Chapter VII
Summary, Findings and Recommendations

7.1 Summary:
Irrigation plays a crucial role in the agrarian economy. It plays protective role as against inadequate rainfall. Green revolution is proved successful in those areas which has assured irrigation facilities. From the beginning of the India’s First Five Year Plan (1951-56) to Ninth Five Year Plan (2002-07) the irrigation along with agriculture has been accorded the highest place in the development scheme. Hence, irrigation development has created favorable impact on agriculture sector and human life in the rural area in India. From this point of view, it is necessary to assess the impact of irrigation on agricultural development; this study is undertaken with this point of view. The Marathwada region in the Maharashtra state known as drought prone area is purposely selected for the present research work entitled “Impact of minor irrigation on agricultural development in Marathwada region”. Near about 67 per cent working population in Marathwada depend on agriculture for their livelihood. The percentage of gross irrigated area to gross cropped area in Marathwada increased from 10.60 per cent to 16.25 per cent during the period from 1981-82 to 2003-04. While in Maharashtra state it has increased from 12.96 per cent to 17.90 per cent during the same period. As against such backward of the region this research study was undertaken to evaluate the major impact of minor irrigation on agricultural development in the study area. The following were the main objectives:

1) To study the development of irrigation in India, Maharashtra state and Marathwada region.

2) To study the development and utilization of irrigation potential in Marathwada region.

3) To study the season-wise and crop-wise utilization of minor irrigation potential in Marathwada region.

4) To study the impact of minor irrigation on agricultural development in Marathwada region.

5) To suggest measures with respect to creation and utilization of minor irrigation potential in the Marathwada region.
In order to study the development of irrigation at all India and Maharashtra State level, secondary data was collected from various publications of the Government of India and Maharashtra State and also from the local Government offices for the period 1981-82 to 2003-04. In the present study with and without approach is used for assessing the micro-level impact of minor irrigation. For this, field survey was conducted during the year 2006-07 in the study area. For the selection of farm households from the study area, the three-stage stratified random sampling technique was used. In the first stage Jalna, Hingoli, Beed, Osmanabad and Latur districts were selected. In the second stage one taluka or tehsil from each district and two villages from each selected talukas were selected for the study. In the third stage, total 441 farm households including 291 irrigated and 150 un-irrigated farm households were selected.

The present study is presented in seven chapters. After introducing the subject along with objectives and methodology in chapter first, the review of literature written and published by eminent scholars is presented in chapter second. The third chapter deals with agricultural economy of Marathwada region. The fourth chapter deals with irrigation development in India and Maharashtra state. The development of irrigation potential and its utilization in India and Maharashtra state is discussed in the fifth chapter. The sixth chapter deals with micro level impact of minor irrigation on agricultural development in Marathwada region. The seventh chapter summarizes important findings of the present study and makes useful suggestions.

7.2 Findings:
Most important findings of the present study are briefly summarized below. All these findings are the results of analysis of both macro and micro level data pertaining to India, Maharashtra and Marathwada of the study region. For micro level impact of minor irrigation on farm economy, the field survey was conducted in the study area during the year 2006-07. Use of secondary data collected from various sources pertaining to irrigation development in India, Maharashtra state and Marathwada region have also helped in drawing few important findings.

1. For the agricultural development irrigation has played a vital role in agrarian economy. In successive five year plan period irrigation development has been given top priority. During the pre-independence period, the emphasis was
given to drinking water resources only as protective measures against inadequate natural rainfall, crop failure and famine. In the post independence period, emphasis changed to develop irrigation as one of the main productive inputs in agriculture. The ultimate irrigation potential at the country level has been estimated to 1,39,893 thousand hectares comprising 58,465 thousand hectares (41.80 per cent) from major and medium projects and 81,428 thousand hectares (58.20 per cent) from minor irrigation sources at the end of Ninth Five Year Plan. Irrigation potential created at the time of pre-independence period was 22.60 million hectares from major (9.70 million hectares) and minor (12.90 million hectares) projects. During the plan period, irrigation potential created increased from 25.04 million hectares in the First Five Year Plan to 80.80 million hectares in the Ninth Five Year Plan. The share of minor irrigation in the total irrigation potential created is increased from 53.54 per cent in the first plan to 60.55 per cent in the nineth plan.

2. Before the formation of Maharashtra state, it is found that, position of irrigation development in the state was very slow. However, irrigation development programmes got real boost since inception of the first five year plan. According to the First Irrigation Commission (Barve Commission) of Maharashtra (1962) overall ultimate irrigation potential of the state was 6.10 million hectares, out of which 5.20 million hectares from surface and 0.90 million hectares from ground water resources. Second Water and Irrigation Commission or Madhavrao Chitale Commission (1999) of Maharashtra state has estimated the ultimate irrigation potential of the State to be 9.7 million hectares, out of which 4.1 million hectares to be from groundwater resources and 5.6 million hectares from surface water resources.

