Chapter VII

FINDINGS AND POLICY MEASURES

Agriculture is the most backward sector of the Indian economy. The main features of Indian agriculture are low productivity and backwardness. Indian agriculture is regarded as a gamble in monsoons. The agricultural strategy proposes to make a new breakthrough in agricultural production in India. This technological breakthrough has brought about large changes in agricultural production of the country. The new agricultural strategy, adopted since the mid-sixties, has helped in revolutionising Indian agriculture.

There are two basic types of agricultural innovations: bio-chemical and mechanical. Biochemical innovations involve the development of new seeds which are very responsive to increased applications of fertilizer and irrigation water. This type of innovation are generally yield increasing. This type of innovations is really a package of inputs: HYV seeds, fertilizer and irrigation water. This technology is thought to be neutral with respect to scale, meaning that it can be effectively and efficiently used on small as well as large farms. Mechanical innovations
generally involve the application of machinery to the production process i.e. tractors, threshers, irrigation pumps etc. Some forms of mechanical technology such as the use of irrigation pumps result in increased yields. However, for the most part it is thought that this type of innovation has little impact on yields. In order to utilise such machinery economically a large operational size of farm is generally necessary i.e. there is a scale-bias.

Finally, it is argued that these two types of innovations are independent of each other in terms of their application. The new agricultural strategy is nothing but the adoption of HYV seeds, chemical fertilizer, irrigation, improved machinery and implements, pesticides and insecticides, etc.

**HYV seeds:**

The high yielding varieties played a significant role in improving the yield rate of crops like wheat, rice etc. The introduction of high-yielding varieties (HYV) of various crop has opened hopes to make the country self-sufficient. HYV seeds are considered to be neutral to scale and can be adopted by small farmers with meagre resource. The high yielding
varieties programme was directed towards increasing the productivity of land through the adoption of package of new inputs and practices. This technology can only be successfully implemented where water and chemical fertilisers are available.

**Chemical fertilizers:**

Fertilizer is a crucial input in agricultural production. The new variety of seeds are highly responsive to chemical fertilizer. This input of fertilizer helps in providing the nutrients to the soil and plant growth. As a result productivity of agriculture is boosted up even in the short period. Fertilizer use also depend upon the availability of factors such as irrigation, credit facilities etc. Crop yields are highly responsive to fertilizer application in the assured and semi-irrigated regions.

**Irrigation:**

Irrigation saves agriculture from the gamble of rainfall. In traditional agriculture, irrigation was recognised only for its protective role, as an insurance against drought. But with the new strategy of high yielding varieties of seeds and multiple cropping controlled irrigation has become a basic prerequisite
for getting high yield. Multiple cropping intensive and
effective use of land and higher production can be
achieved through irrigation. Irrigation not only
provides an insurance against irregular rainfall, but
also increases productivity per unit of land.

**Mechanization:**

The effectiveness of this new technology is
dependent very much on timely, adequate and proper
accomplishment of farm operations. All the operations
performed with human and animal energy are not
satisfactory and can not be finished in time. There-
fore, the object of timely farm operations can be
achieved by using improved farm machinery and
implements. The mechanized farms lead to higher
productivity. The mechanized irrigation offers an
opportunity for reducing risk by ensuring timely supply
of water.

**Plant protection:**

The quick growth of plant with the use of
fertilizer and irrigation has created tremendous pest
and disease problem. New seed varieties are more prone
to pests and diseases. Plant protection is very
important in order to reduce crop losses and to improve
crop yields. The pesticides are mainly used to give
protection and support to the expended HYV cereals. Its
utilization can easily be extended to other crops.

In Marathwada region of Maharashtra state, the
scope for extending cultivation to new lands seems to
be very limited. Therefore, in order to increase
productivity and production in agriculture of this
backward region of the state, we have to rely only on
adoption of new strategy. No one has so far dealt with
this particular aspect of agricultural development in
Marathwada.

