been observed that due to the application of electric gadgets for the various agricultural activities, the variations in the income level of the farmers has decreased.
12. The average annual income of the large sample farmers' worked out to Rs. 236263. In the year 2014, due to the use of electricity in the agricultural activities large farmer's income has increased up to Rs. 546549. The value of standard deviation of the level of income was calculated as Rs. 213483 in 2001 and after making use of electricity the value of standard deviation worked out to Rs. 489512 for 2014. The co-efficient of variation in the level of income was 0.90% in 2001 and 0.89% in 2014. In general, it has been observed that the use of electricity for the various activities of agriculture variation in income has negligible decreased.

13. In general, it has been observed that the use of electricity for the various activities of agriculture variation in the level of income has decreased for Vidarbha and increased for Western Maharashtra.
14. A comparison between the all types of the sample farmers reveals that, the proportion of the income is the highest for the large and medium sample farmers. It is necessary to increase the agricultural production by improving the irrigation method and utilizing electricity. This will not only improve the economic condition of farmers but also reduce the dependence of farmers on moneylenders and other loan providing agencies. This change can be made possible through proper utilization of electrification. By and large electrification to some extent has also helped in reducing inequalities of income. Except in case of marginal farmers, for other farmers the co-efficient of variation values indicate reduction in the inequalities. For higher size of landholding electrification may help in reducing income inequalities. The level of income has significantly increased because of use of pump sets for irrigation purposes resulting in the increase in area under irrigation and also change in cropping pattern from low value to high value crops.
15. The process of rise in the level of income of farmers has been elaborated below. Pump sets came into agriculture for the purpose of irrigation, which resulted in the increase in the area under irrigation. Because of increase in irrigated area, farmers incline towards non-food crops and shifted cropping pattern from low value to high value crops. Farmers used high yielding varieties of seeds, fertilizers, pesticides, modern tools and techniques, machinery, other agricultural equipments etc. in their farm, which resulted in the increase in the level of their income.
16. In Kolhapur and Solapur districts of Western Maharashtra, the average annual expenditure of all sample farmers is calculated as Rs.272462 for the year 2001 and Rs. 590170 for the year 2014. On the other hand Nagpur and Yavatmal districts of Vidarbha, average annual expenditure of sample farmers is found to be Rs. 239938 for 2001 and Rs. 612642 for 2014. It is clearly seen that average annual expenditure of farmers selected from Western Maharashtra has high as compare to sample farmers of Vidarbha in the year 2001 but in the year 2014 annual expenditure of farmers of Vidarbha has increased as compare to sample farmers of Western Maharashtra.

17. Standard deviation of expenditure has been calculated. The standard deviation for Kolhapur and Solapur districts of Western Maharashtra is found to be Rs. 297557 for 2001 and Rs. 709963 for 2014. Similarly regarding to the district of Vidarbha (Nagpur & Yavatmal) it is calculated as Rs. 799039 for 2001 and Rs.1944221 for 2014. It is clearly seen that value of standard deviation of expenditure of sample farmers selected from Western Maharashtra has low as compare to sample farmers of Vidarbha.
18. The co-efficient of variation in the expenditurefor the Kolhapur and Solapur districts sample farmers was worked out to be 1.09% in 2001 and 1.20% in 2014. On the other hand it is calculated as 3.33% and 3.17% for the districts of Vidarbha which is high.In general, it has been observed that the use of electricity for the various activities of agriculture variation in the expenditure has decreased for Vidarbha and increased for Western Maharashtra.
19. The average expenditure of all sample farmers has gone up significantly after electrification. This increase in the level of expenditure is because of the increase in the level of income. In the case of medium and large sample farmers, per capita expenditure has significantly increased after electrification in comparison with the other sample farmers. The level of income has gone up because of increase in the area under irrigation resulting in the change in cropping pattern from food to non-food crops. Because of it the expenditure of sample farmers has increased.
20. It can be seen that the farmers' income and expenditure has increased in terms of real value due to electrification in study area. In general, for all types of sample farmers the levels of income and expenditure have gone up. This may be due the fact that there is a shift in the cropping pattern after the use of electrification towards commercial crops. This has helped to some extent in increasing the levels of income of the farmers during the 13 years period i.e. from 2001 to 2014. In case of marginal and small sample farmers the rate of change in income as well as expenditure is higher in real term then the change in income and expenditure of the other sample farmers in the study area. The rate of change in the level of income and expenditure is 107.56% and 89.90% respectively for Kolhapur and Solapur districts of Western Maharashtra region. Regarding the sample farmers of Nagpur and Yavatmal districts of Vidarbha region, the rate of change in the level of income is 118.10% and for expenditure is 123.85% respectively. The rate of

change in the level of income and expenditure of all sample farmers of Western Maharashtra and Vidarbha region of Maharashtra state is 112.29% and 105.79% respectively. This may be due to the fact that there is a change in the attitude of sample farmers for earning use of electricity.

