II. REVIEW OF LITERATURE
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Tandon and Dhondyal (1956-57, 1957-58) concluded from the study conducted at Kalyanpur block of Kanpur district by the research scholar of the Government Agricultural College, Kanpur that the cropping intensity increases with the decrease in the size of holding.

Realising the significance of the study of costs and returns, the Ministry of Food and Agriculture, Government of India undertook studies on the "Economics of Farm Management", in six typical regions in the country i.e. Bombay, Madras, Punjab, Uttar Pradesh and West Bengal in 1954-55 and in M.P. 1955-56. In these studies especially of West Bengal and M.P. covered cost of cultivation of paddy.

The second phase of the same study is in progress at various centres i.e. Punjab, U.P., Gujrat and Madras since 1966 (John, 1965). John (1965) studied the cost of production of sugarcane and rice in Uttar Pradesh. The study extends over the period from 1954 to 1963.

Driver and Desai (1958) from the farm management study conducted in Ahmedanagar on Nasik District of Bombay State have concluded that increased doses of
manure and fertilizers, human labour and bullock labour in productive operations like irrigation, preparatory tillage would result in increased production and farm business.

Shastri (1960) conducted a study of input-output relationship in Indian farm economy in Hansa district. From the study the author concluded that the employment of casual human labour increases with the increase in the size of holdings. Mandal (1963) in his study economic aspects of cropping pattern found the similar results.

Krishna and Gupta (1962) have emphasised the need of studying the factors affecting the managerial ability of the farmer and its contribution to farm output in Indian Agriculture, so as to achieve the goal of maximising production with limited agricultural resources.

Mazid (1962) conducted a study on cropping pattern and size of cultivated holding in Kerala and concluded that the size of cultivated holding seems to be an important factor, influencing the pattern of crop production, particularly in the collection of area between cash crops and subsistence crops. The author
further concluded that area under cash crops was higher on large size holdings as compared to small size.

Dhondyal (1963) has mentioned, in his book 'Principles and methods of farm management' that the cropping pattern has changed in Uttar Pradesh due to which the area under sugarcane, maize, wheat and cotton increases while the area under gram, jowar, bajra and barley decreases.

Mallya and Meenakshi (1963) conducted a study on organization and cropping pattern in Madras and found that in a region of homogeneous soil and climate features urbanization introduces diversification in the cropping pattern, introducing more cash crops such as fruits, vegetables and flowers.

Ramalingam (1963) analyses some economic aspects of cropping pattern and reported the tendency for the food grain to be dominant in the smaller size groups and cash crops to be dominant in the larger size groups. He further reported that the percentage area under sugarcane increases with the increase in farm size.

Studies on purchased inputs on paddy yield were made by Herdt Robert, W. in 1964 in which he has came to the conclusion that better use of purchased input
like improved seeds, fertilizers etc. has greater impact in increasing the yield per acre of paddy crop.

Manrai (1966) conducted a study on intensive development approach to Agricultural development. This study revealed that in cereal rotation, the field and economic return was considerably increased due to the use of more fertilizers.

Abraham and Rahaja (1967) made an attempt to analyse the growth of production of rice and wheat crops in India. The study was made to assess the contribution of major input factors like irrigation, land and fertilizers consumption etc. They found an increase of 12.6 million tonnes during the period under study (1951-52 to 1964-65). The three input factors account for 7, 16 and 73 per cent increase respectively.

Lavania and Dixit (1968) investigated the problem "Economics of high yielding varieties in package district Aligarh" on 54 sample farms. They used the cost concepts to estimate the inputs in high yielding and local varieties of wheat, maize and bajra. The input per hectare in wheat decreases with an increase
in size of farms, both in high yielding and local varieties. The same trend was observed in the maize local while a reverse trend was visible in high yielding maize and bajra. Excepting wheat, an increasing trend of yield was observed in cases of maize and bajra high yielding varieties. The local varieties gave a declining trend with an increase in size of farms. Net income per hectare for local wheat gave a declining trend with a reversed trend was observed in high yielding wheat, maize and bajra. The cost of production per quintal of high yielding varieties decreased considerably with an increase in size holding.