The present study is undertaken to meet this
exigency and attempts to study as to what extent the
farmers in Marathwada region have acquainted with the
adoption of new agricultural technology and its
consequences on agricultural productivity. The study
cover the period of thirty-four years from 1951-52 to
1986-87. The crops chosen to study the impact of new
technology on their productivity are rice, wheat,
jowar, bajra, other cereals, gram, tur, other pulses,
sugarcane, cotton and groundnut. In order to assess the
impact of new technology the chosen period is split into
two sub-periods: period I - 1951-52 to 1964-65 (pre-
green revolution period) and period II - 1967-68 to
1986-87 (i.e. post green revolution period). The two years i.e. 1965-66 and 1966-67 are dropped for assuring the proper results.

In order to study the objectives of the present study, the growth rates in area, production and productivity of some principal crops are calculated for all the three periods for Maharashtra state and Marathwada for comparison purpose. The compound growth rates of area, yield and production of principal crops are also calculated for all districts of Marathwada for the purpose of studying their performance during pre-and post-green revolution period. Some important findings about crop performance in Marathwada and Maharashtra are summarized below.

In Marathwada, the growth rates in production of other cereals, gram, tur, other pulses, total pulses and cotton were higher in post-green revolution period as compared to that in pre-green revolution period. It means that these crops showed better performance during the post-green revolution period. At the state level the production of wheat, jowar, bajra, total cereals, total foodgrains, sugarcane and groundnut have shown better performance in post-green revolution period as compared to pre-green revolution period.
It is very important to note here that in Marathwada, the productivity of rice, wheat, other cereals, gram, tur, other pulses, total pulses, sugarcane and cotton grew by higher rate in post-green revolution period as compared to pre-green revolution period. Amongst these crops, the growth rates of productivity of rice, wheat, other cereals, tur and other pulse crops were higher in Marathwada as compared with the state level picture, in post-green revolution period. At the state level, the growth rates of productivity of rice, wheat, jowar, other cereals, total cereals, gram, tur, other pulses, total pulses, total foodgrains and cotton were higher in post-green revolution period as compared to pre-green revolution period.

In the post-green revolution period the production of rice, bajra, other cereals, total cereals, other pulses, total foodgrains and cotton has increased by higher rate in Marathwada as compared to Maharashtra. The growth rates of production of wheat, jowar, gram, tur, total pulses, sugarcane and groundnut were higher for Maharashtra than Marathwada in post-green revolution period.
In the post-green revolution period, the productivity growth rates of rice, wheat, bajra, other cereals, tur, other pulses and cotton were higher in Marathwada as compared to Maharashtra. But the growth rates of productivity of jowar, total cereals, gram, total pulses, total foodgrains, sugarcane, and groundnut were higher at Maharashtra level than for Marathwada in post-green revolution period.

Rice production in Marathwada did not perform well, in the post-green revolution period, in all the districts of Marathwada. The growth rates of rice production are found to lower for the post-green revolution period as compared to pre-green revolution period in all districts of Marathwada. This was due to fall in growth of area under rice in latter period. In Marathwada, productivity of rice has grown by 3.88 per cent per annum in the post-green revolution period as against 0.18 per cent in the pre-green revolution period. A significant rise in productivity growth rate of rice in the latter period is found for Beed and Parbhani districts. This happened because of the tremendous change on irrigation front and substantial increase in fertilizer consumption in these districts.
Wheat production in Marathwada recorded a positive growth during the period from 1951-52 to 1986-87. In Aurangabad, Beed and Osmanabad districts the growth rates of area under wheat were positive in the pre-green revolution period, which showed a negative growth in the post-green revolution period. The productivity of wheat has improved significantly in Marathwada and in all the districts of Marathwada in the post-green revolution period as compared to pre-green revolution period. This may be attributed to increased use of HYVs of wheat and fertilizer and growth in area irrigated under this crop. The area under HYVs of wheat has increased up to 341.90 thousand tonnes in 1986-87. The area irrigated under wheat has also increased by 7.99 per cent per annum during 1961-62 to 1984-85. The wheat productivity showed good performance in all the districts of Marathwada during the post-green revolution period.

