Chapter VI

CONCLUSION AND SUGGESTIONS
In India, different strategies based on different models have been used for achieving rapid progress in agriculture. The diffusion model which formed the basis for Community Development programmes was replaced during the sixties by the high pay-off input model underlying the Intensive Agricultural District Programme (IADP), High Yielding Variety Programme (HYVP) etc. There seems to be a consensus that the spread of high yielding cereal varieties, especially of wheat and rice, has ushered in an era of agricultural transformation in India. Then agricultural technology has resulted in a significant breakthrough in area, production and yield, particularly with respect to cereal crops like wheat and rice. It is important to note that not only the area under high yielding varieties has grown rapidly, but that the quantum of modem inputs and their usage has demonstrated remarkable progress in India.

The development and diffusion of a new technological package has stirred a great deal of controversy concerning its impact on income distribution. Of the two arguments involved in this controversy, the technocratic perspective attributes the worsening of income distribution in rural areas to the fact that technical innovation is not rapid enough, in terms of diffusion and applicability, to off-set effects of population growth. Alternatively, the reformist approach argues that it is the technical innovation itself that results in worsening distribution of income. This is due to the fact that the prosperous landowners are likely to capture the greatest share of the
benefits by combining the use of bio—chemical innovation with the mechanization of farming operations. In areas where the new strategy has been successful in terms of food production, it is argued by several researchers that its introduction has favoured the richer farmers. Some argue that a bias against the small farmer is built into the new technology by the very costly nature of the inputs, the role of indivisibles like tractors and also by the selective strategy accompanying the new technology. Some, while accepting that the new technology is scale-neutral, put forward the view that access to resources is not scale-neutral. However, according to the findings of some writers, there is a slight decline in inequalities, particularly in areas undergoing technical change. Further, few writers argue that an inverse relation is still applicable. Thus, there is no consensus among writers on this issue and the controversy has gained importance in recent times.

The fundamental objective of this empirical, fact-finding investigation is to discover the impact of new agricultural technology in the form of high yielding varieties on yield, income and employment also the distribution of income and employment among farmers of different size groups in Kurnool district. The approach is basically inductive and statistical, exploring, measuring and explaining an objective field of observation at the micro level.
The present study examines this issue, making use of both primary and secondary data. The following hypotheses are tested to realize the objectives of the study:

- There is no significant difference in the yield and farm business income of local and high yielding varieties of paddy and sunflower.
- There is no significant difference in the relationship between farm size and yield in adoption of new agriculture technology of local and high yielding varieties of paddy and sunflower and
- There is no significant difference in the pattern of income and employment distribution among the size group under new agricultural technology.

Agriculture is the in occupation of the people in Kurnool district which forms the study area. The principal crops are paddy, jowar, bajra, and cereals crops and especially the commercial crops are groundnut, sunflower rises in the district. The area, production and productivity of paddy and sunflower crops in the district. The area, production and yield increases from 1999-2000 to 2008-2009 in particularly crops are paddy and sunflower, in the effect of green revolution. The crop paddy area increases from 94069 to 114542 hectares, the yield is 2821 to 3641 kgs per hectare and 265387 to 391232 tonnes from 1999-2009 in the Kurnool district. The crop sunflower area increases from 54439 to 86123 hectares, the yield is
645 to 1108 kgs per hectare and 35113 to 91348 tonnes from 1999-2009 in the Kurnool district of Andhra Pradesh.

With the spread of high yielding varieties, the quantum of inputs used has increased substantially and resulted in higher demand for credit. The institutional agencies, particularly commercial banks and co-operatives, have been playing an active role in the provision of credit though much remains to be done to make their role effective.