Dhondyal (1968) conducted a study on effectiveness of modern technology on farm production and farm income, was of the opinion that the demonstration affects the programme in terms of benefit cost ratio. The farm under study have taken more area under improved strains and there were expectations of raising the farm income.

Chowdhury and Ghosh (1968) have studied a random sample of 100 farms, 60 of whom participated in high yielding variety programme and rest had not. They also provide data regarding participation in the programme among all farmers in the four village studied by them.
The authors claim that participation (in terms of proportion of area devoted to high yielding varieties) shows a distinct trend of increase with the increase in farm size. In the case of participant farms, only two high yielding varieties, IR 8 and NC 678 (accounting more than 50% of the area devoted to high yielding varieties) had yields greater than the local variety. The authors are however careful to point out that the best high yielding varieties of their sample, namely IR 8, yields profit of Rs.520 per acre as compared to figure of Rs.372 for the local variety.

Das (1968) obtained his yield data from randomly selected plots (80 in all) growing one or other of the high yielding varieties of paddy - unfortunately, he has not distinguished between a high yielding variety and another - this is extremely unfortunate since all the HYV's do not perform equally well. His main findings may be summarized as the high yielding variety yielded on an average of 24.20 quintals per acre of paddy while the improved and ordinary local varieties yielded 9.36 and 5.36 quintals respectively. The corresponding net income (and total costs) per acre are respectively Rs.9,12,29 (Rs.404.34), Rs.307.03 (Rs.202.42) and Rs.89.30 (Rs.202.42).
Shingarey and Waghmare (1968) randomly sampled 40 cultivators from 16 villages of Kolaba District in Maharashtra. The villages were selected because of their having 'large' area under Taichung Native 1, a high yielding paddy variety. The farm management type analysis showed that cultivation of Taichung Native 1 yielded about 6 quintals per acre more grain and about Rs. 62 per acre additional net gain over the local variety grown by the same farmers. These grains were of the order of 33 per cent extra grain and 27 per cent of extra income over local variety and are not particularly impressive.

Sirohi and Gangwar (1968) used the simplex method to study the potential increased in the farm net returns and farm labour employment by reorganisation of farm resources—especially with restricted availability of owned capital and unrestricted availability of borrowed capital—to determine how the returns differ with capital availability. Further, he introduced 'transfer activities' to avoid scaling down of the marginal value products of the irrigated and unirrigated lands.

Rao (1968) studied the performance of rice variety IR 8 in the West Godavari District. Unfortunately, his study lacks in objectivity for the reason
that he has chosen his sample village and sample block that were 'good' as far as coverage and performance of IR 8 are concerned. For each of the four selected villages, 18 participants and 7 non-participants were contacted. The participants were younger and more educated than of non-participants. The difference between the participants and non-participants with respect to yields and net income from cultivation of local variety are not notable. The variety IR 8 on an average yielded about 58% more grain and about 22 percent more net income per acre.

Mishra and Shukla (1969) made a study on the economic aspects of high yielding varieties programme in village Pilkhini of Kashi Vidyapith Block, Varanasi. The study show how the levels of output, output-input ratio and net income per hectare have been pushed up on adopter farms by high yielding varieties. The cost of production per quintal is reasonably low in case of high yielding variety and is crucial to the justification of the overall effectiveness of the improved strains in holding the price line. The indications are that the demonstration effect of the high yielding varieties programme in terms of cost benefit ratio for individual crop enterprise would induce the cultivators in the locality to allocate more are under improved varieties
and hope for raising farm incomes from the adoption of high yielding varieties programme, consistent with their water, land and manure resources.