21. The consumption expenditure of the farmers has been classified into different household items to analyze the impact of electrification on the consumption expenditure of all households of sample farmers. Considering the consumption pattern of sample farmers it has been observed that in earlier period of times farmers used to spend major portion of their income on cultural activities, wedding functions and other similar activities. As a result of rural electrification, irrigation facilities were developed which has helped to increase the overall standard of living of farmers. This has also helped to create awareness among farmers to pay more attention to the education of their children. In the post electrification period, it has been observed that the expenses on cultural and social activities have gone down and expenses on items of household goods like TV, Radio, Refrigerator, Iron etc. have gone up substantially. Farmers have also started using modern equipments for their farming occupation.
22. The total per capita consumption expenditure on household's items of marginal sample farmers in 2001 was Rs. 53050 it has increased up to Rs. 130695 in 2014. From the above table it can also be seen that the per capita consumption expenditure of marginal sample farmers was found to be Rs. 227.68 in 2001 and Rs. 560.92 for 2014. In general, in Western Maharashtra, it has been seen that the total household consumption expenditure and per capita consumption was found to be high as compare to Vidarbha region of Maharashtra state. In general, it has been observed that the consumption expenditure on education, traveling, medicine, home appliances etc. has significantly increased after use of electrification in the all sample districts in the present study. The consumption expenditure on education, traveling, medicine and other home appliances have significantly increased after use of electrification mainly due to increase in the income level of farmers.
23. The total per capita consumption expenditure on household's items of small sample farmers in 2001 was Rs. 72481 it has increased up to Rs. 155140 in 2014. From the above table it can also be seen that the per capita consumption expenditure of small sample

farmers calculated as Rs. 366.07 in 2001 and Rs. 783.54 for 2014. In Western Maharashtra, the total household expenditure and per capita consumption expenditure was found to be Rs. 37331 and Rs. 380.93 in the year 2001 respectively. In the year 2014, the total household expenditure and per capita consumption expenditure calculated as Rs. 76880 and Rs. 784.49 respectively. Similarly regarding to the Vidarbha region, the total household expenditure and per capita consumption expenditure was found to be Rs. 35150 and Rs. 351.50 in the year 2001 respectively. In the year 2014, the total household expenditure and per capita consumption expenditure calculated as Rs. 78260 and Rs. 782.60 respectively. In general, in Western Maharashtra, it has been seen that the total household consumption expenditure and per capita consumption was found to be high as compare to Vidarbha region of Maharashtra state.

24. The total per capita consumption expenditure on household's items of medium sample farmers in 2001 was Rs. 109356 it has increased up to Rs. 238231 in 2014. From the above table it can also be seen that the per capita consumption expenditure of medium sample farmers calculated as Rs. 710.10 in 2001 and Rs. 1546.95 for 2014. In general, in Western Maharashtra, it has been seen that the total household consumption expenditure and per capita consumption of all selected medium sample farmers was found to be high as compare to Vidarbha region of Maharashtra state.
25. Total sample farmers are 680 and they have 754 electric pump sets in 2001. The average possession is 1.11per head. In the year 2014, they possess 834 electric pump sets and the average possession is 1.32 per head. In Western Maharashtra, total sample farmers are 340 and they have 388 electric pump sets in the year 2001 and 436 in 2014. Similarly, regarding to the Vidarbha region the total sample farmers are 340 and they posses 366 electric pumps in 2001 and 398 in 2014. In the year 2001, the average possession of electric pumps is 1.14 per head for Western Maharashtra and 1.08 per head for Vidarbha which is noticed low. The average possession of electric pump sets is 1.35 per head for Western Maharashrta and 1.29 per head for Vidarbha noticed in the year 2014. In general it has been observed that Vidarbha region has lagging behind to the Western Maharashtra for the possession of electric pump sets. It can be seen that the number of farmers are the highest they possessed 3 HP pumps whereas number of farmers are lower they possessed 7 HP pumps. In modern times, the use of electricity for irrigation has been increasing

substantially. In general, it has been observed that, the purchasing cost is less for 3HP pump sets in comparison with pump sets of 5HP and 7 HP. Therefore, farmers' gives more preference for the pump sets of 3HP for their irrigating own area of land. In general, it has been observed that marginal and small farmer's posses very less electric pump sets as compare to the medium and large farmers. It can also be seen that, the purchasing cost is less for 3HP pump sets in comparison with pump sets of 5HP and 7 HP. In general it has been observed that Vidarbha region has lagging behind to the Western Maharashtra for the possession of electric pump sets.

26. Size of landholding and number of pump sets are interrelated with each other. Higher the size of landholding, higher the number of pump sets on an average. It has been observed that medium and large farmers possess higher proportion of pump sets in comparison with other categories of farmers. However, the number of pump sets possessed by them is not significantly on the higher side.
27. In the year 2001, the total sample farmers are 680, out of which 46.62% of farmers are using wells for irrigation, 15.29% of farmers are depending on canals, 15% of farmers are using rivers as a major source of irrigation, 16.32% of farmers are irrigating their land area with the help of ponds or tanks. The total sample farmers are 680, out of which 48.68% of farmers are using wells for irrigation, 16.47% of farmers are depending on canals, 14.56% of farmers are using rivers as a major source of irrigation, 15.15% of farmers are irrigating their land area with the help of ponds or tanks in 2014. Form the above information it can be seen that wells a source of irrigation has increased and other sources of irrigation has decreased from 2001 to 2014. Therefore, wells played an important role in the irrigation purpose for selected area of this study.
28. Domestic wells seem to be the most popular source of irrigation in the area selected for the study. Out of the total selected sample farmers' majority of them are depending on wells for source of irrigation. All types of farmers are using wells for the purpose of irrigation. Water from canals is also another source of irrigation which is quite popular. Tanks, rivers etc. are not being extensively used for the purpose of irrigation by the selected sample farmers. This may be due to the fact that well irrigation doesn't need any price for lifting water except in terms of electricity charges which are incurred for the use of pumping water but no charges are involved in terms of water rates. This aspect needs

to be considered for management of water. Government can seriously think about bringing some degree of regulation on private wells in order to manage scarce water resources. In certain cases establishment of canal helps to increase the water level of domestic wells but this aspect is neglected while developing the scheme of water management.

