CHAPTER VII

SUMMARY OF FINDINGS, CONCLUSION AND SUGGESTIONS

7.1 Introduction

Sugarcane is an important commercial crop which provides raw material for the second largest industry namely sugar industry and for Gur and Khandsari in the country. The greatest contribution that India has made to the world is in the production of sweetening material like sugar from sugarcane. There are about 450 sugar industries in India and over 35 million farmers and agricultural labourers involved in sugarcane cultivation and harvest. At the global level, India stood next to Brazil in area and production of sugarcane in 1997. Among the states in India, Tamilnadu stood fourth in acreage, third in production and first in yield per hectare of sugarcane. Sivagangai district in Tamilnadu stood first in sugarcane yield in 1998-99. Sugarcane is one of the most important commercial crops in Sivagangai district.

The favourable climate and soil conditions coupled with assured irrigation enabled Sivagangai district to emerge as the largest sugarcane-growing belt of the state. Inspite of these, there are two sugar mills situated in this district. These are the main reasons for selecting Sivagangai district as the study area for sugarcane.
Multi-stage stratified random sampling is adopted for the present study with Sivagangai district as Universe, the Taluk as the Stratum, the Village as the Primary Unit of sampling and the Sugarcane Farm as the Ultimate Unit.

The area under sugarcane in each of the twelve blocks of Sivagangai district was obtained from the records of the District Statistical Office. The revenue villages in each block were arranged in a descending order of area under sugarcane during the period 2007-08. The first five villages in each block amounting to a total of 15 villages in these blocks were selected which accounted for more than sixty percent of sugarcane cultivation in each block. The proportionate probability sampling technique has been used to select each 150 from Traditional Variety (TV) and High Yielding Variety (HYV) sugarcane-planting farms from these fifteen villages.

In the foregoing chapters, review of related literature, methodology adopted, profile of the study area, cost, return and income distribution, determinants of yield, yield gap and yield constraints, supply responsiveness, input demand elasticities and returns to scale were discussed. The summary of the findings and suggestions are presented below:
7.2 **Summary of Findings**

The study on requirements of hired labour in sugarcane cultivation showed that cultivation of Traditional variety incurred a total cost of Rs.2,815 on hired labour per acre for the employment of about 72 labourers (48 male and 24 female), whereas in the case of HYV variety, cost incurred for employing 72 labourers (46 male and 26 females) was Rs.2,770. It was observed that the maximum number of hired labour was employed in the activities of work after cultivation. In the study area, the average wage received by the female labour was relatively lower than that of their male counterparts. The prevailing wage rate during the survey was Rs.150 per manday for a male labourer while it was Rs.75 for a female labourer.

The average labour requirements and the cost incurred on them by the small farms producing Traditional variety as well as HYV variety were found to be less than those of the large farms. It was observed that the large farms incurred more expenses on hired labour compared to small farms in both Traditional and High Yielding varieties in the study area. Further, it was also observed that small farms were particular in making use of their family members in different farm operations, in order to minimize the expenditure on labour.

The input-output structure revealed that there were significant variations in terms of yield in tonnes per acre, human labour in mandays, chemical fertilizers in
kilograms, cost of irrigation and seed in Rupees per acre between TV and HYV variety. The average yield per acre of TV variety was 49.25 tonnes. It was 51.26 tonnes in the case of HYV variety. Thus, it may be concluded that the farms producing HYV variety obtained significantly higher yield per acre than those cultivating TV variety. With regard to the use of other variable inputs such as bullock labour in pairs per acre and pesticides in Rupees per acre, only a marginal difference was found.

