CHAPTER - 6

SUMMARY AND CONCLUSIONS

Farm mechanization is an important component of modern agricultural production system. Population of tractor-machinery is increasing year by year in the country. Now tractors are owned not only by the farmers of large land holdings but also by those with small land holdings. Many farmers are using their tractors on custom-hiring for extra income. With the availability of tractors on custom-hiring, farmers are reducing bullock population and they are hiring-in tractors for the farm operations. In fact, use of tractor enhances the capacity of machines, increases precision and timeliness in farm operations. The greatest challenge faced by the tractor owner is the growing need for more economical use of their tractor-machinery system. A comprehensive survey study on tractor-machinery system was undertaken in district Muzaffarnagar of Uttar Pradesh with the following specific objectives.

1. To study the growth pattern of tractors and its implications on farm production.
2. To study the use pattern of tractors for different agriculture operations and their associated costs.
3. To study the impact of mechanization on labour employment and farm income.
4. To suggest strategy for better utilization of tractor-machinery system.
Research methodology

For the study of first objective secondary data was collected from government departments. To fulfill the second and third objectives of the study, primary data was collected for the year 2001-02 from the farmers with the help of pre-structured schedule through multi-stage random sampling, taking 35 samples from each of the following four categories of farmers:

1. Farmers owning tractor and using it on his own farm only (Tractor operated farm) (Tractor category I).
2. Farmers using tractor on his own farm as well as on custom-hiring (Tractor category II).
3. Bullock owner farmer using hired tractor (Bullock with hired tractor operated farm).
4. Bullock owner farmers not using tractor (Only Bullock operated farm).

The statistical tools and techniques applied for analysis of data were frequencies, percentage, mean and correlation.

Findings

Important findings emanating out of the study were as follows.

Growth of tractor population and its impact on agricultural production

1. During the period 1971-72 to 2000-01, tractor population increased by 1138 per cent. It contributed in shifting of cropping pattern, as area under sugarcane crop increased by 49 percent and area under food gain crops reduced by 30 percent (Table-5.1.1). Along with other economic reasons,
tractor played a major role in bringing more area under sugarcane by use of higher power in the operations like, land preparation and transportation. As cultivation of sugarcane is highly energy intensive job.

2. During the year 1971-72 to 2000-01, tractor population increased twelve fold, where as net cropped area remained approximately 327 thousand hectare without any appreciable change (Table-5.1.2). In fact, in 1971-72 share of net cropped area was about 78 percent of the total geographical area in the district and there was no further scope to bring in new area under cultivation.

3. Cropping intensity increased from 142 percent in the year 1971-72 to 157 percent during 1987-88 and there after it reduced to 152 percent in 2000-01 (Table-5.1.3). Decline in cropping intensity was due to shift in the area from seasonal food grain crops to sugarcane crop, which is perennial crop. Thus, tractor use can bring about major shift in the cropping pattern for economic gains.

4. During the period 1971-72 to 2000-01, productivity of wheat crop increased from 1.8 to 3.5 tonne per hectare (94 per cent), productivity of food grain crops increased from 1.5 to 3.9 tonne per hectare (157 per cent) and productivity of sugarcane crop increased from 49 to 63 tonne per hectare (29 per cent) (Table 5.1.4). Tractor-machinery system contributed in enhancing productivity with other inputs by ways of timeliness and quality of farm operation. During this period tractor density increased 12 fold.
2. Use pattern of tractors and cost of their operation

Use pattern of tractor-machinery system and cost of their operation was studied by taking two categories of tractors: (i) Tractors used on only own farm and (ii) Tractors used on own farm as well as on custom-hiring. On the basis of analysis of data and results obtained, following conclusions were drawn.

1. Tractors with the farmers of medium and large land holding categories were used on own farms only. Farmers below two hectare of land holding were unable to afford the use of tractor on own farm only (Table 5.2.1).