Vishwanathan (1970) formulated an optimum crop plan for the farms of Thanjavur district, Tamil Nadu. He considered the synthetic farm and identified that the limiting factors were land, labour and capital and comparison on existing and optimal cropping pattern showed that with more reallocation of existing resources more efficiently the farm income could be boosted up.

Dixit and Singh (1970) conducted an enquiry on 'Impact of high yielding varieties on human labour inputs' in a village of Aligarh district and found that the high yielding varieties were not only remunerative to the farmers but these were labour intensive as well. The high yielding varieties employed nearly 1.5 times of human and bullock labour over the local ones.

Mandal (1971) calculated the cost of cultivation from the selected farms in East Godavari district, Andhra Pradesh for rabi IR 8 paddy and local paddy in 1968-69. He found that the cost of cultivation of high yielding varieties (Rs.1428/ha) is more by about Rs.450/ha i.e. by 46 per cent than that for the local variety (Rs.978/ha).
Singh \textit{et al.} (1972) conducted a detailed study on resource use pattern on small farms in 3 regions of Uttar Pradesh, concluded that farm resources were not utilized optimally under existing plans. Cash resources which is a serious limitations for small farms can positively enhance farm income, if the constraint is removed.

Singh \textit{et al.} (1972) also suggested that surplus human labour during the periods from October-November, February-April, on small farms need to be utilized in other agro-based industrial like dairy, poultry etc.

Chourasia and Singh (1972) observe that high yielding varieties of paddy required 62.47 per cent higher expenses over the local variety. The high expenditure is attributed to expenses on fertilizers and plant protection. The expenses on seed, fertilizer and insecticides for the high yielding variety was found to be a little over three times more than that of local varieties. The net returns from high yielding varieties was found to be highly significant, with an yield which was more by three times over the local variety.

Pandey (1972) studying on the high yielding varieties of paddy in Varanasi district observes that human labour was the main item of input for both high
yielding as well as local varieties. Manuring and bullock labour followed these. The average input cost for high yielding varieties was found to be higher than local varieties. The cost per unit showed a decreasing trend to the increase in size of farm.

Singh et al. (1972) studied 'Socio-economic factors and the adoption of improved farm practices'. They are of the opinion that it is the adoption of new farm technology which is necessary for increasing food production. New technology can double or even triple agricultural production in less development areas. But the adoption of this technology has not been evenly distributed. Thus, the new agricultural strategy has brought economic disparity with increased prosperity in the agricultural sector. Whereas some sections of the farm population have been able to increase their farm income, other sections have lagged behind.

Through empirical analysis the authors concluded that the income generated through sources other than agriculture, participation in economic institutions, contact with extension agencies, educational level of the family and farmer and exposure to urban centres are the important socio-economic factors which act as
motivational forces for adoption of new agricultural technology in North-Western Uttar Pradesh.

Majumdar (1973) conducted study on crop pattern production targets and strategic intervention in Kerala. The study revealed an increase in the agricultural production at the average rate of 2.9 per cent per annum in the post-independence period on contrary to 0.25 per cent per annum before independence.

Evenson and Jha (1973) conducted a study on "The contribution of agricultural research system to agricultural production in India" at several International Research Centres and concluded that residual growth of the productivity by the subtracting annual input growth rate from annual output growth. He observed 0.43 per cent residual productivity growth during the period 1953-56 to 1958-61, 0.66 per cent during the period 1958-61 to 1963-65, and 1.93 per cent during the period 1963-65 to 1969-71.

Singh and Patel (1973) after analysing data collected in Meerut district, concluded that increasing returns to scale are operating on sample farms in the district. They also found out that inverse relationship does not hold true under new agricultural technology in the area under study.
Singh and Sirohi (1974) conducted a study on disparities in agricultural growth and equity in India in Delhi. From the study the authors concluded that in the pre-green revolution period the growth rate of production of wheat was slightly less than fourth times in comparison to green revolution period. In the pre-green revolution period there was very small difference in the growth rates of production of paddy and bajra. They further suggested that for augmenting the food grain production development of irrigation was essential. They also observed a high correlation between per hectare yield of wheat and the percentage irrigated area of wheat to the total area.