Comparing the small and large farms producing TV variety, small farms yielded significantly higher output per acre than the large farms. The average yield per acre worked out to 49.15 tonnes for small farms whereas it was 47.66 tonnes for the large farms. The mean levels of the variable inputs used per acre showed that the significant differences between two groups of farms were found with regard to human labour, chemical fertilizers, irrigation cost and seed cost. As regards HYV variety, there were significant variations in terms of yield per acre between small and large farms. The average yield per acre was 52.15 tonnes and 49.15 tonnes for small and large farms respectively. The significant differences between the two groups were found in the use of human labour, pesticides and irrigation cost. Thus, it may be observed from the above analysis that small farms has realized higher yield per acre than the large farms, producing both TV and HYV varieties.
Regarding the cost and returns structure, the analysis revealed that cost of production was found to be high in the case of HYV variety. The net income received by the farms producing HYV variety was found higher (Rs.21,989.80) than that of TV variety (Rs.21,130.02). It was observed that farms producing HYV variety were benefited more in both physical and monetary terms of yield. The cost of harvesting and bundling and transportation constituted the major components in the total cost of production for both TV and HYV variety farms. It was also observed that operating cost accounted for more than 80 per cent of the total cost of production in both the varieties.

High cost and low net return were observed in the case of large farms producing both TV and HYV varieties when compared to small farms producing these varieties. The higher net income and yield obtained by the small farms producing both varieties may be due to the effective personal supervision and the involvement of family labour in the farming operations in the study area. In the case of large farms higher cost incurred and low yield obtained may be due to large-scale cultivation, depending on hired and contract labour and ineffective supervision.

The economics of cultivation of TV and HYV variety revealed that each rupee spent resulted in a benefit of Rs.1.16 for TV variety and Rs.1.14 for HYV
variety. It indicates that both TV and HYV variety farms enjoyed equal benefits out of the investments made.

Thus, it may be concluded from the analysis of costs and return structure that small farms for both varieties were much benefited in terms of yield and net income per acre cultivation of sugarcane compared to large farms in the study area. The cost-benefit ratios also revealed that the small farms in both varieties enjoyed more benefits out of the investments made than the large farms.

Comparing the extent of inequality in the distribution of per acre net income, it was observed that more inequality was found in the case of TV variety than HYV variety. Further, the Lorenz curve indicated that inequality in the distribution of per acre net income was higher for large farms than for small farms, in both varieties of the study area. Thus, it may be concluded that the higher disparity has been observed in the net income distribution among the farms producing TV variety and the large farms producing both varieties in the study area.

In order to identify the determinants of yield of TV and HYV varieties of sugarcane and of small and large farms producing these varieties, a log-linear multiple regression model was fitted. The estimated results revealed that the explanatory variables included in the model together, accounted for about 80 per cent variation in per acre yield of TV and HYV varieties. In the case of TV
variety, the explanatory variables, namely human labour, fertilizers, irrigation and capital flow were statistically significant and identified as important variables for influencing the yield of TV sugarcane variety. Among these variables, human labour had a greater influence on the determination of yield of TV variety. In the case of HYV variety, the variables that determined were human labour, fertilizers, irrigation and capital flow. Among these variables, human labour was found to be the most important input influencing the yield of HYV variety. Thus, it may be concluded from the results that the sugarcane cultivation was highly labour-intensive in the study area.

The results of regression model estimated for small and large farms producing TV variety indicated that among the significant variables for both categories, human labour was as an important input influencing the yield of TV variety followed by the variable, fertilizers.

Chow’s test was carried out to find the structural differences between small and large farms producing TV variety. The results indicated that there existed structural differences between these two groups of farms. This difference has been found at the slope level and caused by the variable human labour.

In the case of small and large farms producing HYV variety, the estimated regression results indicated that human labour, fertilizers, irrigation and capital flow were significant factors determining the yield of small farms. Among them,
human labour had a greater influence in the determination of yield. In the case of large farms, human labour, irrigation and capital flow were significant factors determining the yield. In this case also human labour was found to be an important and most influencing factor in the determination of yield.

Chow’s test revealed that the structural differences existed between small and large farms producing HYV variety only at the slope level, caused by the variable, fertilizers.