29. Classification of Land Used by Sample Farmers according to the size of landholding has been explained. The total area of all sample farmers in 2001 was 6070 acres, out of which 9.06% area comes under permanent pastures and grazing lands, 5.14% area comes under the current fallows and 85.80% area comes under net sown. Total area of all sample farmers has remained same in the year 2014. There is a change in net cultivated area. Out of total area (6070 acres) 7.05% area comes under permanent pastures & grazing land, 3.81% area comes under current fallows and 89.14% area comes under net cultivated or net sown.
30. The use of electricity for agricultural activities has helped in increasing the net sown area. On the other hand the current fallow area and permanent pasture & grazing land of all types of sample farmers has gone down between the year 2001 and 2014. However, electricity played an important role in overall agricultural development as well as rural economy. The average possession of total area of all sample farmers was 8.93 acres per head. From the above table it can be seen that the area under permanent pasture & grazing and current fallows has decreased after electrification. On the other hand area under net sown or cultivated has increased. In case of large sample farmers the average possession of net cultivated area has increased significantly after electrification in comparison with other sample farmer's average possession of net cultivated area. This clearly shows that the large sample farmers have derived more benefits from electrification. This may be due to the fact that these farmers can afford to spend adequate amount in bringing land under irrigation as well as they can go for commercialization of agriculture.
31. The change in irrigated and non-irrigated area of all types of sample farmers selected from sample districts has been presented in the above table. In the year 2001, total net sown area was 5208 acre; out of which 2932 acre area comes under irrigated and 2276 acre area under non-irrigated. Net sown area has increased to 5411 acre in year 2014.

From which 3765 acre area comes under irrigation and 1646 acre area under non-irrigated. From the above table it can be seen that irrigated area has increased and non-irrigated area has decreased due to use of electricity in the field of agriculture in the selected area of this study. Simple growth rate has been calculated for the find out the area under irrigated and non-irrigated. The Simple Growth Rate (SGR) has been calculated to known area under irrigation. The SGR is work out to be 28.41 for irrigated area and -27.68 for non-irrigated area and 3.90 for net sown area.

32. In case of marginal farmers, the cropping pattern has been changed from low value crops to high value crops in all selected districts. The area under food crops has decreased and non-food increased seen in under survey. In case of small sample farmers of all districts, the area under food crops has decreased and area under non-food crops has increased. The cropping pattern has been changed from traditional to commercial one. The shift is mainly food crops to non-food crops. In recent times Flowers and Vegetables provides more yield in short duration. Therefore, majority of farmers are cultivating these crops in their own land. This shows that electrification has helped the farmers in changing cropping pattern from food crops to commercial crops like Flowers, Vegetables, and Orange. In general, it has been observed that the use of electrification has changed the attitude of medium and large farmers of all selected districts and they have started focusing their attention on commercialization of farming. The area under food crops has been decreased and non-food increased for all sample districts. The cropping pattern has been changed from traditional to commercial one. The shift is mainly food crops to non-food crops. There is a shift in the cropping pattern after electrification in the area selected for the study. The shift is mainly from crops like Jawar, Tur and Mung to non-food crops like sugarcane and Soyabean. Some of the farmers have also started cultivating Vegetables and Flowers in their farms.

33. The number of sample farmers has switched over to the cultivation of Vegetables after electrification because of the increase in the demand of Vegetables. Vegetables are giving more cash in comparison with food crops. The maturity period of the Vegetables is also less. Therefore, sample farmers are cultivating more and more Vegetables in their farm. There is a considerable increase in the number of farmers cultivating Vegetables. Marginal and small sample farmers have started cultivation of Soyabean crop in their

farm after electrification. On the other hand cultivation of Cotton, Orange and Vegetables has increased substantially whereas cultivation of Pulses has decreased. In case of medium and large sample farmers, there is a shift in cropping pattern after electrification. The shift is mainly from crops like Jawar, Tur and Mung to commercial crops like Vegetables, Orange and Wheat. Some farmers in the above groups have also started focusing to Flower crops. There has been a considerable increase in number of farmers cultivating commercial crops. Cotton seems to be the most popular crop among the farmers prior to electrification. In recent times Flowers and Vegetables give more yields in short duration. Therefore, majority of farmers are cultivating these crops. This shows that electrification has helped the farmers in changing cropping pattern from food crops to commercial crops like Flowers, Vegetables, and Orange.

34. The percentage of irrigated area has increased because of the use of electricity for the various agricultural activities like water lifting from wells, sprinkling etc. Therefore, electricity plays an important role in bringing more and more land area under irrigation as well as indirectly it helps in overall agricultural development in rural sector. In case of medium and large sample farmers the irrigated land has increased almost double (except marginal and small farmers). Medium and large farmers have invested maximum capital in their land while making optimum use of sources of irrigation. Therefore, irrigated area has become almost double. Due to increasing irrigated land these farmers have derived maximum benefits. Therefore, the level of income has increased after electrification for all sample farmers in selected area of this study.
35. In general, it has been observed that the use of electricity shows that the area under food crops has decreased and area under categories of non-food crops has increased. Change in cropping pattern has been taking place in the area selected for the study after electrification. There is a need to find out whether this electrification is disturbing the balance of food and non-food crops in agriculture sector. Otherwise some regulation will have to be introduced at the government level.
36. Agricultural production of all types of sample farmers selected from sample district has been explained. In the year 2001, total production of all crops was 37817 quintals, out of which 51.65% production was under food crops and 48.35% production was under non-food crops. After the use of electrification total production has increased up to 59731

quintals. Out of these 38.05% production is under food crops and 61.95% production is under categories of non-food crops. As per expectation, it can be seen that production of food crops has decreased whereas non-food crops has increased between the year 2001 and 2014. This may be due to the fact that area under non-food crops has gone up in the year 2014.