In panyam the mandal among different categories of farmers. Small farmers account for about 74 per cent of holdings and 36 per cent of total area. Medium size farmers account for about 16.36 per cent of holdings and 26 per cent of total area. In contrast, large farmers hold 9.91 per cent of holdings and 38.94 per cent of land. Land being concentrated in the hands of a few big farmers is the striking feature of Indian agriculture and the mandal is no exception to this. In velgode mandal unequal and highly skewed distribution of land among farmers in the mandal. Small farmers (0-2 hectares) own 85.61 per cent of holdings and 55.14 per cent of area. While medium farmers (2-4 hectares) account for about 11 per cent of holdings and 25 per cent of area. Large farmers (4 hectares and above) at the other extreme, with a meager 3.44 per cent of holdings own 20.12 per cent of the total area. Thus the concentration of land in the hands of few big farmers speaks of the disparities in the mandal.
The total sample house-holds 67.32 per cent are engaged in agriculture while 32.67 per cent reported agriculture as subsidiary occupation in Panyam mandal. In Velgode mandal 73.96 per cent says agriculture and 26.04 per cent subsidiary occupation in the study area. From the data, it is evident that the main source of living for the sample farmers in two mandals of the district.

The percentage of area irrigated to total area of the sample farmers in panyam and velgode are 37.07 per cent and 76.43 per cent respectively. It shows that sample farms in velgode mandal have better irrigation facilities. As such, velgode has higher potentiality for the adoption of new technology than the other panyam mandal. Several studies confirm the correlation between the availability of irrigation facilities and the introduction of new varieties. The adoption of new agricultural technology has led to higher rates of growth both in production and productivity in the district. Paddy and sunflower are the most important crops in the two mandals. Comparatively more area is under sunflower in panyam mandal than other crop grown and paddy in velogode mandal of the total cropped area. In panyam mandal sunflower accounts for 65.93 per cent of the cropped area. Next in importance is paddy which accounts for 34.06 per cent of the cropped area. In velogode mandal paddy is raised on 67.19 per cent while the area under sunflower is 32.81 per cent of the cropped area. It is quite indicative that this is due to the availability of better irrigation facilities in this mandal.
The total area under paddy, local variety accounts for 3.65 per cent and 7.43 per cent in panyam and velgode mandals respectively while high yielding variety ranges between 86 per cent the 93 per cent in all the mandals. Though panyam is placed in the category of less irrigated region, in terms of the area under high yielding variety of paddy, the sample farms of panyam indicate that it is on par with velgode mandal. From the above data that the total area under high yielding variety is higher on sample farms. The variation in the adoption rate of high yielding varieties among mandals may be due to the fact that irrigation, the prerequisite of new technology is high in velgode mandal. In panyam mandal lack of assured irrigation is hampering the adoption of high yielding varieties. According to the sample farmers of panyam mandal, inadequate water and lack of irrigation facilities makes high yielding variety cultivation risky. It means that the sample farmers of panyam mandal are equally progressive in their outlook to adopt high yielding varieties as the sample farmers in velgode mandal. Hence, it may be pointed out that provision or irrigation would further increase high yielding variety cultivation in panyam mandal. The new types more responsive to artificial fertilizers and irrigation than traditional ones spread more widely, more quickly than any other technological innovation in the history of agriculture in the developing countries.

The yields level of high yielding variety of paddy is higher in all the two mandals vis-a-vis local varieties. The difference between local
and high yielding variety of paddy among mandals is explained by variation in irrigation facilities in the Mandals, as the realization of yield potential of high yielding variety depends, inter alia, on the adequate and timely application of water. In the case of sunflower also the data suggests that the average yields of high yielding variety are higher than local varieties in all the Mandals. The slight difference of 1688 kgs per hectare between local and high yielding variety of paddy and 390 kgs per hectare local and high yielding variety of sunflower in panyam may be to lack of irrigation facilities, as the yield superiority of high yielding variety is not established there.

