CHAPTER 2

REVIEW OF LITERATURE
The tractor is used in agriculture to increase farm output through timely operations of sowing, harvesting, transporting, thrashing and preparing the farm for other crops. During these processes it displaces the labour. So there is a conflict of choice between social objectives of higher employment or higher output regarding the use of tractors in agriculture.

Before Independence tractors were used in few numbers in Indian agriculture due to lack of technology and difficulties involved in foreign currency. After Independence tractors are mostly used for reclamation, ploughing and levelling the field. The rest of the field operations, sowing, planting, spreading-fertilizers, weeding, spraying, irrigation, harvesting and thrashing are done by the bullocks. Thus, bullocks remain the corner-stone of the Indian agriculture.

The green revolution in Indian agriculture which gained momentum in the late Sixties and early Seventies helped in increasing production and also gave a spurt to the demand for farm machinery particularly tractors and their accessories. Tractors perform agricultural operations timely and thus, enable the farmers to increase the production. Hence, tractors are used in large numbers after the introduction of HYV programme during the year 1966-67. Therefore, quite a
large number of studies have been conducted in India, specially in Punjab, Haryana, Western U.P., Gujrat, Andhra Pradesh and Rajasthan, to measure the impact of tractorization on farms output and employment after 1966-67. In the pages that following we shall examine the important studies which throw light on this issue.

Sarkar and Prahladachar (1966)¹, studied the impact of tractor use on farm employment in Dharwar district of Mysore state. The Dharwar district has a large number of tractors in comparison to the other districts. The study reveals first that 39 farms removed 24.5 percent bullock power after the purchase of tractors. Secondly, the permanent labour declined from 192 to 164 i.e. by 17.2 percent but casual labour remained intact. Thirdly, tractors were utilized on an average 130 days per year, out of that 29.2 percent was utilized for only own agricultural operations. Fourthly, double cropping and better tractor employment were not possible in the district due to lack of irrigation facilities. Tractors were used mostly for non-agricultural operations, viz., transportation of men and material on hire or for owners.

Sohoni, A.W. (1967), classified the sample farms into two groups, viz., mechanized group (with tractor farms) and non-mechanized group (without tractor farms). The important findings of the study are that (a) the mechanized group of farms did not differ significantly in their requirement for total human labour hours per acre than non-mechanized group of farms (b) the mechanized group of farms did not differ significantly in their utilization of family labour hours per acre (c) both the farm groups did not differ significantly in family labour force for farm work (d) the mechanized group of farms did not differ significantly as regards the percentage of utilization of family labour on a farm. However, they employed significantly less percentage of family labour out of the total family labour force for farm work than non-mechanized group of farms;

Singh, Bhagat (1968), conducted a study in Punjab between tractor and bullock-operated sample farms. In the study, 6 tractor farms were compared with 22 non tractor farms (bullock operated farms). He found that the cost of production of the two groups was the same but the tractor-operated farms used less bullock-power and also displaced the male labour.


Billings and Singh (1969)\textsuperscript{1}, in their study on "Labour and the Green Revolution" in Punjab observed that in the farms of over 10 acres, use of irrigation equipment, tended to increase the demand for labour while the use of tractors tended to reduce it.

Billings and Singh (1970a)\textsuperscript{2}, observed that the farms using conventional energy sources had a cropping intensity of 150 percent, while to those of mechanized farms the cropping intensity was 180 percent. They further found that the mechanized technique had resulted in the displacement of both bullock-power and human labour in all operations.

Johl (1970)\textsuperscript{3}, found that during the period 1966-67 to 1969-70, in Punjab increased use of tractors was associated with a marked rise in employment due to their effect on cropping intensity. He further observed that the cropping intensity had increased from 126.7 percent in the year 1966-67 to 144.3 percent in the year 1969-70. However, he further noted that this increase in cropping intensity was also influenced by increased use of pumpsets during the same period. He did

\begin{enumerate}
\item \textbf{Johl, S.S.}: "Mechanization, Labour use and productivity in India Agriculture." Economic and sociology, Occasional Paper No. 23, Ohio State University, Columbus, Ohio, 1970.
\end{enumerate}
not separate the effects of pumpsets on farm employment from the effect of tractors.