The analysis of yield gap indicated the existence of gap between the potential yield and the average yield produced under farm conditions in both groups of farms. It is also observed that the yield gap experienced under large farms of both varieties was found to be higher than that of small farms. In the case of TV variety, the maximum yield obtained was 52.45 tonnes and 49.69 tonnes for small and large farms, while the average yield obtained per acre was 48.24 tonnes and 48.11 tonnes respectively. This resulted in the yield gap of 1.24 tonnes and 1.58 tonnes for small and large farms respectively. On the other hand, the maximum yield reaped by the HYV variety was 54.54 tonnes for small farms and 52.24 tonnes for large farms, while the average yield attained was 53.22 tonnes and 51.22 tonnes per acre of small and large farms respectively. This caused a yield gap of 1.93 tonnes and 1.02 tonnes per acre for small and large farms respectively.
In order to identify the yield constraints, Garrett’s Ranking Technique was carried out. It was observed that ‘credit inadequacy’ and ‘disease’ were the major hurdles for small farms producing TV variety and for large farms; ‘disease’ was reported to be the main constraint followed by ‘credit inadequacy’.

In the case of HYV variety, ‘disease’ and ‘credit inadequacy’ were the main constraints in small farms, whereas ‘disease’ and ‘want of suitable variety’ were the major constraints in large farms in the study area.

In order to assess the association between yield gap and yield constraints, Chi-square test was carried out. The results indicated that the yield gap was associated with ‘water shortage’, ‘variety’, ‘disease’ and ‘credit inadequacy’ in both the farms of TV and HYV varieties of sugarcane in the study area.

The analysis of supply responsiveness and input demand elasticities revealed that labour demand was highly sensitive with respect to output price for both TV and HYV varieties. A 10 per cent increase in sugarcane price increased labour by more than 10 per cent in both the varieties. Comparing these two varieties, HYV was more responsive to changes in sugarcane price than TV variety. Thus, it may be concluded that changes in the prices of sugarcane appeared to have a significant effect on labour demand in the study area.
The results of output supply elasticities by their own prices indicated that supply responsiveness was found to positively affect their own prices. The demand for labour with regard to real wage rate was elastic in both varieties. It was also observed that a 10 per cent increase in real wage would induce the sample farms to reduce labour employment by 13.27 per cent for TV variety and 13.63 per cent for HYV variety. It was observed from the analysis that an increase in area under sugarcane had a favourable impact on sugarcane supply for both varieties.

High elasticity was found in demand for variable inputs with respect to their own prices. The cross price elasticities of the variable inputs for TV and HYV varieties were negative and low, indicating that they were complements rather than substitutes.

The computed results of indirect estimates of production elasticities for TV and HYV variety farms showed that land had a higher share in output for both varieties. It was also observed that land and labour were important factors of sugarcane cultivation for TV and HYV varieties. The sum of the elasticities indicated the constant return to scale was operating in both varieties.

Regarding small and large farms producing TV variety, change in sugarcane price had a great impact on supply responsiveness and labour absorption. A 10 per cent increase in sugarcane price was found to ensure more
than 10 per cent rise in demand for labour. In both cases, an increase in the real prices of variable inputs negatively affected output supply and demand for labour. The demand for variable inputs with respect to their own prices was highly elastic for both small and large farms. The cross price elasticities of variable inputs were negative indicating the complementarity among the variable inputs. The indirect estimates revealed that a share of land in total output was higher for large farms than for small farms. The sum of the elasticities indicated that constant returns to scale prevailed for small and large farms, producing TV variety.

In the case of HYV variety, small farms had more responsiveness in supply of output to change in sugarcane prices than large farms. Both small and large farms ensured a significant effect on demand for labour with respect to sugarcane prices in the study area. The analysis indicated that land had a more favourable impact on demand for labour as well as supply of output. The demand for variable inputs with respect to own prices was highly elastic for small and large farms producing HYV variety. The results of cross price elasticities indicated that the variable inputs were complements rather than substitutes. The analysis of indirect estimates of production elasticities for small and large farms indicated the dominance of land and labour as important factors of production. The sum of the elasticities of two farms revealed the prevalence of constant returns to scale in the study area.
Thus, it may be concluded from the analysis that both TV and HYV\textsubscript{2} varieties as well as small and large farms were more responsive to changes in sugarcane prices for supply and absorption of labour in the cultivation of sugarcane. In both cases, a demand for variable inputs with respect to their own prices was highly elastic and the cross price elasticities indicated complementarity among variable inputs. The constant returns to scale are operating in sugarcane cultivation with study area.