In Marathwada, though the jowar production has recorded a positive growth in both the periods, it grew by a smaller rate of 3.71 per cent per annum in the post-green revolution period as against the growth rate of 5.15 per cent per annum in the pre-green revolution period. In Aurangabad and Osmanabad districts the
production of jowar has increased even by higher rates than the rate for Marathwada during the whole period from 1951-52 to 1986-87. The contribution of area has been relatively higher than yield at Marathwada level as well as in Osmanabad, Beed and Aurangabad districts. In Marathwada, growth rate of productivity of jowar has also fallen to 2.19 per cent per annum in the post-green revolution period from the growth rate of 2.41 per cent per annum in the pre-green revolution period. The productivity of jowar has grown at substantially higher rate in the post-green revolution period in Parbhani and Nanded districts.

The production of bajra showed a slight better performance in the post-green revolution period as compared to pre-green revolution period. In Parbhani and Beed districts, the growth rates of production of bajra are found to have improved in the post-green revolution period. In Aurangabad and Nanded districts, the production of bajra records lower growth rates in the post-green revolution period. In Osmanabad district the bajra production indicated a negative growth in post-green revolution period. In Marathwada, the productivity growth rate of bajra has fallen from 3.66 per cent in the pre-green revolution period to 3.05 per cent in the post-green revolution period. In Parbhani,
Beed and Nanded districts, the productivity of bajra showed relatively good performance in the post-green revolution period.

In Marathwada, production of other cereals recorded a high negative growth rate of -3.40 per cent per annum in the pre-green revolution period and a very high positive growth rate of 7.77 per cent in the post-green revolution period. Similar picture also appeared at all district levels as well. Both area and yield factors were responsible for such a high negative and positive growth in production of other cereals.

Total cereal production in Marathwada is found to have increased by 2.53 per cent per annum during the period from 1951-52 to 1986-87. After having compared the growth rates of cereal production for pre- and post-green revolution periods it is found that cereal production seriously suffered in the latter period in Marathwada as well as in all its districts. The productivity growth rate has also slightly fallen, at Marathwada level, from 2.85 per cent in pre-green revolution period to 2.54 per cent in the post-green revolution period. The productivity of total cereals has grown at relatively lower rates in the post-green revolution period in Aurangabad, Beed and Osmanabad districts. In Parbhani and Nanded districts, the
productivity of cereals seems to have grown at relatively higher rates in the post-green revolution period.

The production of gram showed better performance in the post-green revolution period as compared to pre-green revolution period in Marathwada. This was due to improvement in growth rates of area and yield of this crop in the latter period. A significant improvement in the growth rate of gram production appeared in Parbhani and Osmanabad districts in the post-green revolution period. In marathwada, the productivity of gram improves from a negative growth rate of -0.45 per cent in the pre-green revolution period to a positive growth rate of 1.05 per cent in the post-green revolution period. In Osmanabad and Parbhani districts the productivity growth rate of gram has improved significantly from a negative growth rate of -3.06 per cent and -1.61 per cent respectively in the pre-green revolution period to a positive growth rate of 1.46 per cent and 1.98 per-cent respectively in the post-green revolution period. In post-green revolution period irrigated area under gram grew by 14.90 per cent and 7.92 per cent per annum in Parbhani and Osmanabad districts respectively.
The growth rate of production of tur in Marathwada is found to have improved significantly from a negative growth rate of -0.41 per cent in the former period to 3.31 per cent in the latter period. The production of tur has shown an impressive rise in the post-green revolution period in all the districts of Marathwada. This may be attributed to both area and yield increases. The increases in yield of tur may be attributed to increased use of fertilizers and pesticides.