The Directorate of Economics and Statistics (1970-71)\(^1\): A study was undertaken by the Directorate of Economics and Statistics, in Punjab and Haryana to find out the difference in the cost of production between the tractor-operated and bullock operated farms. Yield of the particular crop wheat was also considered in this study. It was observed that the average yield per acre of wheat was about the same on the both tractor and bullock-operated farms.

Singh and Singh (1972)\(^2\), have studied the Impact of Tractorization on the yields of Wheat, Paddy and Sugarcane in the Muzaffarnagar district of western Uttar Pradesh. In their study, they divided the samples into two groups viz, tractor-operated farms and non-tractor-operated farms. They found that the tractor operated farms had higher yields of paddy, wheat and sugarcane in comparison to the non tractor-operated farms. It was also observed that per hectare gross output was higher in tractor-operated farms compared to the non-tractor-operated farms. It was concluded that this yield was achieved due to

---


tractorization. They had not taken into account the possible effects of other inputs on farm productivity and produce.

Grewal, S.S. and Kahlon, A.K. (1972)¹: This study was conducted in 1969-70 to find out the impact of mechanization on farm employment in the Central Plains and South Western districts of the Punjab. The study revealed that the average labour input per cultivated acre on all bullock-farms was 47.24 man-days as compared to 38.46 man-days on tractor-farms. Thus the percentage reduction in labour use on bullock-operated farms was 18.59. Also, the average labour use for general crop farms (other than potato region) was worked out separately. In all farm size, it was 40.58 man-days on bullock-farms as compared to 31.49 man-days on tractorized farms. The reduction in labour employment on tractorized farms over the labour use on bullock-farms was 22.40 percent.

Chopra, Kusum (1972)², used two types of comparison to assess the cropping intensity and employment effect of tractors. One was a comparison of bullock farms with tractor-owning one and the secondly there was a comparison


of only the tractor-owning farms in terms of the situation before and after the introduction of tractors as reported by the farmers during the survey. From the first exercise she observed that the bullock-farms had a higher cropping intensity in comparison to the tractor-operated farms and from the second situation (before-and-after comparison) she found that cropping intensity and employment were higher after investment on tractors. However, the source of irrigation had not been taken into account in either of comparisons. In the second situation, the introduction of tractors, Chopra, relied on the memory of the cultivators. But the data obtained by this method, specially the labour use on the farms were likely to suffer from inaccuracies since in most cases the tractors had been bought several years before. The survey revealed that in 6.9 percent of the cases the tractors had been purchased more than 10 years earlier.

Motilal, G. (1973)¹, found first that the cropping intensity was significantly higher for the small size tractor-farms in comparison to those operated by bullocks. Secondly, the average crop yield per hectare was higher on the tractor farms than those on the bullock-operated farms. Thirdly, the tractor farms devoted a large share of the area to the HYVs as compared to the bullock-operated farms. Fourthly, the

tractors had displaced the human labour if there was no change in cropping intensity. On an average the bullock and tractor-operated farms utilized 720.14 and 490.92 hours of human labour per hectare respectively.

Singh and Chancellor (1973)\(^1\): This study examined the effect of mechanization on the yields of specific crops (principally HYV of wheat and maize) in the Meerut district of Uttar Pradesh. The study was based on a survey carried out during the years 1971-72 on a holding of 26 farms in seven villages of the district.

They divided the sample farms into three group viz., bullock farms, tubewell farms and tractor farms. They found that the impact of mechanization on crop yield was different from HYV of wheat and maize. In the case of HYV wheat, the tubewell and tractor farms had significantly higher yield than the bullock farms. But much of this difference was accounted for by factors such as the level of irrigation.