7.3 Suggestions

In order to encourage the farmers to bring more area under sugarcane the following suggestions are given.

- The major factors affecting sugarcane cultivation as revealed by the study are severity of diseases, credit inadequacy and suitable variety. It has been observed from the survey that the majority of farmers cultivating sugarcane in the study area are not aware of the quantity of pesticides to be used and nature and intensity of the diseases. It is suggested that the farmers should be educated to apply the pesticides at the prescribed level. There is a need for extension of farm management services to the farmers in the study area regarding the importance of soil test, use of optimum fertilizers, choice of suitable variety, seed and the like.
- It is suggested that crop insurance scheme may be offered to all sugarcane growers to compensate the loss from natural disasters like cyclone, floods and diseases.

- It is suggested that in order to encourage the farmers to increase the area and production of sugarcane, they should be paid on a par with those cultivating competing crops like cotton. Further, the delay in payment of sugarcane price by the factories should be minimised and spot payments should be introduced to encourage the farmers to enlarge the areas of sugarcane cultivation.

- A large number of peasants who are engaged in sugarcane cultivation possess small holdings in the study area. They are unable to accumulate the necessary inputs in time for their cultivation. As the small farmers have low income, they are unable to use the inputs in required quantities. Hence, it is suggested that adequate financial support may be provided through various financial institutions at lower rates of interest that facilitates the increased use of inputs in required quantities thereby augmenting the yield of sugarcane production in the study area.

- Water shortage leads to all sorts of problems in any agricultural activity. In the study area, even though there was an assured supply of water for irrigation, due to the failure of monsoon during the reference period there was water shortage. The ground water table in the study area was not deep
enough. Efforts must be made to tap the ground water. The farmers should be provided with necessary infrastructural facilities to drill borewells as and when necessary.

- It is suggested that mobile cane research and soil testing centres in the study area should be set up in order to help the sugarcane cultivators to improve the quantity as well as the quality of sugarcane output.

- Production, trade and export barriers should be removed.

- Forward sales should be encouraged.

- Aggressive brand marketing is to be undertaken.

- Value addition possibilities have to be explored.

- E-Commerce for disinter mediation has to be explored.

- Cane prices have to be nationalised across the country.

- The Government should develop sugar policy keeping in view the larger interest of the nation.

- Research on agriculture should be directed at evolving high yielding varieties of sugarcane by using new technique such as genetic transformation, marker assisted selection, forecasting of pest epidemics and promotion of hybrid and disease resistant varieties to meet the challenges under the new agricultural trading environment.
Enhanced crop management techniques may be imparted to the farmers by the extension agencies for the improvement in the operation of sugarcane cultivation.

7.4 CONCLUSION

It is observed from the analysis that HYV variety of sugarcane and small farms (farms less than 5 acres) of both TV and HYV varieties had benefited both physical and monetary-wise in terms of yield compared to TV variety and large farms cultivating both TV and HYV varieties (farms equal to and more than 5 acres) in the study area. Further, supply responsiveness, labour absorption and income distribution have also found favourable impact in the case of HYV variety and in the case small farms in both TV and HYV varieties in the study area. Thus, it may be concluded that HYV variety and small farms for both TV and HYV varieties were more efficient and profitable in the study area.

7.5 SCOPE FOR FURTHER RESEARCH

In addition, the researchers may undertake the pioneering and explorative studies in future in the following unexplored virgin fields in sugarcane cultivation.

1. A study on the integration of sugarcane production and processing.

2. A comparative study of cost and returns of various varieties of sugarcane cultivated.

3. A study on resources management practices in the sugarcane cultivation.