Singh (1975) made a study, how the productivity of inputs and returns to scale differ between the two farm sizes. 7.16 acres (5.08 ha) operated area have been considered as small size farms and above as large size farms. The higher marginal product of land on the small farms seems to be due to the higher use of human labour and bullock labour per hectare of land input. He found that the ratio of total cost to total output is higher in the case of small farms than the large farms.
Pal (1975) conducted a study on the impact of new rice technology on farm practices and the use of inputs, in Cuttack district, Orissa. He found two significant changes in the study area. Rice emerged as a single major crop in the dry season and the use of new inputs such as chemical fertilizers, pesticides became as accepted practice. Since the introduction of modern varieties, farmers were more aware of diseases and pest problems in the study area. And also he found that the use of modern variety of rice seeds, chemical fertilizers and pesticides have increased profits from rice cultivation.

Hanumantha Rao (1975) conducted a study on 'Technological change and distribution of grain in Indian agriculture' in Kerala. He concluded that inter state disparity in productivity of major food crops per hectare increased as a result of technological change. He further revealed that the viability in output of major food crops did not increase owing to the compensatory change in area allotted to these crops. States variation in the per capita output of food grain as a whole increase because crops like wheat and bajra which experienced a break through in output showed higher variability than other crops.
Gupta et al. (1976) attempted to measure the productivity of various agricultural resources and to examine the possibility of increasing the returns by re-allocating the existing resources, optimally on wheat farms in Mandi district of Himachal Pradesh, where Indo-German Agricultural Project had been under operation since 1962-63. They found that improved seed, organic manure and fertilizers are highly responsive as compared to human and bullock labour. They suggested that, human labour should be provided off farm employment opportunities so that it may decrease the cost of labour input on one hand and supplement the farmers income on the other.

Lal (1976) conducted a study on short duration pulses to fit into multiple cropping and found that India grows a large number of pulse crops all the year round. However, their yield in term of per unit area and time is quite low. The low yields are mainly due to poor management to which these crops are exposed and the cultivation of varieties of low yield potential. The study revealed that the low yield of kharif pulses was mainly due to late maturity, susceptibility to too many diseases and insect pests and excessive vegetative growth which results in poor seed setting. The varieties
are unsuitable for any different cropping. With the introduction of high yielding varieties of cereals and millets the pulses are facing tough competition, so much so that in the areas under assured irrigation they are being pushed out of cultivation. For making cultivation of pulses remunerative to the farmer and for fitting them in various multiple or relay cropping sequences, a breeding programme at the Indian Agricultural Research Institute, New Delhi, and various Agricultural Universities or Institutes in the country was carried out for evolving short duration varieties of kharif, arhar, urd, moong and cowpea.

Desai (1977) conducted an analysis of cropping pattern of farm families in Surat district through specification and estimation of an econometric model to explain the cropping pattern of a group of farm families. The analysis was based on 85 sample farmers of Surat district (Gujrat) in Western India.

He demonstrated the importance of non-price variables in explaining the cropping pattern of a set of farmers in Surat districts. It also shows that the use of linear probability method without imposing restrictions on its parameters performs fairly satisfactory. Finally, increasing availability of net
irrigable land would shift the crop pattern in favour of more remunerative and also labour intensive crops such as sugarcane, banana, HYVs paddy. This shift would in turn increase the net income of an average farmer. The increased net income (about ₹.2000) would enable him to recover the investment of ₹.14,088 for acquiring lift irrigation system in about seven years.