The Economic Advisor to the Govt. of Punjab (1973)\(^2\): It was observed from the study that the tractor farms had about 18 percent higher output per acre as compared to the bullock

---


2. The Economic Advisor, Govt. of Punjab: "The Economic of Tractor Cultivation and Economics of Production and cultivation Practices of High Yielding varieties of wheat, maize and paddy in Punjab; Report for the year 1970-71" Govt. of Punjab 1973
farms. It was because, they had marginally higher cropping intensity and slightly larger proportion of area under HYV wheat. Though the data had not been statistically analysed but the higher output tractor farms appeared to be due to the better irrigation facility and heavy doses of fertilizer. In the case of fertilizer, the study revealed that per acre higher expenses on fertilizers by tractor cultivators could be attributed to their influence and higher purchasing capacity of inputs.

Acharya, S.S. (1973)¹, found that the introduction of tractors reduced labour employment by 50.1 percent. However, the area under HYV increased the employment of labour by 35 percent. It had partially offset the negative effect of tractorization on employment. Tractorization enabled the farmers to increase the intensity of cropping by 35.5 percent. It had a positive effect on labour employment. Thus, the net result was that though tractorization per se would have negative effect on human labour employment, the tractor-operated farms employed 12.7 percent more labour as compared to the non-mechanized farms. Tractorization increased the demand for both permanent and casual hired labours.

NCAER (1973)²: A comprehensive study was undertaken by National Council of Applied Economic Research to find out

---


the impact of mechanization on agricultural employment. It was observed that while tractors by themselves did not displace labour, the combined operations of tractors and threshers had that effect.

Sharma, R.K. (1973)¹, observed first that the tractor farms had marginally a higher cropping intensity as compared to the bullock operated farms. Secondly, the estimated labour displacement due to the use of tractor worked out at 6 days per cultivated acre or about 225 days per farm which was quite significant. However, the actual labour displacement worked out to be much less namely 2.5 days per cultivated acre or about 92 days per farm, which was not significant in an area facing labour scarcity. Though the tractor is treated as labour displacing, the demand for hired labour, both permanent and casual, has not been affected. It shows that the family workers on tractor farms enjoy more leisure than before. It was significant that the large tractor farms had larger use of labour even after adjustment were made for use of more inputs on such farms. Thus, the reduction in demand for labour due to tractor had been largely neutralized by the use of more inputs on tractor farms.

Sharma, R.K. (1974)². In his another study "The Economics of Tractor cultivation in Karnal District of Haryana", he


² Sharma, R.K. (1974) "The Economics of Tractor Cultivation: A Case Study in Karnal district, Haryana." Agricultural Economics Research Centre, University of Delhi, 1974 (mimeographed)
found that the tractorization had negligible impact on productivity. The output per cultivated acre in tractor farms was 17 percent higher than that in bullock-operated farms. He also observed that the tractor farms had marginally higher yields of both wheat and paddy as compared to the bullock-operated farms. He concluded that the differences in output per acre between the farms were due to factors other than the use of tractors.

Chopra, Kusum (1974)\(^1\), arrived at the following conclusions from her study. Firstly, tractorization had increased the operated area by nearly 11 percent and also changed the cropping pattern in the region. Secondly, tractorization had increased the use of labour in the villages. Thirdly, it had increased the use of family labour, skilled labour and casual labour on the farms after the introduction of tractors. In family labour the number of full-time and part-time males and part-time females increased from 1.93, 0.21 and 1.1 to 2.39, 0.45 and 1.3 per tractor holding respectively. In casual labour the percentage increased in man-days was 38.47 among males and 80.33 among females. Fourthly, it was assumed that the employment in the non-agrarian sector would also increase because more hands would be needed for the manufacture of tractor-spare parts, tractor implements, accessories and their repairs.

\(^1\) Chopra, Kusum: "Tractorization and Changes in Factor Inputs- A Case Study of Punjab Economics, and political weekly, Vol. 9, October, December 1974, P 119-A127
Kahlon, A.S., Miglani, S.S. and Mehta, S.K. (1974) They studied economics of farm management in Ferozepur district of Uttar Pradesh for the year 1969-70. They found that tractor farms had higher productivity as compared to the bullock-operated farms. But statistical analysis of the data explained that the increase in productivity were affected by factors other than the use of tractors.

