SUMMARY & CONCLUSION
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The present study entitled, "An enquiry into the farm structure, resource use, and productivity in Mawana Block, District Meerut, U.P." was conducted during the year 1975-76 with the main objectives:

(i) to study the farm structure, cropping system and employment pattern,
(ii) to determine the level of capital investment on different farms,
(iii) to work out cost and returns on crop and milk enterprises &
(iv) to analyse the productivity of different resources used on the farms of different size groups of holdings.

The experimental design of the study consisted in the random selection of 100 cultivators from 10 villages of Mawana Block in District Meerut, U.P. A three stage stratified purposive random sampling technique was used to select the Block, Villages and Cultivators. The cultivators were selected under five size groups of 0-1, 1-2, 2-3, 3-4, 4 & above hectares and were kept in proportion to their number in the universe of 10 villages.
The study of farm structure showed that the average size of sample holdings came to 2.00 hectares. An overwhelming population of cultivators i.e. 58% fell within 0-2 hectares size groups while only 10% cultivators were under 4 & above hectares size groups. It was observed that the percentage area under cultivation under 4 & above hectares size group came highest and was lowest under 0-1 hectare size group. The average investment in fixed capital, on per farm basis, came to Rs. 77038.34. It varied from Rs. 15542.74 on small size group of 0-1 hectare to Rs. 126119.23 on the largest size group of 4 hectares and above. The average investment in fixed capital excluding land came to Rs. 11583.94 per farm, which varied from Rs. 1617.94 on 0-1 hectare farm size to Rs. 19748.83 on 4 hectares and above.

The investment in fixed capital, per hectare, came to Rs. 26311.95 which varied from Rs. 25968.17 on the smallest size group of 0-1 hectare to Rs. 26654.01 per hectare on 3-4 hectares size group. The low figures on small farms were mainly due to poor investment capacity of the small farmers. As regards percentage distribution of investment in fixed capital among different items, land accounted for the highest share of 85.29%, followed by livestock (5.30% (milch 2.56% & draft 2.74%)), irrigation structure 3.93% and farm building, implements and machinery to 2.69% and 2.44 respectively of the total investment. An intersize groupwise examination showed that the small farmers made a higher investment on draft & milch cattle while big farmers had higher investment on implements & machinery, irrigation structure.
farm buildings. This trend was due to capacity of the big farmers for investing more funds on items of durable nature as compared to small farmers.

The average investment in fixed capital, excluding land came to Rs. 3874.63 per hectare. It showed almost a rising trend with the increase in the size of farms. The lower investment on smallest size group of 0-1 hectare was because of poor investment capacity of small farmers. As regards percentage distribution, the investment on irrigation structure accounted for the highest share of 26.74%, followed by draft cattle 18.64%, farm building 18.29%, milch cattle 17.42% and implements and machinery 16.35% of the total investment. When a size groupwise comparison was made, the investment on draft and milch cattle was found higher on small farms of 0-1 and 1-2 hectares size groups in comparison to large sized farms where the investment was higher on irrigation structure, farm building and implements and machinery.

Amongst different sources of irrigation, tubewells and pumping sets formed the main source of irrigation. The area irrigated by this source accounted for as high as 66.60%, followed by canal 26.50% and rahats 6.90% to total irrigated area. It was also noted that the area irrigated by tubewells and pumping sets was much higher on big farms as compared to small farms, due to availability of greater facilities and higher investment capacity of the big farmers for irrigation structure. The area irrigated by rahat was higher on small farms, while by canal it was almost the same on all farms.
Coming to the pattern of livestock raising, it was found that the number of draft and milch cattle per farm increased with the increase in the size of holding, while on per hectare a reverse trend was noticed. The average number of draft and milch cattle per hectare came to 0.86 and 0.85 respectively and the figures on per farm basis came to 1.72 and 1.70 for the respective categories of animals. It was found that the number of milch cattle per hectare came higher on small farms as compared to larger ones. It was due to the fact that the small farmers try to maximise their farm income by having more number of milch cattle. A greater number of draft cattle on small farms was due to use of more animal power in farm operations and for transportation purposes etc. as compared to big farmers who were using machinery power also in completion to most of their farm operations.

The average number of family worker came to 1.29 per hectare and 3.16 per farm. It was observed that as the size of holding increases, a small proportion of family members contribute to farm work.