37. The total production of major crops was 17758 quintals in year 2001; it has increased up to 30372 quintals in year 2014in Western Maharashtra. The share of food crops and non-food crops in total production was 51.21% and 48.79% respectively in 2001. The production of food crops has decreased and non-food crops increased i.e. 38.01% and 61.99% respectively in year 2014. In general, it has been observed that the share of food grains in total production has decreased after the use of electrification and the share of non-food crops production has increased. The simple growth rate of production of all types of sample farmers has been calculated. The simple growth rate as calculated as 71.03 for total production; for food production 226.94 and for non-food production 117.30. In general, it can be seen that the production of non-food crops has significantly increased as compare to food production.
38. The total production of major crops was 20059 quintals in year 2001; it has increased up to 29359 quintals in year 2014 in Vidarbha region of Maharashtra. The share of food crops and non-food crops in total production was 52.05% and 47.95% respectively in 2001. The production of food crops has decreased and non-food crops increased i.e. 38.09% and 61.91% respectively in year 2014. In general, it has been observed that the share of food grains in total production has decreased after the use of electrification and the share of non-food crops production has increased. The simple growth rate of production of all types of sample farmers has been calculated. The simple growth rate as calculated as 46.36 for total production; for food production 7.13 and for non-food production 88.95.
39. It can be seen that the share of food crops in total production has decreased significantly for all sample farmers i.e. from 51.65% to 38.05% respectively. On the other hand share of non-food crops in total production has increased significantly for all sample farmers from 48.357% to 61.95% respectively. In general it has been observed that the non-food crops have not lost its importance as compared to food crops.

40. In case of medium and large sample farmers, the share of non-food crops in total production has increased significantly after the use of electrification. On the other hand share of food crops has decreased significantly after the use of electricity in the field of agriculture. Similarly regarding to the marginal and small sample farmers, the share of food crops has decreased and non-food crops increased in total production. In general, it has been observed that there is a change in cropping pattern mainly from cereals and pulses to oilseeds and other non-food crops like Vegetables, Flowers, and Orange etc.
41. In general, it has been observed that the share of cereals and pulses in total production has decreased after the use of electrification in agricultural sector especially rural area. One of the important reasons could be reduction in the area under of food crops. The share of oilseeds in the total production has increased. The production of cotton, orange, vegetables and flowers have also considerably increased due to electrification. The share of vegetables and flowers in the total production has significantly increased. The demand for these two crops has increased and the area under cultivation of these two crops has also increased. The share of these two crops in the total production has also gone up after making the provision of electricity. Hence, there is a change in cropping pattern from food crops to non-food crops.
42. The average (Mean) annual production of all types of sample farmers in Western Maharashtra region of Maharashtra state has increased from 52.23 quintals to 89.33 quintals. The standard deviation (SD) of production for 2001 was 12316.39 and 21235.83 for 2014. The co-efficient of variation (CV) as calculated to be 235.81 for 2001 and 237.72 for 2014. The average annual production of food crops was 26.74 quintals in 2001; it has increased up to 33.95 quintals in 2014. Similarly regarding to the non-food crop production, the average annual production was 25.49 quintals it is increased to 55.38 due to use of electricity in the field of agriculture. In the year 2001, the standard deviation of food crops production was 6189.31 quintals; it is significantly increased to 7921.72 in year 2014. Similarly regarding to the production of non-food, it was 5886.66 quintals to 13073.70 quintals. The co-efficient of variation has been calculated for the production of food and non-food crops. The co-efficient of variation of food production work out to be 231.43 in 2001 and 233.33 for 2014. Similarly regarding to the production of non-food crops, the co-efficient of variation has been calculated it is 230.98 for 2001 and 236.08

for 2014. In general it has been observed that food production and non-food production also increased significantly in selected area of this study.

43. The average (Mean) annual production of all types of sample farmers in Vidarbha region of Maharashtra state has increased from 59.00 quintals to 86.35 quintals. The standard deviation (SD) of production for 2001 was 13943.44 and 20519.53 for 2014. The co-efficient of variation (CV) as calculated to be 236.34 for 2001 and 237.63 for 2014. The average annual production of food crops was 30.71 quintals in 2001; it has increased up to 32.89 quintals in 2014. Similarly regarding to the non-food crop production, the average annual production was 28.29 quintals it is increased to 53.46 due to use of electricity in the field of agriculture. In the year 2001, the standard deviation of food crops production was 7141.78 quintals; it is significantly increased to 7667.87 in year 2014. Similarly regarding to the production of non-food, it was 6561.24 quintals to 12611.25 quintals. The co-efficient of variation has been calculated for the production of food and non-food crops. The co-efficient of variation of food production work out to be 232.59 in 2001 and 233.11 for 2014. Similarly regarding to the production of non-food crops, the co-efficient of variation has been calculated it is 231.92 for 2001 and 235.92 for 2014. In general it has been observed that non-food production has been increased significantly as compare to food crops production in selected area of this study.