The Government of Maharashtra has been spending large amount of money for the creation of irrigation facility through successive plans. Therefore, at the end of 2005, net irrigated area increased up to 31,40,200 hectares, out of which 10,50,200 (33.44 per cent) from surface irrigation and 20,90,000 hectares (66.56 per cent) from well irrigation. Irrigation was just about 6.00 per cent of total cropped area (1960) at the time of formation of Maharashtra state. This percentage has increased up to 17.90 per cent in the
year 2004-05. It is observed that the increase in percentage of irrigated area is 33.52 per cent till the year 2004-05.

3. When Marathwada region was a part of Hyderabad province, the position of irrigation development in this region was that just about 0.25 per cent of net sown area was under irrigation. After the formation of Maharashtra state, the Government of Maharashtra has given top priority to development of irrigation facilities in economically backward region like Marathwada. Therefore, it became possible to increase irrigated area (wells and surface irrigation facilities). Total net irrigated area was increased from 4,36,500 hectares in the year 1981-82 to 7,31,700 hectares in the year 2003-04. The percentage of net irrigated area to net sown area was increased from 8.93 per cent in the year 1981-82 to 16.05 per cent in the year 2003-04. It means that, net irrigated area has doubled during the 22 years period.

During the period from 1981-82 to 2003-04 the percentage of net cropped area to net sown area in Beed district was highest (13.34 per cent) and lowest (0.05 per cent) in Latur district. Total minor irrigation potential 194.368 thousand hectares was created by the end of June 1992. It was increased up to 226.499 thousand hectares by the end of the June 2003 in Marathwada region. But the utilization of minor irrigation potential was decreased from 39.81 per cent to 20.86 per cent during the same period in Marathwada region.

4. During the period 1991-92 to 2003-04, there was massive expansion in irrigation by minor irrigation sources in Marathwada region. Total season wise (kharif, rabi, hot weather, two-seasonal, perennial) irrigated area was increased from 190.784 thousand hectares in the year 1991-92 to 208.350 thousand hectares in the year 2003-04 in Marathwada region. It means that, during the twelve year period it increased by 17.566 thousand hectares. The analysis of the growth of minor irrigated area showed that, there was decrease in kharif season, minor irrigated area from 13.81 per cent in the year 1991-92 to 0.68 per cent in the year 2003-04. There was small increase in irrigated area during rabi season from 58.57 per cent to 65.56 per cent during the same period. In the hot weather season, it was increased from 0.29 per cent to 6.03
per cent from the year 1991-92 to 2003-04. In the perennial season crops, there was significant increase in irrigated area from 0.56 per cent in the year 1991-92 to 16.02 per cent in the year 2003-04 in Marathwada region. District wise picture of season wise irrigated area by minor irrigation sources shows that, in Jalna, Beed, Latur and Osmanabad districts area under kharif crops has decreased whereas it has increased in Aurangabad and Parbhani districts. Irrigated area under rabi season crops in all the districts except only Aurangabad district has increased, whereas minor irrigation sources for perennial crops has decreased from 0.56 per cent in the year 1991-92 to 0.20 per cent in the year 2003-04. But it has jumped to 16.02 per cent in the year 2003-04.

5. In the study of field investigation, micro level impact of irrigation on family size in the Marathwada region, it is observed that the overall size of family is higher in irrigated sample farms as compared to un-irrigated farms, the figures being 5.48 family members and 4.71 family members respectively. It increased with the increase in size of land holdings in both irrigated as well as un-irrigated farms which shows that, relatively large farms have more members to support. But when the size of family is considered vis-à-vis number of persons per hectare, the opposite trend is noticed. The size of family per hectare is inversely related to the size of land holdings that relatively smaller farms had larger members to support as compared to the relatively larger farms. This means that land-man ratio is unfavorable to small farm cultivators.

6. The overall level of literacy (male and female) is 86.22 per cent of the total family members in irrigated farms as against 77.46 per cent of the total family members in un-irrigated farms. This shows that, overall literacy in irrigated farms households is higher as compared to un-irrigated farm households. In study of level of literacy in relation to the size group of farm households, it is highest (91.97 per cent) in case of large farms as against lowest (79.79 per cent) for the small farms in irrigated area. In un-irrigated area, it is the highest (81.72 per cent) in case of large farms and lowest (75.47 per cent) for small
farms. Hence, there was no significant relation between the level of literacy and farm size groups in both irrigated and un-irrigated areas.