Vashistha (1975) used the FMS (Farm Management Studies) data to examine the effect of tractors on farm output per operated acre, farm employment (Labour days) per-operated acre and cropping intensity on Punjab farms during the year 1968-69. Using the analysis of variance and co-variance he worked out the adjusted mean levels of per acre farm output, per acre farm employment and cropping intensity for tractor owning and non-tractor farms after standardizing for the effect of other factors such as farm size, the percentage of cropped area irrigated, the use of seed-fertilizer and the availability of tubewells and threshers. In his study Vashistha found that tractors had a neutral effect on cropping intensity and employment per acre and it had a neutral effect on farm yield as well.


Rao, Hanumantha (1975)1: The study was based on data from Farm Management studies (FMS) 1968-69 and 1969-70 for Punjab. He used a dummy variable (which has a value of 1 if tractors are owned and 0 otherwise) to measure the net impact of using tractors instead of bullocks. Along with the tractor dummy, he had also used tubewell expenses, the percentage of net sown area irrigated, the percentage of net sown area under HYVS and fertilizer expenses as explanatory variables. He found that a high cropping intensity was largely accounted for by a high use of HYV of wheat and tubewell irrigation, tractor per se was unimportant in this regard. He also found that tractors had a neutral effect on farm employment for both the years studies. However, the effect of tractor use on farm yield was found by him to be positive for 1968-69 and neutral for 1969-70. He observed that tractors per se could be labour displacing and attributed the neutral labour displacement effect to the compensatory rise in employment resulting from farm yield increases through tractor use.

Desai, D.K. and Gopinath, C (1975)2: A study on the impact of tractorization on farm employment and productivity in representative farming areas of Gujrat was carried out by Indian Institute of management, Ahemdabad. The analysis of


of variance, co-variance and 't' test were used for a comparison of the output and employment per-hectare between tractor and non-tractor farms. The results of the analysis indicated the output per hectare on tractor farms was higher than non-tractor farms and the employment per hectare on tractor farms was not significantly different from that of non-tractor farms.

Mishra, S.P. (1976) 1: The study revealed first that the intensity of cropping was 105.90 percent and 114.62 percent on the bullock and tractor-operated farms respectively. Secondly the yield per hectare of different crops increased considerably on the tractor operated farms. In jowar per hectare increase in yield was 16.42 percent on the tractor operated farms over those of bullock-operated farms. Finally there had been considerable decrease in the employment of both human and bullock labour on the tractor-operated farms. Per hectare decrease in human labour employment varied from 16.67 percent in maize to 57.58 percent in wheat, while in bullock labour it varied from 64.71 percent in maize to 90.48 percent in wheat. The utilization of bullock

---

labour indicated substantial reduction in its use on the tractor-operated farms, but the decline in the number of bullocks was not commensurate with it. Whereas the actual utilization of bullock labour on the tractor-operated farms as a whole decreased by about 82 percent, the number of bullocks declined only by 50 percent.

Kahlon, A.S. (1976) ¹: The study revealed firstly, that the cropping intensity of 177.62 percent was higher on the tractor farms as compared with 158.65 percent on bullock farms. Secondly, the yields (maize, wheat and paddy) were found marginally higher on tractor farms than that on bullock farms. Thirdly, gross output per hectare and productivity on tractor farms was higher. Fourthly, when the bullock farms were compared with the tractor farms, it was seen that family labour and total labour decreased by 59.53 percent and 1.08 percent respectively, whereas, permanent and casual labour increased by 26.85 and 71.53 percent respectively on the tractor farms. Finally, per hectare bullock power use worked out to be 75.45 bullock pair hours on bullock farms and 23.94 bullock pair hours on tractor farms. Thus, bullock power use came to about one third on the tractor farms as compared to the bullock farms.