The analysis of cropping pattern revealed that the average intensity of cropping, on sample holdings, came to 144.69 per cent which was highest being 158.03% on the smallest size group of 0-1 hectare and lowest being 140.30% on the largest size group of 4 & above hectares. The intensity of cropping on the sample farms seems to be lower. It was due to higher area under sugarcane crop in the cropping pattern of sample farms, which occupies the field for whole year and accounted for nearly 35% of the total cropped area. Sugarcane, wheat and maize were
the important crops of the study area. On an average, sugarcane occupied for the highest area of about 35%, followed by wheat 25%, fodder crops 11.62% (kharif + Rabi) and maize 8.46% to the total cropped area, under study.

H.Y.V. and improved varieties of crops were grown to the extent of 44.19% to the total cropped area, under study. H.Y.V. of wheat accounted for 20.94%, potato kufri 2.42% and improved varieties of sugarcane 20.83% to the total cropped area. The area under H.Y.V. of wheat crop gave an increasing trend with the increase in the size of holdings, while no such trend was noticed in case of potato and sugarcane crops. Of the total area under wheat crop, wheat H.Y.V. shared for 82.32 per cent.

As regards potato and sugarcane crops, the H.Y.V. and improved varieties shared for 84.90% and 80.72% to their total area under respective crops. It was found that percentage area under H.Y.V. and improved varieties of crops, to their respective crops, showed an increasing trend with the rise in farm size. It was due to the fact that big farmers were having higher capacity of investment for different inputs in growing of these crops.

As regards the area under food, cash and fodder crops it was found that food crops occupied 49.89%, cash crops 37.80% and fodder crops 11.62% to the total cropped area of kharif and rabi season combined. Amongst kharif and rabi season, kharif season shared for as high as 63.61% area (due to inclusion of sugarcane crop) and that of rabi 36.39% to total cropped area. The percentage share of food crops in total came to 28.09% in
rabi season and 16.80% in kharif season. The area under cash crops was highest being 34.89% in kharif season due to sugarcane while it was 2.91% in rabi season. The area under fodder crops was higher being 8.97% in kharif as compared to rabi season (2.65%). The percentage area under food crops was a little higher on small farms as compared to big one's. Against this the area under cash crops showed an increasing trend with the rise in farm size.

The economics of important crop showed that sugarcane planted gave the highest net return of Rs. 2830.08 per hectare, followed by sugarcane ratoon Rs. 2389.59, jowar green fodder Rs. 1410.12, wheat Rs. 1175.89 and maize Rs. 428.95 per hectare. On an average, the input cost per hectare was highest on sugarcane planted being Rs. 5225.50, followed by sugarcane ratoon Rs. 3502.62, wheat Rs. 2946.21 and maize Rs. 1748.33 per hectare. The average yield of sugarcane planted came to 596.71 quintals, sugarcane ratoon 436.46 quintals, wheat Rs. 29.43 quintals and maize 20.26 quintals per hectare. The cost of production per quintal for the corresponding crops was worked out to Rs. 875, Rs. 803, Rs. 78.55 and Rs. 60.41 respectively. The input-output ratio for sugarcane planted, sugarcane ratoon, jowar fodder, wheat and maize came to 1:1.54, 1:1.68, 1:2.38, 1:1.40 and 1:1.24 respectively.

The economics of milk production revealed that the cost of maintenance on a cow, during the lactation period, came to Rs. 1150.74 per cow. The net maintenance cost (after deducting the income from cow dung etc.) came to Rs. 1087.81 per cow. Amongst
different items of maintenance cost; concentrates accounted for the highest share of 36.11% followed by green fodder 33.05%, dry fodder 13.15% and human labour 10.19% to the total cost of maintenance. On an average, a cow gave milk yield of 835.33 litres during the lactation period which amounted to a total gross income of Rs. 1670.66 and net income of Rs. 582.85 by incurring a net maintenance cost of Rs. 1087.81 per cow, per lactation. The cost of production per litre of cow milk was worked out to Rs. 1.30, which showed an increasing trend, with the increase in the size of holding due to comparatively higher maintenance cost and low milk yield. The average input-output ratio came to 1:1.53. In case of she-buffalo, the average maintenance cost during a lactation period came to Rs. 1711.42 per she-buffalo. The average net maintenance cost, after deducting the income of dung etc., came to Rs. 1601.17, per she-buffalo. Amongst different items the investment on concentrates accounted for the highest share of 44.67%, followed by green fodder 23.15%, dry fodder 14.33% and labour charges 10.47% to the total maintenance cost. On an average, a she-buffalo during a lactation period, yielded 1285.90 litres of milk, amounting to a total gross income of Rs. 2570.98, and a net income of Rs. 969.81 by incurring a net maintenance cost of Rs. 1601.17 per she-buffalo, per lactation. The average cost of production per litre of milk came to Rs. 1.24.