Full benefits of new technology can be obtained only when irrigation is assured. The difference in the yields of local variety and high yielding variety of paddy is 1875kgs per hectare and 750 kgs per hectare local and high yielding variety of sunflower in velgode mandal. It means the yield potentiality of Green Revolution in the case of paddy is realized in velogode mandal to a greater extent than in panyam mandal. The differences in the mean yields of high yielding variety and local variety of paddy in the sample villages have been tested.

The differences in the mean yields of high yielding variety and local varieties of paddy in all the two mandals are statistically significant. Hence, we reject the null hypothesis \( \bar{x}_1 - \bar{x}_2 = 0 \) and accept the alternative hypothesis \( \bar{x}_1 - \bar{x}_2 > 0 \). Despite irrigation disparities among the mandals, the yields are significant statistically between
local variety and high yielding variety of paddy. The significant difference between yields of local variety and high yielding variety of paddy in the two mandals may be due to the fact that though there is difference in the area under high yielding variety. In panyam mandal the sample farmers cultivated high yielding variety in the available irrigated area, thereby the yield of high yielding variety becomes significant.

The farm business income of high yielding varieties is higher than the farm business income of local variety in the mandals under study for both paddy and sunflower. In the case of paddy, though the paid-out costs are higher per hectare for high yielding variety, than those for local variety, the gross farm income and as such farm business income are still higher. The difference between the average farm business income for high yielding variety and local variety of paddy is highest in velgode mandal as compared with the other mandal. However it reestablishes the fact that in two mandals, irrespective of irrigation disparities, the farm business income from high yielding variety of paddy is found higher as compared to local variety. Regarding sunflower, the highest farm business income for high yielding variety per hectare is recorded on the sample farms of mandal and in the case of local variety of sunflower, the sample farms of velgode record highest farm business income, the data reveals that the Cost A₂ of high yielding variety is more than that of local variety in mandals. Despite the fact that the cost of cultivation per hectare of

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high yielding varieties are higher than that of local varieties in respect of both the crops in all the Mandals, the farm business income from high yielding varieties are much higher than that of local varieties indicating the higher profitability of high yielding variety technology. The difference in the mean farm business income of local and high yielding variety of paddy in the two mandals is statistically significant. Thus the results show that the farm business incomes from high yielding variety of paddy are significantly different from the farm business income of local variety in the mandal. It means that irrespective of inter variation in irrigation and other facilities like input marketing and credit, the performance and success of high yielding variety of paddy in terms of farm business income is found superior to that of local variety in two mandals. The difference between local and high yielding varieties in mean farm business income is statistically significant in two mandals. It means that the farm business incomes from high yielding varieties on sunflower are significantly different from the farm business income from local varieties in the two mandals.

The analysis of costs and returns presented above has some limitations. It does not explain fully the efficiency of resource allocation in the study area. In fact, production is the simultaneous process of so many variables. In order to explain the individual contribution of a single variable out of this simultaneity, production function analysis has been used. The determination of efficiency of
factors of production used for producing the output is analyzed here with the help of production function techniques. Cobb-Douglas type of production function has been used to study the elasticity of output with respect to each input and returns to scale. Marginal value productivities of various inputs are estimated and compared with their acquisition costs to evaluate the optimality of resource use.

The elasticity of various factors of production is computed by least squares regression methods. A positive elasticity which is less than unity would indicate decreasing marginal productivity of an input factor. Likewise, more than unity regression coefficient would indicate increasing marginal productivity. The larger the elasticity of a factor of production, larger would be the addition to output if that factor is increased to a given proportion by holding other inputs at their constant level. Negative production elasticities of factors indicate their inefficient and excessive use.

The regression co-efficient of estimated production function for high yielding variety turns out to be significant in the case of seeds and fertilizers and pesticides. But for local variety, it is significant for all input factors. The co-efficient of human labour turn out to be significant for local variety but it is not significant for high yielding variety. It may be mentioned here that the use of modern inputs for high yielding variety cultivation has relatively lessened the importance of human labour. Further, not significant elasticity of machinery use for high yielding variety points to the fact that it has yet to make its
impact on the farm economy of the district. However, the production elasticity in the case of machinery bears a positive sign and it clearly demonstrates that the farmers of Kurnool who grow high yielding variety have taken to the mechanization of agriculture practices.