7. It observed that, in case of irrigated farms overall irrigated area was 59.54 per cent as compared to 32.37 per cent in case of un-irrigated area. This fact clearly shows that irrigated sample farms are able to put relatively higher proportion of their total land under cultivation as compared to un-irrigated sample farms.

8. It is found that irrigation has contributed to the intensive utilization of land. The overall index of cropping intensity in irrigated area was 146.30 per cent as compared with 116.88 per cent in un-irrigated area. Thus, the provision of irrigation facilities has resulted in the enhanced cropping intensity by 29.42 percentage points. This is mainly due to the sample farm households are able to cultivate their agricultural land at least twice in the year in irrigated area as compared to un-irrigated area. Further, it is found that the intensity of cropping was higher (154.29 per cent) in case of small size farms and lower (141.05 per cent) in case of large size farms in irrigated area. On the contrary, the index of cropping intensity of medium size farms was highest (118.80 per cent) on medium size farms and lowest (115.02 per cent) in case of small size farms. This showed that, there was no significant relation in between the index of cropping intensity and size group of farms in irrigated as well as un-irrigated areas.

9. The data about area under different crops grown by sample farm households in both irrigated and un-irrigated areas were collected in the field survey for the year 2006-07. These data reveal that, total area under different crops is 1407.73 hectares in irrigated sample farms as against 536.78 hectares in un-irrigated sample farms. Out of this total irrigated area, the percentage area under sugarcane was (13.85 per cent) followed by soyabean (13.72 per cent), wheat (17.20 percent), cotton (10.55 per cent), fruits (4.12 per cent). On the other hand, few crops such as cotton (20.48 per cent), soyabean (25.35 per cent), jowar (rabi) (12.81 per cent) are raised in un-irrigated area.

Season wise group of large farms, the proportionate area under cotton, sugarcane and fruits was more than small and medium size farms. Area under
jowar, soyabean and gram was more in medium size farms than other size farms, remaining area under tur, bajara, maize and wheat was more in small size farms in irrigated area. As against, area under cotton, bajara, soyabean and groundnut was more in small size farms as compared to large and medium size farms. Further, area under jowar and wheat was more in medium size farms. In large size farms area under jowar (kh), udid and tur was more than other size farms in un-irrigated area. It is found that the farmers with irrigation facility have mostly grown.

10. It is observed from study of field investigation that, the impact of minor irrigation has increased per hectare productivity more in irrigated area than un-irrigated area. Provision of irrigation facility stimulates the extensive use of High Yielding Varieties (HYV) seeds, fertilizers and pesticides etc. In case of food grains per hectare productivity in irrigated farms was 17.63 quintals as against 9.30 quintals in un-irrigated farms. It means that, impact of irrigation on per hectare productivity of food grains is 8.33 quintals higher in irrigated farms than that of un-irrigated farms. Among the food grain crops, per hectare productivity was more by 8.86 quintals in case of wheat, 7.43 quintals in case of maize, 6.44 quintals in case of jowar (rabi) and 0.67 quintals in case of jowar (kh) in irrigated farms than that on un-irrigated farms.

Per hectare productivity of pulses in irrigated farms was 13.30 quintals as against 6.85 quintals in un-irrigated farms. In other words, it is higher by 6.45 quintals in irrigated farms than that of un-irrigated farms. Among the pulses crops, per hectare productivity of udid was 9.68 quintals, mung 5.47 quintals, tur 18.70 quintals and gram 6.50 quintals in irrigated farms, as against 6.12 quintals, 3.00 quintals, 8.66 quintals and 5.02 quintals for the same crops in un-irrigated farms respectively. In other words, per hectare productivity of these crops was higher in irrigated farms than that in un-irrigated farms.

Per hectare productivity of oilseeds both soyabean and groundnut was 18.85 quintals in irrigated farms as against 8.75 quintals in un-irrigated farms. It means that, it is higher by 10.10 quintals in irrigated farms than that in un-irrigated farms.
Per hectare productivity of cotton crop was 3.10 quintals in irrigated farms as against 3.01 quintals in un-irrigated farms. It means that there is no vast difference in per hectare productivity of cotton in irrigated and un-irrigated farms.

In brief, per hectare productivity of all crops was higher in irrigated farms as compared to that in un-irrigated farms.

