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high-yielding varieties are highly capital intensive, a cultivator has to incur heavy loans and/or squeeze other expenditures to channelize the capital for the introduction of high-yielding varieties. But the time path of investment for high-yielding varieties is rarely smooth, rather it often appears jerky. It has been seen that in the first phase of the introduction of high-yielding varieties when the cultivators are convinced as to its capacity to increase income, the investment tempo goes high for a period. But after reaching a certain level when the income fails to continue a rapid rise, the demand for consumption goods (both of essential and non-essential nature) tends to increase and the rate of investment suddenly declines.

IMPACT OF NEW TECHNOLOGY ON THE LEVELS OF INCOME,
PATTERNS OF INCOME DISTRIBUTION AND SAVINGS OF
FARMERS IN CENTRAL UTTAR PRADESH

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The adoption of new technology by farmers is a function of, among other things, its effect on income. The quicker and greater the rise in incomes resulting from the use of a 'new' technique, the greater is the probability of its being adopted by farmers. Furthermore, the impact of this 'new' technology (or any technology or innovation for that matter) may not be uniform for a country or even for a given region within a country. It may vary from one group of farmers to the other depending upon, among other things, their economic status, resource availability with them, their outlook, education, etc. This means that a given or a new technology affects different types of farmers differently, which may lead to a change in the pattern of income distribution and consequently in that of expenditure, investment and saving.

In this paper data are presented to show the disparities in the levels of income, consumption and investment of progressive farmers in contrast to less progressive and also between the different size-groups in each category. It is hypothesized that inequalities in income distribution have widened due to the impact of the new technology and these are likely to increase further with the advancement of the new technology.

METHODOLOGY

The study¹ was conducted in district Budaun, a representative of the agricultural conditions obtaining in the central part of Uttar Pradesh. Of the 13 blocks in the district, two blocks (Bisauli and Wazirganj) were selected on the basis

1. Changing Agriculture and Rural Life in a Part of Northern India—Socio-Economic Behaviour of Progressive Farmers, U. P. Agricultural University Project.

of their ranking in agricultural performance, viz., predominant use of 'new' improved inputs including high-yielding variety seeds, chemical fertilizers, owned irrigation equipment, agricultural machinery, etc. A minimum of six *gaon sabhas* from each block were selected, again according to their agricultural performance and the net cultivated area in each *gaon sabha*. All the progressive farmers² in these *gaon sabhas* and also 10 per cent of the less progressive farmers with the proviso of no less than 5 and no more than 10 comprising the sample were included in the study. In all, 120 progressive and 91 less progressive farmers were selected. These progressive and less progressive farmers were further classified into three groups, viz., those with less than 10 acres, those having 10 to 30 acres and those with holdings above 30 acres.

The impact of the new technology on the progressive and less progressive farmers and on different size-groups of holdings in each type is reflected in their economic rationality as resource management, use of non-conventional inputs, and building up of farm capital resource like independent irrigation facilities, tractor equipment, etc., on which data are presented. Income, consumption, agricultural working expenditure, savings and investment levels and patterns by type and size-group of holdings are compared. It is seen that income disparities shall widen due to the impact of the new technology between the two types and by size-group of holding in each type. These may widen further due to the predominance of long-term investments by the medium and large progressive farmers.

INCOME LEVELS AND PATTERN

Income is generated through sale of crops mainly wheat, paddy, maize and sugarcane. A new source of income which is emerging with the impact of the new technology is through renting of farm resource such as sale of water, renting of farm machinery. Table I shows the break-up of gross income per farm.

TABLE I—PER FARM GROSS INCOME FROM DIFFERENT SOURCES

		(in Rs.)							
Farmer type		No. of farmers	Operated acre per farm	Gross crop income	Gross farm business income	Gross agricultural income	Income from farm stock disposal	Non-agricultural income	Gross income from all sources
<i>Progressive</i>									
Small	..	38	6.34	1,125	168	1,293	153.2	585.1	2,031.3
Medium	..	63	17	8,312	525	8,837	847	1,552	11,236
Large	..	19	40	17,942	1,153	19,095	1,611	1,474	22,180
<i>Less progressive</i>									
Small	..	47	6	1,278	422	1,700	184	438	2,322
Medium	..	41	16	2,163	120	2,285	445	334	3,064
Large	..	3	35	4,000	17	4,017	975	833	5,825

2. A progressive farmer was defined as one who met at least three of the following conditions: (i) having 30 per cent of his own area irrigated; (ii) having at least one agricultural machinery; (iii) having at least 20 per cent of his cropped area under HYV; (iv) using chemical fertilizers in 20 per cent of his sown area; (v) having an owned means of irrigation.

In view of the wide variation in the size of the operated area, Table II has been prepared which gives the figures on per acre basis. In this table a break-down of cereal and non-cereal crop income and business income is also given.

TABLE II—GROSS INCOME PER ACRE FROM FARM OUTPUT, CROPS SOLD AND FARM BUSINESS

(in Rs.)