Land has due importance in the process of farm production for local variety and high yielding variety. The co-efficient of land 0.2618 for local variety which is significant at 5 per cent and 1 per cent probability level. For high yielding variety cultivation, the coefficient is 0.0949 though positive is not significant. It means by increasing land input by 100 per cent, holding all other inputs constant at their geometric mean level, the gross output increases for local variety by 26.18 per cent and for high yielding variety by 9.4 per cent in Kurnool district. This supports the hypotheses that in the case of more modernized relative importance of land decreases. It supports the contention that high yielding variety technology is land saving.

The co-efficient of fertilizers and pesticides are 0.3149 for local variety and 0.5243 for high yielding variety which are significant at 5 per cent and 1 per cent probability levels respectively. The magnitude of production elasticities for inputs mentioned above in the Kurnool district are less than unity indicating thereby the operation of law of diminishing returns. Thus if an input is increased by one per cent, the output may increase by less than 1 per cent, holding other inputs constant at their geometric mean level. The value of $R^2$, the coefficient of multiple determinations, both for local variety and high
yielding variety turns out to be significant. The six variables included in this study explain 89 and 95 per cent of variations in gross output for local variety and high yielding variety respectively in Kurnool district. The remaining amount of unexplained variation may be due to the variations in the technique of production used by different farmers, climatic and other natural factors, variation in management, etc. The sum of production elasticity computed from the Cobb-Douglas production function gives the returns to scale which indicates the proportionate increase in the output when all the inputs are increased by one per cent. It this sum is less than, equal to or greater than unity, it indicates decreasing, constant or increasing returns to scale respectively. The sum of production elasticities in the case of local variety and high yielding variety is 1.987 and 1.235 respectively. The increasing returns to scale are indicated by the table as the sum of elasticities is greater than one for both local and high yielding variety. However, to test the validity of the generalization, the sum of the regression co-efficient is tested for their deviation from unity. The t-test indicates that both the sum of elasticities are not significantly different from one. Hence the returns to scale are found to be constant.

In the mean level of inputs is higher for high yielding variety. The marginal value productivity of an input shows the expected addition to gross output caused by the addition of one unit of the resource input concerned while other inputs are held constant. The
marginal value productively helps in estimating the efficiency of prevalent factor proportions in agriculture of the district under study and year in which the study is conducted. The marginal products of fertilizers and pesticides are higher for high yielding variety than for local variety. The marginal value productivity of land per hectare turns out to be significant. The marginal value productivities are higher for high yielding variety than local variety. The marginal value productivities for fertilizers and pesticides of high yielding variety and local variety respectively. While the marginal value productivity of labour is positive in the case of high yielding variety, and local variety.

It is generally believed that the new technology results in increased yield/farm business income of farmers irrespective of their holding size. Differences in irrigation reflect differences in the area under high yielding varieties between the two Mandals under study. However, the yield of high yielding varieties is significantly different from that of local variety of paddy/sunflower in velgode Mandals and the yielding variety is maximum in the highly irrigated mandal. The superiority of high yielding varieties over local variety in terms of yield/farm business income and the effectiveness of irrigation in realizing the yield potentiality of high yielding variety technology are thus established. The resource use and productivity of farms in the study area reveals that at a higher level of technology, high yielding variety of seeds, fertilizers and pesticides influence the yield significantly while in local variety technology, human labour,
fertilizers, and landholding influence yield to a significant level. It is also revealed that in case of modernization of agriculture in the district, the relative importance of land decreases, thus reaffirming the contention that high yielding variety technology is land saving.