44. It can be observed that, per acre productivity of all crops has increased from 7.95 quintals per acre to 11.55 quintals per acre in selected area of this study. The productivity of food and non-food crops like Wheat, Rice, sugarcane, soyabean etc. has substantially increased. It has almost become double after electrification. The simple growth rate is calculated, it is observed that 45.27. In case of Western Maharashtra, productivity of food crops was 7.80 quintals per acre in 2001; it is increased to 12.09 quintals per acre in 2014. Similarly regarding to the non-food crops productivity, in 2001 it was 8.14 quintals, and it has gone up to 12.01 quintals per acre in 2014. The simple growth rate has been work out; it is calculated as 54.99 for food and 47.59 for non-food crops production. Similarly regarding to Vidarbha, productivity of food crops was 7.95 quintals per acre in 2001, it is increased to 12.33 quintals per acre in 2014. Similarly regarding to the non-food crops productivity, in 2001 it was 7.95 quintals, and it has gone up to 10.45 quintals

per acre in 2014. The simple growth rate has been work out; it is calculated as 55.20 for food and 31.40 for non-food crops production.

45. Modern varieties of seeds play a vital role in increasing agricultural production in selected area of this study. Due to the use of high yielding varieties of seeds, irrigation, fertilizers, pesticides etc. are more useful inputs for improving production and productivity also. Farmers having large size of landholding can afford to employ more labours so the expenditure on labourers by way of wages goes up whereas farmers having small size of landholdings do not spend more on out side labour force and the tendency is to make use of family labourers only.
46. In order to study the change in cropping pattern from food crops to non-food crops, productivity of the crops was studied; it shows that the area under cultivation, which has decreased, is due to lower productivity. On the other hand the area under cultivation, which has increased, is due to its higher productivity. In case of the crops under cultivation like Soyabean and Wheat, the area under cultivation has continuously increased along with its productivity.
47. The regression co-efficient beta for the seed is 0.543; it is higher than that corresponding regression co-efficient beta for the fertilizers, pesticides and labour i.e. 0.230, -0.008 and 0.285 respectively. As expected the sign of the regression co-efficient beta of fertilizers and labour variables worked out to be positive and for pesticides variable worked out to be negative. The effect on production for the selected dependent variables is studied in the context of the expenditure incurred by the farmers after electrification. The influence of variables is shown in order to analyze the factors which are relevant along with electrification. The table value for *t* is 2.78 (at 5% level of significance). The calculated value of *t* for seeds (8.07), fertilizers (2.77) and labours (4.53) is more than the table values hence the difference is significant. The calculated value of *t* for pesticides (0.10) is less than the table values hence the difference is insignificant (at 5% level of significance). On the basis of these values it can be said that in order to influence the level of production, genuine seeds, labour power and fertilizers play an important role. The beta co-efficients for these variables are significant.
48. The main electricity consuming sectors are industry, agriculture, commercial, traction &railways and others. Some statistical tools and techniques are used to analyze and

interpretation of the data. These techniques are average, compound growth rate, standard deviation and coefficient of variation. In the case of industry, the consumption of electricity was 29579 GWh in 1970-71, which has increased to 346469 GWh in 2011-12. The compound growth rate of electricity consumption for the purpose of industry is calculated at 19.75. The standard deviation is calculated to 95742.53 and coefficient of variation is 0.65. The consumption of electricity has increased for the purpose of industry. The consumption of electricity by agricultural sector has also increased during the period. In the year 1070-71 the consumption of electricity was 4470 GWh, which has increased to 133660 GWh in 2011-12. The compound growth rate of electricity consumption for agricultural purpose is 26.80. The standard deviation and coefficient of variation is calculated to 46484.28 and 0.61 respectively. The consumption of electricity for domestic purpose has increased from 3840 GWh in 1970-71 to 170034 GWh in 2011-12. The compound growth rate of electricity consumption for the purpose of domestic uses has been calculated to 34.43. The standard deviation is calculated to 61701.33 and coefficient of variation is found at 0.75. It is shows that the consumption of electricity has increased for the purpose of domestic uses. Electricity use for the commercial purpose has increased from 2573 GWh in 1970-71 to 69266 GWh in 2011-12. The compound growth rate of electricity consumption for commercial purpose is calculated to 30.90. The standard deviation and coefficient of variation is calculated to 24844.33 and 0.79 respectively. It is shows that the increase rate of electricity consumption for the purpose of commercial uses is very high. The consumption of electricity for the traction and railways uses has increased because of the expansion of railway tracks connected with electricity for the overall development purpose. In the year 1070-71 the consumption of electricity was 1364 GWh, it has increase to 14327 GWh in 2011-12. The compound growth rate of electricity consumption is 20.24. The standard deviation and coefficient of variation are calculated to 46.79.53 and 0.59 respectively.

49. In general, it can be seen that the consumption of electricity for the purpose of industry has very high followed by domestic and agricultural uses as compared to other uses.In the case of electricity consumption for the purpose of domestic uses, the growth rate is significantly high as compared to the other uses of electricity consumption. The government should keep the gap between electricity supply and electricity sold to

consumers demand; and also should reduce the gap for the purpose of overall development of the country and met the consumer's energy demand. Therefore, government should introduce and implement new policies related to energy balance in next few years.