During the pre-green revolution period, the production of other pulses had recorded a negative growth rate of -0.90 per cent per annum in Marathwada but it improved significantly to a positive growth rate of 2.83 per cent in the post-green revolution period. The productivity of other pulse crops, in Marathwada, showed a positive growth in both the periods and it is found to have increased by a slightly higher rate in the post-green revolution period. This may be attributed to irrigation factor. In Marathwada, the growth rate of irrigated area under other pulses has increased by 7.43 per cent per annum in the post-green revolution period. The use of fertilizers and pesticides also explain this positive growth of pulse production in Marathwada in the
latter period. Similarly, in all the districts the productivity of other pulse crops recorded a positive growth in both the periods.

In Marathwada, the total production of pulses recorded a negative growth rate of -0.52 per cent in the pre-green revolution period which has improved to a positive growth rate of 2.05 per cent in the post-green revolution period. This is due to improvement in both area and yield of pulse crops. With the exception of Aurangabad district, in all other four districts the production of pulses has grown by relatively higher rates in the post-green revolution period. At the Marathwada level the productivity of pulse crops has showed better performance in the post-green revolution period. This may be due to growth in irrigated area under pulse crops and fertilizer consumption. The district level picture reveals that the productivity of pulse crops improved significantly in four districts, namely, Parbhani, Beed, Nanded and Osmanabad in the latter period. Impressive rise in productivity of pulse crops in the latter period is found in Beed district (i.e. 4.15 per cent per annum).

In Marathwada, the growth in foodgrains production is found to have depressed in the post-green
revolution period as compared to pre-green revolution period. This was due to decline in area under total cereals during post-green revolution period. The productivity of foodgrain crops also grew by a lower rate in the latter period, in Marathwada. But in Osmanabad, Nanded and Parbhani districts the growth rate of productivity of foodgrain crops has improved in the post-green revolution period.

The production of sugarcane has grown at a very high rate of 7.59 per cent per annum in Marathwada during the period of 34 years (i.e. 1951-52 to 1986-87). This growth in sugarcane production has come mainly from increase in area under sugarcane. The growth rate of sugarcane production in Marathwada was higher for pre-green revolution period as compared to the latter period. The production of sugarcane has grown at relatively higher rates in Osmanabad and Beed districts in the post-green revolution period. At the Marathwada level the productivity of sugarcane records a negative growth in both pre- and post-green revolution periods. But the productivity of this crop declines at a relatively lower rate in the latter period.

In Marathwada, cotton production is found to have increased by 1.97 per cent per annum in post-green
revolution period as against by 1.62 per cent per annum in the pre-green revolution period. This was due to negative growth rate of area i.e. -0.06 per cent per annum in the latter period. In post-green revolution period, the productivity of cotton is found to have grown by relatively higher rates in Parbhani, Beed and Nanded districts. The productivity of cotton seems to have increased due to increase in irrigated area under cotton, fertilizer consumption and substantial increase in use of pesticides.

The production of groundnut in Marathwada recorded a very high negative growth rate of -4.53 per cent per annum during the whole period. In Marathwada, groundnut production had indicated a very small but positive growth rate in pre-green revolution period as against a negative growth rate of -5.57 per cent per annum in the post-green revolution period. In Parbhani district, the groundnut production showed a substantial improvement from a negative growth rate of -6.14 per cent in the pre-green revolution period to a positive growth rate of 3.20 per cent in the post-green revolution period. In Marathwada, the productivity of groundnut showed a negative growth in both the periods. In Osmanabad, Nanded and Aurangabad districts, the
groundnut productivity records a negative growth in post-green revolution period. However, in Beed and Parbhani districts it changes from a negative growth rate of -2.02 per cent and -0.63 per cent respectively in former period to a positive growth rate of 4.78 per cent and 0.36 per cent respectively in the post-green revolution period. This improvement could be attributed to substantial growth in irrigated area under groundnut in Parbhani and Beed districts during the post-green revolution period.

During the recent years Indian agriculture has experienced rapid changes in production technology. The key input such as HYV seeds, fertilizer, irrigation and pesticides showed an increasing trend in the post-green revolution period. Before 1960s there was not significant use of these inputs in Indian agriculture. The use of mechanical inputs sharply increased after 1966. In Marathwada, the growth in use of these inputs is of recent origin and low. However, with the introduction of commercial agriculture, farmers have adopted it on an increasing scale.