In the study area 67.95 per cent of the total cultivated is of sample farms in panyam mandal is irrigated while it is 76.44 per cent in velgode mandal respectively. The proportion of area irrigated to total cropped area is skewed among the size groups of land-holdings. In the case of farms up to 2 hectares in panyam mandal, it is 52.91 per cent of the irrigated cropped area while it is better but less than 67.74 percent in the size groups of 2-4 hectares and above 4 hectares 88.63 per cent irrigated area to the total cropped area in study area. The exists a positive relation between farm size and area irrigated among sample farms in panyam mandal. In case of sample farms of velgode mandal small farmers (0-2 hectares) and medium farmers (2-4 hectares) stand better in terms of irrigation than large farmers (4 hectares and above) where the proportion of area irrigated is a little more than half of total cropped area. There seems to be positive relation between farm size and area irrigated in velgode mandal. In order to test the relationship between farm size and area irrigated, log linear function has been used. The positive relation between farm size and irrigated area is statistically significant in the study area. This is in fact supported by some studies, which showed that the proportion of area irrigated is highest in the group of small farms and that the
proportion is inversely related to farm size. As such, the small and medium sized farms have potentialities to benefit more from new technology. The evidence shows that it is the large farms that can benefit more from new technology than the small and medium sized farms.

The paddy and sunflower are the most important crops in the study area. Comparatively more area is under sunflower in panyam mandal than other crop and paddy occupies major part of the total cropped area while in the case of velgode mandal both paddy and sunflower are grown by sample farmers almost equally. This variation in cropping pattern among the two mandal of the district may be due to variation in irrigation facilities among the mandal. Small, medium and large farmers of panyam plough 33.38 per cent, 31.62 per cent and 35.41 per cent of the total cropped area respectively under paddy crop, whereas the corresponding figures velgode mandal are 74.11 per cent, 72.91 per cent and 72.71 per cent respectively. In the same way, area under sunflower crop is 66.59 per cent, 68.37 per cent and 64.58 per cent of total cropped area on small, medium and large farms in Panyam mandal. The corresponding figures for velgode mandal farms are 25.88 per cent for small farms and 27.08 per cent medium farms and 27.28 percent in case of large farms. In the mandals, the yield per hectare of high yielding variety of paddy is higher than the local varieties in all the size classes. This is accounted for better irrigation facilities in velgode mandals. Size-wise analysis of the data
indicates that in the case of local varieties, the yield per hectare is falling as farm size increases in the two mandals. The per hectare yield of high yielding variety of Paddy increased continuously as farm size increased in all the mandals under study. The nature of relationship between the size of holding and yield is tested in the study area. In the case of local varieties, the relation between farm size and yield is positive in the two mandals. But it is significant. In respect of high yielding varieties, we find all the two mandals relation becomes positive and highly significant.

In panyam mandal both local variety and high yielding varieties are grown on farms of all size groups. Regarding yield levels of the two varieties, yield of high yielding variety is higher than that of local variety. The yield per hectare of high yielding variety of sunflower increases as farm size increases in panyam mandal, the exception being the top class, which recorded highest yield rate. In velgode mandal, it is in all the farm categories that local variety and high yielding variety increases. The relationship between farm size and yield of sunflower is tested in the study area. In all the mandals, there exists a positive relation between farm size and yield of local and high yielding variety of sunflower and the relation is statistically significant. These results confirm the empirical evidence established by some recent studies, that with the technological changes the returns per acre are much higher on large farms than on small farms.