Dharam (1977) conducted a study on "Growth of productivity in Indian agriculture" in Karnal district. He examined that since independence, growth performance of Indian agriculture had failed to get accelerated despite the sources had changed over time. He further concluded that about 70 per cent of the increase in productivity in the year 1952-53 to 1960-61 was due to changes in cropping pattern and the locational shifts of areas under individual crops and only 30 per cent increase in productivity was due to increase in per hectare yield. According to him the growth of productivity is made up of three components viz., changes in cropping pattern, locational shift in areas under individual crops and pure increase in the yield of individual crops.

Easter et al. (1977) in a study attempted to measure the contribution of various inputs to total
output in the Eastern rice region of India. They included both the traditional inputs such as land, labour and fertilizer as well as non-traditional inputs such as irrigation technology, environmental factors and infrastructure. They estimated production function in long term using district level data and found that the production elasticity on surface road ways was highly significant. Increase in irrigation the improved rice varieties are important sources of output growth.

Vidya Sagar (1977) conducted a study on "A component analysis of the growth of agricultural productivity in Rajasthan at Nanded, Akola, Amroli and Achalpur research stations". He concluded that the overall growth rate in aggregate population during 1956-61 to 1969-74 was about 40 per cent and annual growth was 38.45 per cent of the output growth. He further revealed that other positive components of output growth were 7.82 per cent due to changes in relative price structure and 3.5 per cent due to interactions between changes in cropping pattern and yield.

Sridharan and Radhakrishnan (1978) conducted "A study on factors affecting changes in the cropping pattern in Nilgiri district, Tamil Nadu" and they
concluded that there was no shift in the cropping pattern between 1966-67 to 1976-77. The acreage allocation between the crop is influenced by physical, economical, biological and sociological factors. According to them 'shift' occurs when area under crops are arranged in increasing or decreasing order and if they did not exhibit similarity between them.

Chamak et al. (1979) surveyed different categories of 60 farmers to examine the resource efficiency in Punjab. They found that land and working capital were significant variables, whereas bullock labour was a significant variable adversely affecting the output. They explained that sacrifice of land and other resources to maintain bullocks may be the cause for that phenomenon. Production elasticity was found to be negative which may be due to its lumpy nature.

Ram and Gupta (1979) attempted to compare the productivity of various agricultural resources in case of paddy on the farms of adopters and non-adopters in Chandauli block of Varanasi district. They found that coefficient of all the resources are significant indicating that yield can be increased by using more of the resources. The marginal value products of all the inputs are quite high on adopter farms than on non-adopter
farms. There is further scope for increasing the use of these inputs on both adopter and non-adopter farms to increase income and profit.

Alagh and Sharma (1980) observed that the high yielding varieties were introduced during the crop year 1965-66 but their impact on agricultural production could be seen only after 1969-70. The production of food grains was 89.4 million tonnes in 1964-65. In two subsequent years it was 72.3 and 74.2 million tonnes, respectively. Only in 1967-68, it crossed the level of 1964-65 i.e. 89.4 million tonnes. The study shows that in Uttar Pradesh, sugarcane is the most important crop of the state, witnessed a negative growth rate (-0.21 per cent) upto 1969-70 but improved during period 1969-70 to 1978-79 (2.55 per cent). Major oil seeds showed -0.61 per cent growth in 1969-70 to 1978-79 and 2.77 per cent during 1960-61 to 1969-70 through states contribution in total oil seeds production in the country is the highest (19.5 per cent).

Ranade (1980) conducted a study in the 268 districts of 16 states of India and concluded that marginal fluctuations in cropping pattern in a region can increase agricultural productivity even if use of fertilizers and irrigation remain unchanged. In order
to examine the effect of fertilizers, irrigation and cropping pattern separately, ordinary least squares (OLS) method was used and then the significance of different variables was assessed.