¹ Kahlon, A.S. : "Impact of Mechanization on Punjab. Agriculture with Special Reference to Tractorization" Indian Journal of Agricultural Economics, Vol. XXXI No. 4, October-December-1976, P. 54-70
observed from the study that (i) the cropping intensity of 122.32 on tractor owned farms was higher as compared to 116.05 on bullock farms, (ii) the gross output as well as net output per hectare was comparatively higher in tractor-owned farms for all the selected crops (Tobacco, Cotton, Paddy, Bajra and Wheat) (iii) In bullock-operated farms, the employment per hectare was considerably higher for crops such as tobacco (179 mandays), Paddy (131 Mandays) and wheat (112 Mandays) in comparison to 163, 81 and 81 mandays respectively in tractor-owned farms. Whereas, in tractor-owned farms per hectare human labour employment for crops, cotton (217 mandays) and bajra (72 mandays) were higher as compared to 203 and 66 mandays respectively in bullock-operated farms. Thus, there was not very significant displacement of human labour on per hectare basis through tractorization but it helped the increased use of inputs, more employment opportunities through extensive as well as intensive utilisation of land, expanded output and maximum net return.

Hans, P. Binswanger (1977) has studied on "The Economics of Tractors in India Subcontinent." In his study he found firstly that the gross value of output per-operated farm was higher on tractorized farms by more than 10 percent


in 75 percent of the cases and Secondly, the net cropped area was also higher on tractorized farms by more than 30 percent in one-third of the cases studied.

Gill, Gurumukh Singh, Miglani, S.S. and Singh, Nirmal (1979)\(^1\), found firstly, that with the introduction of tractors and intensive use of modern inputs, the output per hectare increased by 26.70 percent. Secondly, on per hectare of operational area, the family labour was displaced to the extent of about 35 percent on tractorized farms whereas, these farms hired 20 percent more labour as compared to the non-tractor farms. This showed that employment opportunities increased for the more needy section of rural labour and the displacement was only in the case of family members who wanted to go for higher studies or better jobs or to enjoy leisure. In addition, the tractorization also generated employment in manufacturing, distribution and servicing of the tractors and other related farm machinery. In this context, if the arable impact of mechanization consider the loss in human labour employment may not be a matter of talk.

Dhawan, K.C. (1980)\(^2\), found the average cropping intensity of bullock farms was higher i.e. 179.81 percent while it was 176.64 percent on tractor farms. Secondly the use

---


of human labour on bullock and tractor farms were 303.10 and 259.84 hours per cropped area respectively, which indicated a decline by 43.26 percent on the tractor farms as compared to the bullock farms. The calculated 't' value was 7.12, which was significant at 1 percent level. It clearly indicates that tractors displaced human labour at the farms. Thirdly, the tractor farms used more chemical fertilizers than bullock farms and it was a healthy trend because it increases the agricultural output. Finally, the average net return on bullock and tractor farms were Rs. 432.92 and Rs. 632.99 per cropped acre respectively which amounted to 55.54 percent higher income on tractor farms. The calculated 't' value was 9.79, which was significant at 1 percent level. It indicates that there was more income on tractor farms as compared to the bullock farms. 

As observed from the study that tractor farms employed per acre human labour 35.3 mandays in Paddy-Desi, 42.7 mandays in paddy-HYV, and 34.2 mandays in wheat HYV crops while they were 37.6, 39.3 and 35.8 mandays respectively in bullock-operated farms. Thus, tractor farms employed more labour in the cultivation of paddy-HYV Crop while in regard to cultivation of paddy-desi and wheat-HYV, non-tractor farms employed slightly more labour than tractor farms. Number of bullock-power (per farm) used in tractor-
owing farms (2.2) was about half as compared to the bullock-farms. (4.1).

NCAER (1980)¹: The study reveals that tractor-owners in the sample had obtained significantly higher yields than that of bullock-farms in all the major crops grown by them. The extra yield obtained varied from 72 percent in jowar to 7 percent in cotton. In paddy and wheat the additional output obtained by tractor-owners averaged over 20 per cent whereas, in bajra and gram it was over 13 percent.