While gross output and gross income indicate in a crude manner, the farm-level efficiency in resource use, farm business
income shows the profitability of farm business. The concept farm business income used here is similar to the one used in Farm Management Studies of the Government of India. Gross income less cost $A_2$ is farm business income. The farm business income from local variety exhibits inconsistency among different size classes in the two mandals. In the all the size of classes a continuous increases in farm business income. In the all the sizes we observe a farm business income small increase. Farm Business Income per hectare from high yielding variety is higher as compared to local varieties in all the size groups and in all the mandals. Mandal wise analysis suggests that farm business income from high yielding varieties is higher in velgode mandal in the case of both local and high yielding varieties for all the size groups. This difference is explained by the variation in irrigation facilities. Size-wise analysis of farm business income from high yielding varieties and local varieties are increases. The results indicate that there is a statistically significant positive relation between farm size and farm business income from local varieties and high yielding variety of paddy it is found to be positive in all two mandals.

In the two mandals the farm business income from high yielding variety sunflower is higher than local variety in all size groups. Whereas in the case of high yielding variety, as farm size increases, farm business income also marks an increase in the study area. The relation between farm size and farm business income from sunflower in the two mandal.
There is a positive relationship between farm size and farm business income from positive relation is observed in the case of high yielding variety sunflower in all the two mandals. Thus our results pertaining to the relation between farm size and farm business income in the case of both paddy and sunflower are in conformity with the existing evidence that the inverse relation found under labour intensive traditional fact the inverse relation has yielded place to positive relation. The large farmers being affluent and resourceful can afford the high cost pay-off technology by applying the recommended dosage of modern inputs like fertilizers, pesticides etc. and reap the maximum yield/income benefits offered by the modern technology. The small farmers due to resource constraint are handicapped in applying the recommended dosage of these inputs, thereby lag behind the big elite in getting the higher yield or income potentiality of high yielding variety technology. This sufficiently establishes the fact that after the setting in of the Green Revolution, the income gap between small and large farms has widened.

The employment levels of paddy and sunflower cultivation are directly associated with the substitution of one input for another. The increased use of recommended doses of inputs increases employment levels in the cultivation of various crops. The employment level differs not only between crops but also between panyam and velgode mandals due to differences in the input levels and adoption rates. These aspects are discussed in the following lines. The details pertaining to labour input per hectare of sunflower crop in the case of sample mandals.
It is clear that under modern agriculture more careful land preparation is required for the cultivation of sunflower crop. Higher quantum of labour has been used by velgode in the cultivation of sunflower. Velgode mandal used 34 per cent more labour per hectare than the panyam for land preparations.

Manuring and fertilization in the study area have been combined as a single operation as the house-holds are unable to distinguish the labour requirement for both operations separately. The cultivation is profitable only when recommended dosage of fertilizers are used and the will produce a positive effect on the labour input used. The labour input used by velgode is higher by 32 per cent for this operation as a compared to the panyam. Sowing and transplantation involve preparations and growing and transport seedling to the field and transplanting. Normally care is taken in the sowing operation it is found that velgode employed 46 per cent more labour than the panyam.

Weeding is one of the important operations in crop cultivation, since without it yield is reduced considerably. However, the number of weeding operations vary according to crop grown and technology used by panyam and velgode. The panyam, according to our data, resorted to more frequent and more intensive weeding. Because of this panyam used 84 per cent more labour per hectare, when compared to velgode. Eradication of pests, treatment of crops with pesticides and fungicides, breeding of pest and disease resistant varieties of plants are some of the functions carried out by the house-holds under pesticides operations. For pesticides operation it is found that 119 per cent more labour is
used by the velgode than that of the panyam. Irrigation involves not only the supply of water in certain quantities at fixed intervals but also proper control and drainage of excess supplies of water as well. Canals and bore wells are the main sources of irrigation in the area under study. The mechanical power has been used for delivery of water by both the velgode and panyam. It is found that 143 per cent more labour is used by the velgode than the panyam, as the panyam primarily on family labour and traditional methods of irrigation for this operation. The manual methods are used for harvesting sunflower, General labour input in harvesting per hectare is yield dependent. Higher the yield, higher labour is required. Per hectare labour input used by panyam is 16 per cent cultivators. This may be due to the fact that the velgode mandal use both manual and mechanical methods for harvesting, whereas the panyam use mostly manual method making use of the family labour. Threshing and winnowing are more labour-intensive operations. In some cases winnowing machines are used. However, this is majority of the cases, this operation was done by the manual labour. In the case of this operation, the velgode mandal used more labour as compared to the panyam. The labourer used per hectare by the cultivators is higher by 6 per cent as compared to the panyam mandal.