This study also examines the impact of the new agricultural technology on productivity of certain crops in Marathwada. The main results obtained in this respect are presented below.
In Marathwada, the highest HYV area is found under jowar crop and the lowest under rice. The proportion of HYV area under total cereals is also found to have increased during the period from 1975-76 to 1986-87. In Marathwada, the total area under HYVs of cereals was 1132.6 thousand hectares in 1975-76 which increased up to 2162 thousand hectares in 1983-84. It means that in Marathwada the area under HYVs of cereals has increased about 91 per cent in 1983-84 over 1975-76. Area under HYVs of cereals is also found to have increased in all the districts of Marathwada between these two years.

The consumption of fertilizers in Marathwada has increased from 23.5 thousand metric tonnes in 1968-69 to 106.9 thousand metric tonnes in the year 1986-87. In other words, fertilizer consumption in Marathwada is found to have grown the rate of compound growth rate of 10 per cent per annum during the period 1968-69 to 1986-87. The growth rate of fertilizer consumption is found to be relatively higher for Nanded (i.e. 13.21 per cent per annum) and Aurangabad (i.e. 13.12 per cent per annum) districts.
The consumption of pesticides in Marathwada has increased from 410 metric tonnes in 1967-68 to 1269.8 metric tonnes in 1986-87. An impressive rise in consumption of pesticides is found in Nanded and Osmanabad districts.

The gross irrigated area in Marathwada has grown at the rate of 4.24 per cent per annum during the period 1954-55 to 1984-85. In Parbhani and Nanded districts, it has increased by relatively higher rate of 6.73 per cent and 6.59 per cent per annum respectively in the same period. The growth rates of irrigated area are found to have been positive and very high for post-green revolution period for all the districts of Marathwada.

The irrigated area under total cereals in Marathwada has increased at the rate of 5.01 per cent per annum during the period 1961-62 to 1984-85. The irrigated area under total cereals has grown by higher rates in Parbhani and Nanded districts (i.e. 14.19 per cent and 6.86 per cent respectively) than the rate for Marathwada. The rank correlation co-efficient between growth rates of irrigated area under cereals and production of cereals in five districts of Marathwada is found to be +0.80, which is statistically significant.
Similarly, the rank correlation co-efficient between growth rate of irrigated area under cereals and productivity is found to be +0.90, which is also statistically significant. It means that there has been a strong positive association between growth in irrigated area of cereals and production and productivity of these crops, in Marathwada.

The irrigated area under total pulses in Marathwada, has increased by 6.63 per cent per annum during the period 1961-62 to 1984-85. In Parbhani, Nanded and Osmanabad districts, the irrigated area under total pulses has grown even at higher rate (i.e. 13.13 per cent, 9.83 per cent and 7.48 per cent per annum respectively) than the rate for Marathwada. The rank correlation co-efficient between growth rates of irrigated area under pulses and production of pulses is found to be +0.05, which is statistically insignificant. Similarly, the rank correlation co-efficient between growth rates of irrigated area under pulses and productivity is found to be +0.25, which is also statistically insignificant. This clearly indicates that growth in irrigated area under pulses has not affected the production and productivity of pulses to a greater extent, in Marathwada.
Irrigated area under total foodgrains in Marathwada has grown by 5.13 per cent per annum during the period 1961-62 to 1984-85. In Parbhani and Nanded districts it increased by a high rate of 14.02 and 9.09 per cent annum respectively. The rank correlation co-efficient between growth rates of irrigated area under total foodgrains and production of foodgrains is found to be +0.80, which is statistically significant. Similarly, the rank correlation co-efficient between growth rates of irrigated area of foodgrains and productivity is found to be +0.90, which is also statistically significant. This clearly indicates that growth in production and productivity of total foodgrains has come from growth in irrigated area under total foodgrains, in Marathwada.