50. Maharashtra state is considered to be the leader in the production of agricultural commodities in India. As the irrigated area is more in the region, multiple crop system can be applied but the system is completely dependent on the availability of electricity. It can be said that production of non-food crops is a function of electricity, which helps to develop irrigation, and in turn motivates farmers for bringing diversification in farm sector. If the electricity is properly utilized for agricultural purposes it can lead to increase in agricultural production, which in turn will help to increase the income of farmers and the agro-based industries, can also automatically be developed. In sample districts, there is a wide scope of using electricity in agricultural sector for the purpose of rural development. With this background about the electricity consumption and its importance in bringing suitable changes in agrarian economy, it would be interesting and useful to analyze the impact of rural electrification on agricultural development in selected area of this study.
51. The increase in the consumption of electricity for agricultural purposes has adversely affected the availability and consumption of electricity for industrial purposes. In the recent times it has been observed that the consumption of electricity for domestic purpose, due to frequent use of modern machines has been increasing day by day.In short, it can be said that the consumption of electricity for agriculture as well as for domestic use has increased; on the contrary, the consumption in industrial sector has gone down in term of percentage.
52. All different kinds of agricultural activities are analyzed considering the total sample size. All sample farmers used electricity for the purpose of irrigation. Sample farmers have started making use of electricity for irrigation activities in farm. Regular supply of water provided for their crops by electric pumps. Electric pump sets are also helpful for lifting water from wells and other sources of irrigation. Therefore, it is helpful for increasing production and improving productivity. Out of total selected sample farmers (680), 18.53% of them have used electricity for the purpose of green house. In recent

times electricity has proved to be helpful in development of green house. Electricity has also helped in lighting the green house, supply of water for their crops and also for maintaining temperature of the green house. Out of the total sample farmers, 16.91% of them have started making use of electricity for poultry product or poultry house. Electricity can also be helpful for the poultry and poultry product such as lighting, cooling, incubates of eggs, hitting etc. Out of total selected sample farmers, 32.06% of farmers make use of electricity for the purpose of cattle shed. Sample farmers also use of electricity for lighting purpose in the cattle shad. Out of the total selected farmers, 17.79% of farmers make use of electricity for the purpose of farm house. Out of total sample farmers 49.56% of farmers make use of electricity for the purpose of machinery in their farm. The large number of sample farmers is making use of electricity for irrigating their own area of land as well as machinery. The farmers are using electricity for electric pump sets, lifting water from wells, canals, ponds, tanks, lakes, rivers etc. this has contributed in increasing the total area under irrigation. It is helpful in increasing production and improving productivity. Therefore, it automatically improves the level of income and standard of living of farmers.

53. The benefits derived from the use of electricity are presented in the above table. Some farmers pointed out that the use of modern inputs has increased for agricultural sector after the use of electrification. The use of modern inputs in agriculture has helped in increasing the quality of agricultural product and productivity also. Selected sample farmers' are used modern agricultural inputs such as high yielding varieties of seeds, fertilizers, pesticides and machinery (tractor, thresher, cutter etc.) in their farm after electrification. All benefits are analyzed considering the total sample size. Out of 680 selected sample farmers 81.32% of farmers of the opinion that due to electrification for agriculture purpose water supply has improved. Due to the improved facilities of water supply, area under irrigation has increased and it has helped to increase in the level of income, production and productivity. It is explained in the previous chapter. Out of 680 sample farmers, 72.79% of them were of the opinion that because of the use of electricity there is an improvement in fertility of land. About 73.09% of farmers were of the opinion that because of the use of electricity area under irrigation has increased. Out of 680 sample farmers, 75.73% of them were of the opinion that because of the use of electricity

there is an increased area under non-food crops. The supply of electricity has helped in increasing area under non-food crops such as Flowers, Vegetables, Soyabean etc. Therefore, farmers have changed their life style and are earning more money from their farms. About 73.38% of farmers were of the opinion that production of the all commodities has increased because of use of the electricity. According to 73.52% of farmers viewed that because of the use of electricity income has increased consequently their consumption expenditure have gone up.

54. The problems indicated by sample farmers arising from electrification presented in the above table. All problems are analyzed considering the total sample size. Out of 680 selected sample farmers, 76.47% of them pointed out that taking connection for the electric pump sets it becomes the major problem. According to 76.91% of farmers irregular and discrete supply of electricity in the agriculture sector also creating obstacle in increasing the level of production. About 74.85% of farmers were of the opinion that there is a difficulty in maintaining electric equipments. Out of total sample farmers, 58.68% expressed their view that low voltage supply of electric power is also a major problem which many times spoil their agriculture equipments. Low voltage of power supply creates major problem in the irrigation, as it becomes difficult to run the electric pump sets and this ultimately affects the irrigation and crop production. All the farmers pointed out that load shedding is now the new problem creating hindrance in the development of agriculture sector. Large numbers of the farmers depend on the electricity for the purpose of irrigation. The government and MSEB have not able to provide regular electric supply to the energized agricultural pump sets.