For all operations taken together, velgode used 28 per cent more labour than the panyam. It may be due to the fact that panyam rely more on family labour while velgode depend more on hired labour. Similar trend observed in the cultivation of paddy.
On the effects of labour inputs per hectare of paddy in respect of sample panyam and velgode mandals. In velgode used more labour per hectare as compared the panyam for all the operations, with the exception of harvesting in which case the labour input per hectare is higher for panyam when compared to velgode. As the velgode and panyam shift from traditional to modern farming more careful seed bed preparation and planting practices are adopted. The velgode who rely more on hired labour reported higher dosage of labour input than the panyam for all operations. The labour input used by velgode is higher by 9 per cent more than the panyam.

As the velgode have sound resource position, the adoption rate of modern technology is high. This requires more labour per hectare. This is particularly true in the case of manuring and fertilization operation, as the modern technology is fertilizer responsive. Therefore, the velgode used 123 per cent more labour per hectare than the panyam for manuring and fertilization. Sowing and transplanting involve preparation and growing of seedlings, subsequent pulling, bunding and transport of seedlings to the field and transplanting. In the case of this operation 44 per cent more labour is used by velgode when compared than the panyam.

Weed control is one of the important operations in crop cultivation, and the number of weed operations varies according to technology used. The new technology requires more frequent and more intensive weeding. The labour input used by velgode is higher by 128 per cent than that of the panyam as the adoption rate of new technology
is higher in the case of the velgode. Eradication of pests, treatment of
crops with pesticides and fungicides, breeding of pests and disease
resistant varieties of plants are some of the functions carried out by the
farmers under pesticides operation. For pesticides application labour
used by velgode is higher by 23 per cent than that used by the panyam.

Irrigation involves not only the supply of water in certain
quantities at fixed intervals but also proper control and drainage of
excess supplies of water as well. Irrigation in the study area was carried
through canals and bore wells. It is observed that labour used for the
purpose was 48 per cent more in the case of and velgode as compared
to the panyam. The manual methods are used for harvesting paddy,
General labour input in harvesting per hectare is yield dependent.
Higher the yield, higher labour is required. Per hectare labour input
used by panyam is 16 per cent velgode. This may be due to the fact
that the velgode use both manual and mechanical methods for
harvesting, whereas the panyam use mostly manual method making
use of the family labour. Threshing and winnowing are more labour-
intensive operations. In some cases winnowing machines are used.
However, this is majority of the cases, this operation was done by the
manual labour. In the case of this operation, the velgode used more
labour as compared to the panyam. The labourer used per hectare by
the velgode is higher by 6 per cent as compared to the panyam. For all
operations taken together, 30 per cent more labour input per hectare
has been used by the velgode as compared to the panyam. The
differences in the means of total employment per hectare for panyam and velgode mandals are tested.

The difference between the means of total worker hours per hectare in respect of sunflower crop for panyam and velgode of the study area is highly significant. Hence we reject the null hypothesis \((X_1 - X_2 = 0)\) and accept the alternative hypothesis \((X_1 - X_2 = 0)\). The difference in the means of total employment of worker hours per hectare of paddy between panyam and velgode in the study area is not significant. Thus, we accept the null hypothesis \((X_1 - X_2 = 0)\). To determine the influence of factors of production on the employment, regression analysis has been employed.