An economic analysis of farm business as a whole for crop production enterprises showed that the per hectare values of input, output, net income, family labour income and farm
business income came to Rs.3807.81, Rs.5842.66, Rs.2034.35, Rs.2621.49 and Rs.2843.63 respectively. These values tended to rise from the lowest size group of 0-1 hectare to 3-4 hectares size group after which they dropped sharply. The rise in values with the increase in farm sizes was mainly associated with the greater prevalence of cash crops, assured irrigation facilities and higher investments in the form of quality seeds and manures and fertilizers. The input-output ratio on an average, came to 1:1.53, which was highest being 1:1.56 on 3-4 hectares size group because of higher output in relation to input cost.

As regards gross income over cost $A_1$ and $A_2$, cost $B$ and cost $C$, it came to Rs.3489.10, Rs.3489.10, Rs.2626.28 and Rs.2034.85 per hectare respectively. Differentials of income over cost $A$ and cost $C$ showed an increasing trend up to 3-4 hectares size group, while in case of cost $B$ no such trend was noticed. The average values of cost $A_1$, $A_2$ was Rs.2353.56 each per hectare while that of cost $B$ and cost $C$ came to Rs.3216.38 and Rs.3807.81 per hectare respectively.

The input cost, on an average, came to Rs.3807.81 per hectare which was lowest being Rs.3480.59 on 0-1 hectare size group and highest being Rs.4003.60 per hectare on 3-4 hectares size group. The highest input cost on 3-4 hectares size group was because of more investment capacity of the farmer for quality seed, manure and fertilizers and irrigation water in general and comparatively larger area under sugarcane crop, demanding greater investments in particular. Amongst different input
factors, human labour accounted for the highest share of 24.80%, followed by manure and fertilizer 12.74%, bullock labour 11.20% seed 10.82%, irrigation 8.74% and machinery power 4.55% to total cost. An intersize groupwise examination revealed that the percentage cost on human labour and bullock labour was higher on small farms in comparison to big farms because of its more utilization. Big farms were also utilizing machinery power, along-with animal power in completion of certain farm operations like ploughing and threshing, which resulted in comparatively lower utilization of human and bullock labour on their farms.

The utilization of human labour per hectare of cultivated area came to 189.54 man days which varied from 180.99 man days in the smallest size group of 0-1 hectare to 195.71 man days in 4th size group of 3-4 hectares. This increase in utilization of man days with the increase in farm size was associated with the increase in sugarcane area, which was higher on larger farms. As regards to utilization of bullock labour the per farm and per hectare figures showed an increasing trend with the increase in the size of holding because of larger farm business while no definite trend was noticed for per hectare basis.

In case of family labour utilization, it showed an decreasing trend while that of hired labour an increasing trend, with the rise in the farm size. The main reason responsible for this trend was that big farms have to employ comparatively more hired labour for completion of certain farms operations in time due to large size of farm business. Further, due to short avai-
lability of family labour in proportion to their holding size, also resulted in hiring of more hired labour. On an average, the share of family and hired labour stood 62.40% and 37.60% respectively to total utilization of human days. The utilization of family labour was highest being 75% on smallest farm of 0-1 hectare and declined to 58.14% on the largest size group of 4 & above hectares. As regards hired labour it was 25% and 47.36% on the smallest and largest size group respectively.

The utilization of human labour among different crops showed that sugarcane crop alone used about 54% (sugarcane planted 32% + sugarcane ratoon 22%) of the total labour followed by wheat 13.54%, maize 11.82% and fodder crops 7.30%. As regards percentage utilization of bullock labour days sugarcane accounted for the highest share of 56% followed by wheat 13.41%, maize 11.80% and fodder crops 8.05% to total bullock labour days.

Contribution of income to total output value made by different crops showed that sugarcane alone accounted for as high as 62.59% (sugarcane planted 46.72% + sugarcane ratoon 15.87%) to the total income received from different crops. This indicates that the farm economy of the study area is largely dependent on sugarcane crop. The next important crop was wheat which contributed 24.36% to total output value while maize and fodder crops made a contribution of 4.38% and 5.29% respectively. If the contribution of food and non-food crops to the total output is considered, it amounted to about 32% and 68% respectively.
To measure the efficiency of farms of different size groups, various measures of farm profits were worked out. Percentage return to capital investment came to 8.29%, which varied from 6.39% on the smallest size group of 0-1 hectare to 8.64% on 4th size group of 3-4 hectares. The average figures of capital turnover came to 19.72%, which was lowest being 17.31% in the lowest size group of 0-1 hectare to 20.46% in 3-4 hectares size group. Amongst different financial test ratios, gross ratio, on an average, came to 0.63 which showed that Re.0.63 was incurred as total expenses for every rupee of gross income. The fixed and operating ratio were worked out to 0.025 and 0.38 respectively. Gross and fixed ratio were higher on small farms while operating ratio showed a reverse trend. The financial test ratios applied to the farming business, in the study area, showed that the expenses per rupee of gross income were higher on small farms portraying that these farms have lower income producing ability.