It is found that the Production of food grains of medium size farms was higher than the small and large size farms. Out of total food grain production the share of medium size households was as high as 22.03 per cent, but it was 22.88 per cent and 12.38 per cent in case of small and large size farm households respectively. The production of food grain in un-irrigated area showed that, the share of food grain in small size farms in the total production is 59.94 per cent. It is 58.80 per cent and 42.28 per cent in case of medium and large size farm households. It is indicating that small size farm households have more influence over production of food grains in un-irrigated area.

It is found that the per hectare productivity of food grains was 15.04 quintals for medium size farm households in minor irrigated areas as against 10.30 quintals for the corresponding size farm households in un-irrigated area. Further, per hectare productivity of same category of crops in case of small and large size farm households were 13.32 quintals and 12.38 quintals in minor irrigated area respectively and 9.95 quintals and 5.85 quintals in un-irrigated area respectively. In both irrigated and un-irrigated area, per hectare productivity of food grains is higher in case of medium size farm households than the small and large size farm households.

The study showed the average man-days of employment per hectare increased along with decrease in size of farm in both minor irrigated area and un-irrigated area. Small, medium and large size farms in irrigated area generates 218.45, 155.12 and 115.55 man-days of employment respectively. Thus, small and medium size farms are able to generate higher employment opportunities than the large size farms in irrigated area.

The average man-days employment increased with decrease in size of farms in un-irrigated area as well. Small, medium and large size farms
generates 157.76, 100.12 and 59.30 man-days of employment respectively. It is found that, irrigation has increased immensely the generation of more employment opportunities in agriculture sector.

7.3 Recommendations:

On the basis of these findings, some relevant recommendations emerging from the study may be summarized as follows:

1. During the planning period (1951-56 to 1997-02) outlay on minor irrigation schemes was 25.98 per cent but outlay on major and medium irrigation projects was 64.81 per cent. Hence, there is an urgency to increase plan outlay on minor irrigation schemes to create ultimate irrigation potential rather than other irrigation sources at national level.

2. It is found that there are wide and enormous intra-sectoral imbalances in investment allocations between minor and major/medium irrigation during last 50 years (1951-52 to 2002-03) in Maharashtra state. In all the five year plans, higher portion of public investment has gone in favour of major and medium irrigation projects in the state. Out of the total outlay incurred in irrigation sector during last 50 years, major and medium irrigation projects accounted for 85.60 per cent and remaining minor irrigation schemes accounting for only 14.40 per cent. Therefore, more efforts have to be made to allocate adequate financial resource for the development of minor irrigation for the future in the Maharashtra state.

3. To ensure faster rate of quantitative expansion of irrigation potential, minor irrigation, particularly ground water resources need to be accorded high priority in irrigation planning of the state. Minor irrigation claims priority over major and medium irrigation because of its proven definite and practical advantages. Minor irrigation leads to increase in higher irrigation potential immediately and high potential utilization as compared to major and medium irrigation projects. Therefore, in irrigation planning, in times to come more emphasis should be given to the development of minor irrigation schemes.

4. It is observed that utilization of irrigation potential of major and medium irrigation projects is a serious problem in Maharashtra state as compared to national level. To make more optimal utilization of irrigation potential already
created in the state at huge cost to the public exchequer, field channels need to be provided to all irrigated area at an early time on a priority basis. Secondly, the lack of adequate and timely availability of water is also one of the reason for low utilization of irrigation potential. Therefore, to pay more attention on minor irrigation schemes as a alternative source of irrigation to avoid these few drawbacks of major and medium irrigation projects.

5. In low arid region like Marathwada, the modern methods of irrigation i.e. drips, sprinklers are most useful because these methods of irrigation are more efficient in adequate utilization of water. Generally, this modern irrigation methods can save 30 per cent to 40 per cent water and 20 per cent to 30 per cent increase in crop yields with good quality of farm produce as compared to traditional irrigation methods. But these modern irrigation methods are not found to be so popular in irrigated farm sector. Therefore, it is recommended that these modern methods of irrigation should be promoted in irrigated farm sector of farmers by propaganda, demonstrations and training camps to the farmers.

6. In agriculture sector of the economy, the infrastructural facilities like electricity to supply irrigation water to farms, road transport, communication for marketing agricultural produce, banking facilities for farms activities etc. are essential and more useful for increasing agricultural production. Further, health and educational facilities should be improved. These infrastructural facilities will be helpful to farm households for increasing net returns.

Findings of this research study and their policy implications are definitely helpful for understanding the important role of minor irrigation in agricultural development of Marathwada region. The government should carefully consider these suggestions keeping in view the fact that accelerated expansion of minor irrigation facilities and improvement of minor irrigation systems are essential pre-requisites for a prosperous agriculture sector.