2. A maximum of 49 per cent, of the total tractors used on own farm only were of below 25 horse power (Table 5.2.1).

3. A maximum of 60 per cent tractors of the total tractors used on custom-hiring were of 25-35 horse power range (Table 5.2.1).

4. Comparatively new tractors were preferred for use on custom-hiring as average age of the tractors used on custom-hiring was 9 years and it was 14 years for the tractors used on own farm only. (Table 5.2.2).

5. Average annual use of Tractors used on own farm only was for 253 hours, of which 87 per cent use was in agricultural use. It was a maximum of 45 per cent (114 hours) in sugarcane crop followed by 17 per cent (43 hours) in wheat crop (Table 5.2.3).

6. Transport of produce consumed a maximum of 35 per cent (89 hours) and land preparation consumed 25 per cent (63 hours) of the annual use of the Tractors used on own farm only (Table 5.2.4).
7. Non-agricultural use of tractors used on own farm only accounted for 13 per cent (33 hours) of the total annual use. It was mainly to visit market and attend social functions (Table 5.2.4).

8. Annual use of tractors used mainly on custom-hiring was for 990 hours, of which 86 per cent was in custom-hiring (Table 5.2.6).

9. Custom-hiring use of tractor was a maximum of 40 per cent (341 hours) in land preparation and 17 per cent (143 hours) in wheat threshing (Table 5.2.6).

10. Custom-hiring use of tractors in non-agricultural operations accounted for 15 per cent (131 hours) of the total custom-hiring use. It was mainly in the transportation of building materials and industrial goods (Table 5.2.6).

11. Custom-hiring use of tractor was a maximum of 53 per cent (383 hours) in wheat crop followed by 32 per cent (229 hours) in sugarcane plant crop (Table 5.2.7).

12. Over all, tractors with the farmers of small land holding category were used for a maximum of 891 hours per year. As custom-hiring of tractor was the main source of income for them (Table 5.2.8).

13. Tractor use was a maximum of 38 hours per hectare in sugarcane plant crop and a minimum of 18 hours per hectare in sugarcane ratoon crop (Table 5.2.5).

Cost of tractor operation

1. Average annual cost of tractor operation was Rs. 35,067 for the tractors used on own farm only and Rs. 98,341 for the tractors used mainly on custom-hiring. Out of total operational cost, shares of fixed cost and variable
cost were 35 and 65 per cent for the tractors used on own farm only and 21 and 79 per cent for the tractors used on custom-hiring (Table 5.2.10).

2. Cost of fuel accounted maximum share among all cost components of tractor operation. It was 31 per cent of total operational cost for the tractors used on only own farm and 47 per cent for the tractors hired-out. Other important cost components were depreciation cost, oil cost, maintenance cost and drivers wages (Table 5.2.10).

3. Driver’s wages accounted 11 of the total operational cost of the tractors used on own farm only and 15 per cent for the tractors hired-out.

4. Average cost of tractor operation was Rs 139 per hour for tractors used on own farm only and Rs. 99 per hour for the tractors hired-out (Table 5.2.11).

3. Impact of farm mechanization on labour employment and farm income

Impact of tractor-machinery system on the employment of human labour and farm income was studied by comparative study of following three categories of farms divided according to their main source of motive power.

Farm category I : Tractor operated farm

Farm category II : Bullock with hired tractor operated farm

Farm category III : Only bullock operated farm

Labour employment

1. Employment of human labour in Paddy crop was a maximum of 180 man days per hectare on Bullock tractor operated farm. It was lower by 11 and
6 per cent on Tractor operated farm and Bullock with hired tractor operated farm as compared to only Bullock operated farm (Table-5.3.1).

2. Total employment of human labour in wheat crop was a maximum of 82 man days per hectare on only Bullock operated farm. It was lower by 17 and 16 per cent on Tractor operated farm and Bullock with hired tractor operated farm as compared to only Bullock operated farm (Table-5.3.2).