55. As has been already mentioned, electricity has helped in bringing changes in cropping pattern. The crops now a days, required regular supply of electricity however, currently MSEB is facing difficulty in providing regular supply. This has badly affected rural sector of the economy and especially agriculture. Commercial or cash crops require adequate water and irrigation facilities. Electrification has created new scenario relating to cropping pattern in the region under study. Due to electrification cropping pattern has shifted from low value crops to high value crops. Alternative arrangement needs to be developed in situation of non-availability of regular electric supply. Now a days, supply of electricity is one of the instruments for the irrigation. The demand for electricity

increases with the increase in irrigated area. So, electricity has played a very significant role in providing irrigation as well as in increasing the production of agriculture for the farmers in selected districts. If the supply of electricity decreases the irrigation facilities and agricultural production also decreases this may adversely affect the farmers' income. An increase in the production of agriculture directly depends on the increase in the supply of electricity. The problem may occur when the supply of electricity is stopped or discontinued, means of irrigation cannot be used as all irrigation sources depend on the electric pump sets. The use of electricity for the purpose of agricultural activities is very important, since there is no other source for irrigation at present, which can replace the use of electricity with the cheaper cost than that of electricity. The use of animals for lifting water from wells; diesel engines etc. are traditional instruments for irrigation, which can replace the electric pump sets.

56. The farmer's expectation from MSEB and Government has been presented in the above table. All expectations are analyzed considering the total sample size. Total sample size is 680. Out of total sample farmers, 39.12% of them were of the opinion that there is a need to reduce electric bill for the marginal and small farmers because the income of these farmers is very less as compared to other farmers. About 71.16% of sample farmers were of the opinion that no charges should be imposed in natural calamity. Out of total sample farmers, 73.24% of farmers expect good behaviour from MSEB employees.About74.11% of sample farmers were of the demanded the provision of regular electric supply from MSEB. Out of 680 selected sample farmers, 71.47% of them suggested that MSEB should provide information in advance regarding electric supply.

The findings of this study are likely to be useful in many ways. The analysis presented in this study may help the authorities to formulate plans for improving the standard of living of the farmers in our country. The study would also be helpful in asserting the relative effects of different types of farmer's characteristics of consumption. The role and importance of electrification have also been analyzed, which would probably be useful for framing suitable energy policy for rural electrification.

Major Recommendations:

It is rather difficult to generalize on the basis of the results from the analysis of the sample of about 680 farmers. This is a study at micro level. These results are indicative of the situation prevailing in the rural sector of India. Rural electrification did contribute to bridge the gap between urban and rural life. The internal-combustion engine brought major changes in the agricultural sector in most of the countries of the world. In advanced regions it soon became the chief power source for the farm. The following measures are recommended as mere guidelines for improving the standard of agricultural sector.

1. Instead of giving free electricity to the farmers the government should strive hard for the regular availability of electricity for the purpose of farming. This will result in reducing the amount of destruction of crops. Only the farmers from marginal and small categories should be provided electricity without charging any price for some period of time till they improve their income levels.
2. Electrification of non-electrified households should be financed with 100% subsidy by the state government for selected study area in Nagpur district to improve their standard of living. It is a serious matter for all of us that even after 65 years of independence; even in those rural areas, which are electrified, there is a tremendous shortage of power supply. Thus it is not uncommon for these areas to have load shedding every day for rural and urban area. Because of tremendous shortage of electricity, agricultural growth and general life in the selected area of sample districts is seriously affected. Moreover with problems of low voltage as well as discrete electric supply, rural areas are affected the most, since the State Electricity Boards (SEB) provide urban areas with electricity on priority basis. There is an urgent need to give priority to the rural areas for overall uplift of rural masses with the help of agricultural development. Therefore government and MSEB should provide sufficient and regular supply of electricity with high voltage to the selected study area of sample districts.
3. The Jawar crop is one of the important crops in the selected area of the present study. The Jawar crop (sweet sorghum) can provide food, fodder and fuel from the same part of land and require much less water than the other crops such as Sugarcane and other commercial crops. With the help of Jawar crop production, it is possible to create bio-fuels on the one hand and save water on the other hand. Therefore, there is a need of more research and development in case of Jawar crop production. State government should provide fund for

research and development programme for making bio-fuels in the selected area of this study.

4. The regional office of State Electricity Board for all sample districts should provide facilities for training which would be of great help for documentation, information, demonstration and mass communication. This would also be useful in the rural area to reduce accidents and short circuits regarding the electric pump sets and households uses in the selected area of this study.
5. Majority of the rural people come under weaker section, particularly marginal farmers, small farmers and landless labourers, they cannot afford to install meter in the households because it is too expensive. Therefore, they have no electric connection in their houses and it is one of the indirect reasons of theft of the electricity. So, various State Electricity Boards have launched "Kutir-Jyoti" scheme in which single point connection is provided to the economically weaker section households. This type of programme will improve the standard of living of weaker section. Therefore, this type of scheme should be applied extensively for the selected area of this study to reduce theft on one hand and improve their living condition on the other hand.
6. Majority of all sample farmers in the selected study area of the all sample districts were found to be facing the problems of indebtness, credit supply, marketing of agriculture goods, maintaining the electric equipments etc. The state government has a social obligation to provide sufficient credit at cheaper rate of interest i.e. 4% for marginal and small farmers, and 5% for other farmers whenever they need with minimum documentations and without any security. The main objective behind this type of loan facility is to give incentive to produce more with better quality on one hand and on the other hand it helps to minimize the burden of debt on the farmers. It is equally important for efficient marketing of agricultural commodities in the farm of storage facilities, cooling facilities, processing facilities etc. All these measures are necessary to give better remuneration to the farmers. Therefore, to provide all these above marketing facilities the better supply of electricity must be made available. Most of the time farmers from rural area face the problem relating to the maintenance of farm equipments. This unique type of problem will be solved if the agro-service sectors are established in every village for

repairing and maintaining all types of agricultural equipments such as machineries, tractors, electric pump sets etc.