The growth rate of irrigated area under cotton is found to be 10.32 per cent per annum in Marathwada during 1961-62 to 1984-85. In Parbhani and Nanded districts, it has grown by very high rates i.e. 20.73 and 30.64 per cent per annum respectively. In Osmanabad district, irrigated area under cotton recorded a negative growth rate of -1.77 per cent per annum. In Marathwada the growth rate of irrigated area under groundnut has increased by 24.67 per cent per annum. The
irrigated area under groundnut is found to have grown at the highest rate of 46.36 per cent per annum in Parbhani district.

In 1956, there were only 55 ploughs for one thousand hectares of gross cropped area in Marathwada. This availability of ploughs remained constant till 1983. But the availability of ploughs has increased in Aurangabad, Parbhani and Beed districts, however, in Nanded and Osmanabad districts it has declined.

The availability of sugarcane crushers, in absolute terms, has increased marginally from 2773 crushers in 1956 to 3261 crushers in 1983, in Marathwada. In Marathwada, there has been about five-fold increase in the number of power-operated crushers in 1983 over 1956. The district-wise picture revealed that the availability of sugarcane crushers has deteriorated in both absolute and relative terms in Parbhani, Beed and Nanded districts between 1956 and 1983. In Aurangabad district, the availability of sugarcane crushers has improved whereas in Osmanabad district it improved in absolute terms only.

The availability of oil engines for one thousand hectares of gross cropped area has increased from one oil engine in 1956 to three oil engines in
1983, in Marathwada. In 1956, there were 73 electric pumps used for irrigation purpose in Marathwada which increased up to 76113 pumps in 1983. The availability of electric pump-sets has increased in all the districts of Marathwada.

The availability of tractors has also increased substantially in all the districts of Marathwada between the years 1961 to 1983. The rank correlation co-efficient between percentage increase in availability of tractors and production of total cereals is found to be negative and statistically insignificant. The rank correlation co-efficient between availability of tractor and productivity is found to be positive but statistically insignificant. The rank correlation co-efficient between percentage increase in availability of tractors and production of total foodgrains is found to be negative and statistically insignificant. The rank correlation co-efficient between availability of tractor and productivity is found to be positive but statistically insignificant. This clearly indicates that availability of tractors has not affected production and productivity of total cereals and foodgrains in Marathwada. The rank correlation co-efficient between percentage increase in availability of
tractors and production of total pulses is found to be +0.3, which is statistically insignificant. Similarly, the rank correlation co-efficient between availability of tractor and productivity is found to be +0.90, which is statistically significant. This clearly indicates that the availability of tractors has positively affected the productivity of total pulses in Marathwada.

Suggestions:

On the basis of above conclusions, the study has the following policy implications.

In Marathwada, the growth rate of production of wheat, jowar, gram, tur, total pulses, sugarcane and groundnut were low in post-green revolution period as compared to the growth rate of these crops at the state level. Hence efforts need to be made to improve the growth performance of these crops in Marathwada. Irrigation is the key factor in this. Attempts are required to induce farmers to take pulse crops and jowar crop on their irrigated lands. In the case of pulses, farmers of this region are still using traditional varieties which keep yield at a low level. Farmers in Marathwada do not use the new varieties of sugarcane which require less irrigation water.
In Marathwada, the productivity growth rate of jowar, total cereals, gram, total pulses, total foodgrains, sugarcane and groundnut were low in post-green revolution period as compared to the growth rates of these crops at the state level. For increasing the growth rates of productivity of these crops attempts are needed to ensure adequate quantities of new forms of agricultural inputs like seeds of high yielding and improved varieties, fertilizers, pesticides etc. Efforts may be made to exploit underground water resources through digging new wells.