In panyam, the regression co-efficient for the value of seeds, value of fertilizers, manure and pesticides, proportion of sunflower area to total cropped area and proportion of irrigated area to total cropped area are not statistically significant. In the case of velgode, the co-efficient for the value of seeds is statistically significant at 1 per cent level. The co-efficient are significant at 5 per cent level for the value of fertilizers, manure and pesticides and proportion of sunflower area to total cropped area. In respect of proportion of irrigated area to total cropped area, the co-efficient is not significant. The co-efficient of multiple determination \((R^2)\) indicates that four explanatory variables included in this analysis explain the variation in the dependent variable viz., employment. The variables explain 80.8 and 92.1 per cent variation in employment of the panyam and velgode respectively in the study area. In the case of paddy, for panyam, the influence of the value of
seeds on employment is not significant. The effect of other variables like value of fertilizers, manure and pesticides, proportion of paddy area to total cropped area is statistically significant at 1 per cent level, and the proportion of irrigated area to total cropped area at 5 per cent level. For velgode, the regression co-efficient for the value of seeds, and proportion of irrigated area to total cropped area are not significant. The value of fertilizers, manure and pesticides and proportion of paddy area to total cropped area significantly influenced employment.

The co-efficient of multiple determination ($R^2$) indicates that four explanatory variables included in this analysis explain 83.4 per cent variation in the dependent variable employment in the case of panyam and 82.9 per cent variation in respect of velgode. If is clear from the above analysis that the cost of cultivation yield farm business income and also employment levels differ between the panyam and the velgode. The difference in the farm business income the panyam and velgode is explained by the rent element which is part of cost cultivation of the panyam. Even among the panyam, we agree that difference exits between the pure panyam and the share-croppers. The results of our study indicate that the panyam are worse-off when compared to the velgode. And even among the panyam, share-croppers are in a disadvantageous position as compared to the panyam. This highlights the need for improving the agrarian relations effectively implementing land reform measures. Technological changes in Indian agriculture are introduced within an institutional framework characterized by marked disparities in land and other investable resources per acre between
large and small farmers. It is held that the new technology is not resource-neutral though it is neutral to scale. Since a positive relation is found between farm size and yield/farm business income, it lends support to the notion observed by many researchers in this regard that higher growth among large farms is achieved mainly through the use of capital inputs and substitution of capital for labour. As a consequence, the inverse relationship between farm size and output per acre found under the traditional labour-intensive technology does not seem to hold good in areas undergoing technological change. The unequal land distribution - both operated and irrigated area - among size groups and unequal access and possession of resources among farm households reinforce each other and perpetuate unequal distribution of income in the rural sector of the study area. Due to resource constraint, the small and marginal farmers are unable to use the recommended doses of modern inputs and realize the full benefits of new technology in terms of yield and farm business income.

On the basis of irrigated area to total cropped area, three regions in the district, one with poor irrigation facilities, one with moderate irrigation and one highly irrigated have been selected for the study. This is because irrigation is the prerequisite for the adoption of high yielding variety technology. The sample study reveals that agriculture is the main source of income for the sample farmers in the district. The performance of the agrarian system is judged on the basis of productive efficiency, provision of employment and
promotion of egalitarian distribution of income, the ability of the system to generate surplus and the promotion of popular participation and fulfillment of basic human needs. No doubt the new agricultural technology in India satisfies the first criterion, that is, productive efficiency. However, in terms of income distribution, it has not been encouraging, because the new technology is beyond the means of small farmers.

In totally the findings of the study emerges the conclusion that inter-regional and intra-regional income and employment inequalities may be attributed to variation in irrigation, land concentration and imperfect factor markets. Unless these problems are effectively tackled, the benefits of new technology cannot percolate into small farms and backward regions. The disparities in irrigation can be overcome through the Government's initiative in extending irrigation facilities to backward regions and creating community irrigation. With regard to the unequal distribution of land the solution lies in the effective implementation of land reform measures. Imperfections in credit and input markets can be removed by reorienting the institutional set-up and planning appropriate price policies. Only then, the twin objectives of growth and social justice can be attained in the farm sector in India.