It was further observed that tractor-owners had provided additional employment of 5.4 percent mandays as compared to the bullock farms. In Andhra Pradesh, Haryana, Punjab and U.P., tractor-owners and users employed less number of persons whereas, tractor owners in Maharashtra, Tamil Nadu and Gujarat employed more persons compared to the bullock farms. Hired labour formed 81 percent of the total employment of the tractor-owner compared to 63 percent in bullock farms. In Andhra Pradesh family participation in crop production was observed to be the lowest. But in Punjab and Haryana, where tractor use was more widespread, participation of family members in farming was relatively more. In all

the states that were surveyed, the participation of family labour was lower in tractorized farms.

P. Kumar, Mathur, V.C., and Singh, R.P. (1981)\(^1\): This paper reveals the results pertaining to predominantly wheat growing farms randomly selected from two villages of Union Territory of Delhi.

The study reveals that (i) per acre human labour hours employed in tractor-operated farms was 128 mandays, which is about half of the bullock farms 274 mandays (ii) per acre bullock labour hours used on tractor farms was only 1 as compared to the bullock-operated farms of 89. Thus, it may be concluded that the use of tractor had displaced both, human labour and bullock-labour hours used on the farms.

Singh, Baldev and Vinod Kumar (1982)\(^2\): The study had two broad strands of technologies; (i) the bullock-technology (\(T_b\)) and (ii) the tractor-technology (\(T_T\)).

The study revealed firstly, that the tractor farms earned higher yield per acre (Rs. 1218) than that of bullock farms (Rs. 1111). Secondly the tractor farms


employed 13.4 percent less per acre labour resource than bullock farms. Thirdly, if the bullock farms were substituted by tractor farms, they found that the share of family labour which accounts for half (50.80 percent) of its labour use fell to around one-fourth (27.03) percent. The same holds true in the case of field labour. Its share in total employment fell from 71.51 percent on bullock-farms to 54.00 percent on tractor-farms.

Singh, Jagmohan, Mathur, D.C. and Gupta, A.K. (1986)1: It was observed from the study that cultivators get more yield per acre in larger fields by using tractors. Whereas, the yield per acre obtained by them was significantly higher in small fields where bullock power was used. Also, bullock cultivation being labour intensive, provided gainful employment to rural unemployment.

The per acre yield, of the selected cultivators who used tractors was also not significantly high but cost per acre was high as compared to that for bullock cultivation. This points out to the fact that the use of tractors for cultivation of vegetable crops in small holdings is not economical. Moreover, the use of bullock-power in small holdings is not only economical but also employment-oriented.

1. Singh, Jagmohan, : “A Study on use of Tractor and Bullock Labour in Cultivation of Vegetable crops in Delhi.” Agricultural Situation in India, April 1986, P. 29
The study revealed firstly, that the cropping intensity on tractor and bullock farms were an average 127 and 126 percent respectively. Thus, cropping intensity on tractor farms was only marginally higher than that on bullock farms. Secondly, the yields of all crops were higher by 9 to 22 percent on tractor farms than those of bullock farms. Thirdly, employment of family and hired labour per hectare of net cropped area showed that hired labour formed 86.75 percent of the total labour employment on tractor farms compared to 75 percent on bullock farms. It clearly indicates that tractorization accompanied by changes in cropping pattern had resulted in increasing employment opportunities.

In the traditional agriculture, where the draught power was used, the proportion of family labour was larger in the total human labour employment as compared to the tractor-operated farms. Finally, the tractor-farms had provided additional employment compared to that of bullock farms.

STUDIES OUTSIDE OF INDIA:

Anwarul Haq and Shaukat Ali Quraishi (1962): The study was conducted in Lyallapur district of Pakistan. Forty farms, using tractors were selected and their size ranged from 8 to 130 hectares. Of the 40 holdings 10 had no records about draught animals before tractorization. The


2. These findings are preliminary results of scientific research by Anwarul Haq and Shaukat Ali Quraishi at Lyallpur Agricultural University, Pakistan.
remaining 30 holdings were utilizing 281 bullocks before tractorization. In 1962 after the introduction of tractors only 92 of them were maintained. 32 tractors replaced, 189 drought animals at a rate of 1 tractor instead of about 6 animals. Nine owners had contracted work for other cultivators with their tractors.