Rice and wheat production in Marathwada did not perform well in the post-green revolution period in all districts of Marathwada. About rice, it was due to fall in growth of area under rice in this period. In Aurangabad and Beed districts, the growth rates of irrigated area under rice were very low i.e. 1.51 per cent and 3.45 per cent per annum respectively during the post-green revolution period. Farmers in Marathwada do not use HYVs of rice on a large scale. So in order to increase production and productivity of rice the irrigation and HYVs are the key factors. More emphasis needs to be given on adoption of these two inputs in rice production. In the post-green revolution period
the growth rate of area irrigated under wheat was very low. In the case of wheat, though the farmers are now well acquainted with its HYVs, there is lack of other inputs in its cultivation steps are required to make possible the simultaneous use of HYV seeds, water and fertilizer in production of wheat and rice. This would definitely show an impressive improvement in production and productivity of these superior grains.

In Marathwada, the jowar production grew by relatively lower rates in all the districts in post-green revolution period. Production of bajra also grew by a relatively lower rate in the post-green revolution period in Aurangabad and Nanded districts. In post-green revolution period the growth rate of area irrigated under jowar was very low in all the districts of Marathwada. The growth rate of area irrigated under bajra was very low in Aurangabad district and there was no irrigated area under bajra in Nanded district. In order to improve the growth rates of production and productivity of jowar and bajra there is need of allocating irrigated lands to these coarse grains. Further, the use of HYV seeds and fertilizers needs to be increased.
The growth rates in production and productivity of pulse crops have improved during the post-green revolution period in Marathwada. But there is more scope for increasing production of pulses through increase in yield, in Marathwada. Farmers usually allocate low quality and unirrigated lands to pulse crops. They still use mainly traditional varieties of tur and gram crops. A very meagre use of fertilizers is made in cultivation of pulses. Through simultaneous use of HYV seeds, water and fertilizer, the production and productivity of pulses can be increased to a large extent. Hence farmers should be provided with new varieties of seeds and adequate supply of fertilizers and pesticides. Attempts needs to be made to increase irrigated area under pulses.

Sugarcane production in Marathwada grew by a lower rate in the post-green revolution period, as compared to pre-green revolution period. But the productivity of sugarcane showed negative growth in both the periods. Decline in productivity might be due to irregular water supply and lack of high yielding varieties. For increasing the production and productivity of sugarcane, efforts may be made for exploitation of underground and flow irrigation
resources. Adequate supply of fertilizers, credit facilities and electricity is needed.

In Marathwada, production of cotton has grown by a relatively higher rate but its productivity has grown by a relatively lower rate in the post-green revolution period. For improving the cotton productivity efforts may be made to exploit water resources. In Marathwada region, area under irrigated cotton has been very low. So the efforts may be made to increase the irrigated area under cotton. Efforts also be made for adequate supply of pesticides to the farmers. The farmers may be supplied with adequate quantities of fertilizers, and new seeds of high yielding varieties on large scale.

Irrigation is a key input of new agricultural technology. In Marathwada, the gross irrigated area has increased by a rate of 4.24 per cent per annum during the period from 1954-55 to 1984-85. In post-green revolution period it has increased by a rate of 5.83 per cent per annum. This rate of increase in gross irrigated is not sufficient and satisfactory. Hence, massive programme be launched for exploiting underground water resources by digging new wells and for harnessing flow water resources through construction of percolation
lakes, and small irrigation dams wherever possible. Rate of fertilizer consumption is not satisfactory. The level of mechanization in the agriculture of Marathwada is very low. Efforts should be made in these fields also.

The farmers may be provided with adequate credit at concessional interest rate for purchasing material inputs required for crop-production. Attempts may be made to develop adequate infrastructural facilities in the region. Rural electrification and road construction programmes may be geared up in the immediate future. Efforts may be made to strengthen extension activities in the area to educate farmers about the new agricultural technology.

Efforts are needed to complete the work of land improvement. The extension education programme may be strengthened on the lines suggested under the proposed 'BENOR' system. The extension education programmes must also include appropriate methods for increasing their effectiveness. Efforts may be made to bring about proper co-ordination among various governmental, semi-governmental, co-operative and private agencies in implementing different developmental programmes in the region.