3. Total labour employment in Sugarcane plant crop was a maximum of 315 man days per hectare on only Bullock operated farm. It was lower by 6 and 5 per cent on Tractor operated farm and Bullock with hired tractor operated farm as compared to only Bullock operated farm (Table-5.3.3).

4. Total labour employment in Sugarcane ratoon crop was a maximum of 206 man days per hectare on Tractor operated farm. It was lower by 5 and nil per cent on Bullock with hired tractor operated farm and only Bullock operated farm as compared to tractor operated farm (Table 5.3.4).

5. In each crop, share of family labour increased and share of hired labour decreased as one move from Tractor operated farm to only Bullock operated farm.

6. Crop harvesting was the most labour intensive operation. It consumed 42 to 48 per cent of the total labour employment on each farm (Table-5.3.5).

7. Requirement of human labour in land preparation and transport of produce were lower by 5 man days per hectare gross cropped area in each, on Tractor operated farm hectare as compared to only Bullock operated farm (Table-5.3.5). Use of tractor can make crop production process economical by reducing labour requirement.
8. Average annual labour employment on was 183-189 man days per
hectare gross cropped area on different categories of farms (Table-
5.3.5). Thus, it was almost at same level on all categories of farms.

**Farm income**

1. Total costs of production of sugarcane plant and sugarcane ratoon crops
were a minimum of Rs.51666 and Rs.33258 per hectare on Tractor
operated farm. The same were higher by 8 and 6 per cent, respectively
on Bullock with hired tractor operated farm and higher by 11 and 8 per
cent, respectively on only Bullock operated farm as compared to Tractor
operated farm (Table-5.3.6.A, Table-5.3.7.A).

2. Net returns from sugarcane plant crop and sugarcane ratoon crops were a
maximum of Rs. 13286 and Rs. 47104 per hectare, respectively on Tractor
operated farm. The same were lower by 55 and 18 per cent, respectively
on Bullock with hired tractor operated farm and lower by 54 and 13 per
cent on only Bullock operated farm, respectively as compared to Tractor
operated farm (Table-5.3.6.B, Table-5.3.7.B).

3. Total costs of production of Wheat and Paddy crops were a minimum of
Rs.21310 and Rs.24083 per hectare on Tractor operated farm. The same
were higher by 16 and 13 per cent, respectively on Bullock with hired
tractor operated farm and higher by 15 and 18 per cent, respectively on
only Bullock operated farm as compared to Tractor operated farm (Table-
5.3.8.A, Table-5.3.9.A).

4. Net returns from Wheat and Paddy crops were a maximum of Rs. 20982
and Rs. 18043 per hectare on Tractor operated farm. It was lower by 22
per cent) and 34 per cent, respectively on Bullock with hired-tractor operated farm and lower by 15 and 28 per cent, respectively on only Bullock operated farm as compared to Tractor operated farm (Table-5.3.8.B, Table-5.3.9.B).

5. Net return from each crop was highest on Tractor operated farms. So, tractor operated farms were most profitable.

4. Strategy for better utilization of tractor-machinery system

1. Suitable tractor operated equipment for hoeing/Interculture and harvesting of sugarcane may be made available to farmers on priority basis.

2. Tractor operated equipment may be developed for incorporation of sugarcane trash (dry leaf) in the soil to improve its fertility.

3. Tractor companies should also promote use of new farm equipments.

4. Training and extension program should be organized to promote use of machines like, semi-automatic sugarcane planter, ferti-seed drill, crop reaper and paddy thresher developed by research institutions.

5. Farmers of medium and large land holding categories may be encouraged to take use of tractor as an enterprise. They should purchase modern high capacity equipment for use on custom-hiring in critical un-mechanized operations. Tractor propelled combine harvester is one such potential machine.

6. Practice of custom hiring use of Tractors used on own farm only should be encouraged as sufficient slack time was available for custom-hiring use for these tractors.

7. Use of tractors on custom-hiring should be treated as service sector.