7. It is generally found that there is a close relationship between use of electricity and modern agricultural equipments. The modern agricultural equipments or inputs greatly influence agricultural production. If the farmers use the modern agricultural inputs at greater extent such as drip irrigation, sprinkling irrigation, threshing units, pump sets etc. the agricultural production will increase at faster rate. In the other words the use of electricity for the modern agricultural equipments will create a huge marketable surplus of agricultural production such as Wheat, Rice, Jawar etc. But it will be possible when the sufficient and regular electricity supply is maintained by the electricity board.
8. During the study period, the researcher observed that the cropping pattern shifted from food crops to non-food crops due to the rural electrification. The sample farmers of all the categories give preference to non-food crops such as sugarcane, Soyabean, Orange, Flowers, Vegetables, and Cotton etc. because of better remunerative price than the food crops, and this type of remunerative price will improve their purchasing capacity and standard of living. It is necessary to improve and maintain the standard of living and purchasing power of farmers for the long term. Therefore, government should develop agro-processing units especially for sugarcane, Soyabean, Vegetables, Flowers, Orange and Cotton.
9. The burden of population on agricultural sector has been rising in our country and the demand for food crops and non-food crops have been increasing continuously, therefore, the intensive cultivation is the need of the agricultural development. The intensive cultivation, for example, sowing at proper time, application of fertilizers and other inputs is not possible without the sufficient irrigation. The multiple cropping patterns can only be possible if there are sufficient irrigation facilities. The sufficient water obtains with the help of water management; therefore there is a need to develop the water harvesting and watershed schemes. This type of programme will help to maintain the sufficient level of ground water. Therefore, above mentioned programme should be implemented efficiently by the rural community to solve the problem of water.
10. The major portion of the agricultural production in our country goes waste. It is this waste that has made farming non-remunerative. So the utilization of this waste to

generate power can be helpful to farmers. Three types of energy can be produced from these wastes such as liquid fuels (ethanol or pyrolysis oil), gaseous fuels (biogas) and electricity. The wastes from the crops like sugarcane produce ethanol whereas jatropha can be used to produce bio-diesel. It has been observed that in the region of Vidarbha farmers have started cultivating jatropha, this would be useful in generating energy for a particular village. These agricultural wastes can also be used through the bio-digester route to produce fertilizers for crops, methane gas to run rural transports and irrigation pump sets. Hence, the proper utilization of agricultural wastes can take care of a huge chunk of India's energy need and thus can contribute to overcome insufficient power supply. In India today it is necessary to develop the technology to generate power from agricultural wastes. The nations like Canada, Japan and USA have already set up few large plants for generation of energy from agricultural wastes. In India a lot of research needs to be done for this development. The government should make available, sufficient funds and subsidies for this activity.

Sign. of the Principal Investigator Sign. of the Principal

Final Report of the work done on the Major Research Project

1. Project report No. 1st / 2nd / 3rd / Final:- **Final**
2. UGC Reference No. : **F. No. 5-169/2013(HRP), dated 11 March, 2013**
3. Period of Report: **1st April, 2013 to 31st March, 2015 (Two Years)**
4. Title of the Project: **"Contribution of Electrification in the Agricultural Development: A Comparative Analysis of Western Maharashtra and Vidarbha"**
5. (a) Name of the Principal Investigator: **Dr. H. N. Kathare, Assistant Professor, Deptt. Of Economics, Rajaram College, Kolhapur**

   (b) Deptt. And University/College where work has progressed: **Deptt. of Economics, Rajaram College, Kolhapur (MS), Pin-416004**
6. Effective date of starting of the Project:- **1st April, 2013**
7. Grant approved and expenditure incurred during the period of the report:-

   (a) Total amount approved Rs. :- **7,62,600/-**

   (b) Total expenditure Rs.:-**7,62,600/-**

   (c) Report of the work done:- **Attached separate sheet**

Sign. of the Principal Investigator Sign. of the Principal

ANNEXURE - III

FINAL REPORT OF THE WORK DONE

i. **Brief objectives of the project:**

The main objectives of this research work are as follows:

(1) To study the pattern of consumption of electricity in Maharashtra State.

(2) To find out the impact of electrification on cropping pattern.

(5) To study the impact of electrification on production and productivity.

(6) To examine the impact of electrification on standard of living of the farmers.

ii. **Work done so far and results achieved and publications, if any, resulting from the work:**

(a) Work done so far:- **Yes**

(b) Publication:- **One paper published and one paper accepted for publication**

- **Published paper:-** One

  Name of the Paper:- "Trends in Consumption of Energy in India"

  Name of the Journals:- Indian Streams Research Journal (International Multidisciplinary Research Journal, Solapur)

  ISSN NO: 2230-7850, VOL. IV, ISSUE II/March - 2014

- **Accepted Paper:-** One
- **Name of the Paper:-** "An Evaluation of Energy Balance in India in India"
- **Name of the Journals:-** Serials Publications, New Delhi

  Indian Development Review (IRD) ISSN NO: 0972-9437

  Tentatively publish paper in Vol. 12, No.1, 2014 of the IRD

iii. Has the progress been according to original plan of work and towards achieving the objective, if not, state reasons:- **N.A.**

iv. Please indicate the difficulties, if any, experienced in implementing the project: **NIL**

v. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the commission on a separate sheet:- **Project Completed**

vi. If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the Commission: **Project Completed and Summary Enclosed (Attached Separate Sheet)**

vii. Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any: **NIL**

Sign. of the Principal Investigator Sign. of the Principal