Rath (1980) has mentioned in note on agricultural production in India during 1955-78 that in post 1965 period only wheat and ragi had been able to keep up their past performance. Wheat has gained in area not because of increase in the irrigation facilities during rabi season but also at the cost of crops like barley, gram and cotton. Growth in production of rice declined at the rate of 2.77 per cent in this period. The general performance of agricultural production and yield rates was poor during the period 1964-65 to 1970-71 and improved during the seventies. During 1973-78 rice production for the first time recorded a growth rate of 4.30 per cent. In case of wheat which had a growth rate of about 11.66 per cent during 1964-72 registered only 4.05 per cent growth rate during seventies.

Dikshit et al. (1981) found that the recent advances in the development of short duration photo-insensitive and high yielding varieties of rice have made impossible to adopt multiple cropping in the jute growing tracts of Orissa. A sizeable acreage of
cultivated land in the coastal districts of the state is annually devoted to jute crops.

The ultimate criterion to select the best crop rotation is the economics of the production. It is evident from the rotation of jute-rice-potato which gave the highest net profit of ₹.7076 per hectare per year followed by jute-rice-rice with net profit of ₹.6084.

Ved Prakash et al. (1982) conducted a study at Vivekananda Parvatiya Krishi Anusandhan Shala (VPKAS) experimental farm, Hawalbagh (Almora), explored ways of increasing cropping system intensity. The local rotation was compared with five improved crop sequences, four of which used early-maturing experimental rice varieties.

Average grain yield of June-seeded experimental varieties equaled that of spring-seeded rice. June seeding made 2 annual rice crops possible. Rapeseed included in the spring sequence produced a reasonably good yield (0.8 t/ha).

Highest average annual net return and benefit cost ratios were recorded using a June-seeded rice-chickpea rotation followed by rice-lentil, rice-field pea and rice-wheat sequences.
Results show that changing from traditional dry land rice rotations to more intensive cropping sequences using early maturing varieties suitable for June seeding is profitable. Planting legumes in rabi season helps economize fertilizer use.

Chadha and Shrama (1982) made a study to examine whether the inverse farm size-cropping intensity relationship exists for Indian agriculture as a whole, after the arrival of the green revolution. The relationship was examined separately for each of the 318 districts of India spread over almost in all the states. They found that there was a strong evidence in favour an inverse farm-size cropping intensity relationship in all the states studied except in Kerala.

Dutta (1982) conducted a study in Ranchi district, Bihar and observed that small farms are relatively more efficient with regard to the production of paddy while large farms are more efficient regarding wheat. He also found that as farm size increases, positive impact of family labour was decreased.

Bal (1982) from his study in Punjab concluded that major part of farm income inequality is due to size of the farm. Human labour and irrigation on small farms reduces this inequalities to some extent. He
concluded that speedy implementation of land reforms is not likely to affect aggregate agricultural production adversely as productivity and farm size are negatively related.

Rao (1983) in one of his articles observed that production and productivity can grow in labour intensive small farms. It is not true to say that to reduce unit cost one has to necessarily resort to large scale agricultural operation as extensive agricultural operation results in diseconomies. He concluded that to reduce cost of production strengthening of small peasant farmers is a must.

Sirbar et al. (1983) studied to analyse the relationship between farm size and productivity in a crop farming area of West Bengal. Random sample of 76 farms, spread over in 11 villages of Birbhum district, West Bengal was taken for the study. The data relates to 1975-76 crop season. Cobb-Douglas production function were used for the observed data. They found that farm size and distribution of holding bears significant on farm productivity. Reorganisation of agriculture through reduction inequality distribution of land holdings and land consolidation policies are expected to enhance farm productivity.
Jagi (1963) attempts to analyse the effect of farm size on productivity, inputs demand and the cost of production based on farm level data, from Haryana state, collected by the economic and statistical organisation of the state for 1969-70 agricultural year. The analysis shows that the irrigated small farms are able to allocate resources relatively more efficiently as compared to irrigated large farms. However, the unit cost of production is higher on the irrigated small farms as compared to the irrigated large farms. In the case of unirrigated small farms the per hectare demand for labour is on an average equal, but the unit cost of production is lower as compared to the unirrigated large farms.