Bose and Clark (1969)\(^1\), has studied to find out the impact of tractor mechanization on agricultural output and employment in West Pakistan. The study reveals that tractorization in West Pakistan had no output augmenting effect but had a substantial labour-displacing effect.

Lawrence (1970)\(^2\): He analysed the effect of different levels of farm mechanization on the yields of certain crops (wheat & cotton), on farms with an irrigated wheat-cotton rotation over a two-year period. The seven production techniques he considered were: the use of bullock-power with unimproved implements, the introduction of improved bullock implements in two stages, the addition of a thresher to these bullock farms, the introduction of a tractor in lieu of bullocks, the addition of a thresher to tractor farms and the use of both the tractor and the

---


combine. He came to the conclusion that the tractors had a substantial positive effect on both crop yields and cropping intensity and had a neutral labour displacement effect. He further noted that 'timeliness' was of crucial importance since quick wheat harvesting and early cotton planting greatly effect cotton yields.

Abercrombie (1973), in his review of the experience of tractorization in Latin America noted that tractor-use was largely concentrated in Argentina, Brazil and Mexico and had benefitted agricultural production in those countries. He observed that the direct effect of tractorization on crop yields per hectare had been small; of much more importance in raising yields had been the use of other inputs such as improved seeds, fertilizers and water control. He found that the overall effect of tractorization had been to displace labour to the count of 3 to 4 workers per tractor.

Clayton (1973), has reviewed the experience of various countries in East Africa. From the Ugandan experience, where, tractorization had been receiving government support since the mid sixties, he noted that the scheme had proved to be both uneconomic and labour displacing per acre. The poor upkeep of tractors and their low utilization level had also been responsible for their negligible contribution to yields.

McInerney and Donaldson (1975) had carried out a study in West Pakistan to evaluate the effect of tractorization. They compared a sample of farms during the years 1966-67 and 1969-70. They observed that the main benefit of using tractors had been to bring some uncultivated land under crop cultivation, thus increasing the net sown area of the farm. Cropping intensity was however, found to increase by only 7.5 percent (11.5 percent). They did not observe any change in cropping patterns or in crop yields.

In Kenya too, tractors had led to the displacement of labour, particularly on large farms. He pointed out, however, that the economic justification of tractorization and the effect of tractors on employment could vary with ecological conditions and the factor endowments of the farms under examination. He observed, for instance, that in certain regions of Kenya where two cash crops were grown over the year, tractor-use had led to an increase in both farm income and farm employment, particularly on farms where the land-man ratio had exceeded 2 to 5 acres per man.


** ** **
** ** **
** **
CONCLUSION:

Research studies carried out in the past evaluated the impact of tractorization on farm productivity and employment by adopting either of two methodologies:

(i) Cross-section comparison of tractor-cultivated and bullock-operated farms. The reference period for these studies was generally one agricultural year.

(ii) Comparison of changes in tractorized farms 'before and after' tractor purchase.

Most of the studies used cross-section comparison of tractor-cultivation and bullock-operated farms. The main findings of the above studies are given below:

(1) Most of the studies have shown that tractor-farms had displaced human labour. But Sohani, NCAER (1973), Vashistha, Rao and Desai, D.K. found tractors neutral whereas, Johl, Chapra, Acharya and NCAER (1980) indicated that the use of tractors had provided additional human labour employment.

(2) The tractor farms had higher output per acre/hectare than the bullock-farms. But directorate of Economic and statistics and Vashistha indicated the impact of tractor neutral. The additional output on tractor-farms was not due to tractors alone. It was influenced by other factors also.

(3) The tractor-farms had higher cropping intensity, percentage of irrigated area, area under HYVs and larger quantity of fertilizer consumption as compared to the bullock-farms. These were the factors contributed directly to increase production and productivity.