To compare the managerial abilities of farmers of different size groups, it was found that the cultivators of 3-4 hectare size group were more efficient and having better managerial ability, as the return to management on their farms came highest being Rs.1668.01 hectare, followed by Rs.1466.84 per hectare on 2-3 hectares size group. The lowest management return of Rs.922.12 per hectare was found on the smallest size group of 0-1 hectare due to poor resources.
Return per human labour day worked out to Rs. 24.06, which was lowest being Rs. 16.79 on the smallest size group of 0-1 hectare and highest being Rs. 25.44, on the largest size group of 4 & above hectares. So far as the case of return per day of family worker is concerned, it was worked out to Rs. 2645.49 per annum per farm and Rs. 7.26 per day.

Cost and return analysis on milk production showed that the cultivators obtained an average net income of Rs. 416.20 per hectare from milk production, on making an expenditure of Rs. 669.20 as net maintenance cost. The family labour income and farm business income came to Rs. 492.58 and Rs. 531.28 per hectare respectively. The input-output ratio was worked out to 1:1.62.

It was interesting to note that all these values were higher on small farms, because of the fact that small farmers try to increase their farm income through milk production enterprise.

Coming to the total farm income and expenditure, taking crop and milk production combined, the cultivators received an average gross income of Rs. 6930.00 per hectare by making an average investment of Rs. 4476.75 as input cost. The values of net income family labour income and farm business income came to Rs. 2453.20, Rs. 3109.12 and Rs. 3127.60 per hectare respectively. The input-output ratio was worked out to 1:1.54. All these values were found more or less on all size groups of holdings except to that of the largest size group of 4 & above hectares where it came lowest. If only crop production is taken into account, these
values were lowest on small farms and increased with the rise in farm size. But when milk production values are combined with the crop production, the income values of small farms also increased and came to the level of big farms, because of comparatively higher incomes from milk production per hectare on their farms. The percentage share of input came to 80% and 20%; output 84% and 16% and net income 84% and 16% on crop and milk production respectively. Thus a complementary relationship existed between crop and milk enterprise, as the share of income from milk production was more than 10% to total farm income.

An examination of the marginal value product of different resources on the farm as a whole indicated that the marginal value products of human and bullock labour were lowest in comparison to other resources. It may be concluded that farmers of the study area use more of human and bullock labour in relation to other inputs. The marginal value product of human labour varied from 1.0788 in 3-4 hectares size group to 1.5348 in 0-1 hectare size of holding, while the marginal value product of bullock labour varied from 1.2760 on 0-1 hectare to 2.2848 on 4 & above hectares size group of farms. The M.V.P. of seed was almost equal on all size groups of farms. In case of manure and fertilizers the M.V.P. was highest in all size groups of farms followed by irrigation. The M.V.P. of manures and fertilizers varied from 3.2788 on 4 & above hectares size group to 5.1655 on 3-4 hectares size group while that of irrigation it ranged from 3.2704 on 0-1 hectare to 5.3124 on 3-4 hectares size group of farms.
So far as individual crops are concerned, the M.V.P. of human labour and bullock labour were almost equal and did not show much variation. The M.V.P. of seed came to 2.7640 for maize, 3.0078 for sugarcane planted and 3.8462 for wheat. The M.V.P. of irrigation varied from 4.2188 for sugarcane ratoon to 5.5109 for sugarcane planted. In case of irrigation, M.V.P. varied from 3.8901 for wheat to 4.5303 for sugarcane ratoon. In case of milk production enterprise, the M.V.P. for human labour, fodder and concentrates came to 1.5461, 2.1768 and 3.0774 respectively.

The importance of livestock enterprise can be overruled in raising the level of income on the sample farms. Such a preposition is particularly true for small and marginal farms where land lease is small and income from crop production is low. Hence, a greater emphasis is needed to improve the livestock sector to establish a near perfect relationship between crop and livestock enterprises.