Farmer type	Income from crops sold				Income from farm business				Total farm output income
	Four major cereal crops	Sugar-cane	Other crops	Total	Sale of animal products	Sale of irrigation products	Rent out of tractor threshing equipment	Total	
<i>Progressive</i>									
Small ..	185	136	87	408	16·8	0	0	16·8	424·8
Medium ..	225	136	117	478	7	12	11	30	508
Large ..	274	90	80	444	9	8	11	28	472
<i>Less progressive</i>									
Small ..	81·78	45·5	54	181·30	61·3	0	0	61·3	242·60
Medium ..	58	22	62	142	8	0	0	8	150
Large ..	200	106	43	349	0	0	0	0	349

INCOME DISPOSAL : AGRICULTURAL WORKING EXPENDITURE AND SAVINGS

The only direct charge on the income of farmers is land revenue, which is an insignificant portion of the income of farmers in all size-groups of holdings. Agricultural working expenditure of progressive farmers in new inputs has gone very high. With increased income, the consumption level has also gone high as is observed from Table III.

TABLE III—INCOME, EXPENDITURE AND SAVING

(in Rs.)

Farmer type	Gross income: agricultural and non-agricultural	Revenue paid	Agricultural working expenditure	Net income	Consumption	Saving
<i>Progressive</i>						
Small ..	2,031	21	1,559	451	1,532	—1,081
Medium ..	11,237	51	5,078	6,108	5,965	143
Large ..	22,180	173	13,211	8,832	9,958	—1,126
<i>Less progressive</i>						
Small ..	2,322	28	1,201	1,093	2,442	—1,349
Medium ..	3,202	34	2,329	839	3,929	—3,090
Large ..	5,825	110	1,253	4,462	3,513	949

TABLE IV—PER ACRE AGRICULTURAL WORKING EXPENDITURES

(in Rs.)

Farmer type	Traditional expenditures			New inputs								Grand total working expenditure	Percent-age of new inputs			
	Labour	Animals	Total	Irriga-tion: im-ported water	Owne-d irriga-tion equip-ment	Total	HYV seed	Chem-ical fertili-zer	Plant protec-tion	Machi-nery and vehicles	Total new inputs					
<i>Progressive</i>																
Small	223	132	255	20·17	12	32·17	20·17	14·46	1·7	1·27	69·77	324·77	21
Medium	105	46	167	10	34	44	16	52	—	13	125	292	43
Large	109	44	156	10	20	30	25	70	—	46	171	327	52
<i>Less progressive</i>																
Small	88·4	34	122·4	11·65	—	11·65	22·73	16·7	0	10	61·08	183·48	33·3
Medium	84	31	120	10	3	13	3	14	—	3	33	153	22
Large	59·33	32·1	91·43	22·73	—	22·73	4	3·4	—	31	61·13	152·56	40·06

INCOME DISTRIBUTION, SAVINGS AND EXPENDITURE

The saving is positive for the progressive medium and the less progressive large farmers only. It may, however, be seen from Table III that the levels of agricultural working expenditure and consumption of progressive and less progressive farmers vary directly with the size-group of holding in each category.

The working expenditures of farmers are categorised as 'traditional' and 'new.' The traditional inputs are labour and animals whereas the new inputs are HYV seeds, chemical fertilizers, irrigation owned or through imported water, running costs of machinery and vehicles and plant protection material. The expenditures on new inputs are a sort of short-term investments of the farmers as they generate the growth and increase in output which contribute to the increasing farm income. These figures are highlighted in Table IV.

INVESTMENT IN CAPITAL ASSETS

To generate long-term growth, capital formation in agriculture is necessary. The savings of farmers should be invested in capital assets such as irrigation equipment, tractors, farm machinery, farm building, etc., to generate a sustained growth. According to Tara Shukla,³ 'low investments in traditional agriculture are due to low factor substitution between land and capital and between labour and capital. Investment is largely made in traditional assets like cattle, bullock cart ploughs, etc.' 'The new technology brings, in its wake, the need for assured means of irrigation and also mechanization to go in for multiple cropping. The investments in such capital assets have gone up because of the technological advance.'⁴

In this study figures of gross capital investment and disposal of capital stocks were obtained. From these, net capital investment was determined by deducting the income received from disposal of stock assets from the gross capital investment during 1967-68. The figures are given in Table V.

TABLE V—PER FARM NET CAPITAL INVESTMENT IN AGRICULTURE
AND PROPORTIONAL ALLOCATION

		(in Rs.)				
Farmer type		Purchase of animals	Irrigation equipment	Machinery and vehicles	Farm building	Total
<i>Progressive</i>						
Small	.. ..	0	148.9	12.76	276	436.66
Medium	.. ..	223(6)	2,330(62)	1,105 (29)	114(3)	3,782
Large	.. ..	290(2)	3,489(28)	8,210 (65)	632(5)	12,621
<i>Less progressive</i>						
Small	.. ..	—	152	120	—	272
Medium	.. ..	371(22)	688 (42)	375 (22)	239(14)	1,678
Large	.. ..	—	386.6	100.00	—	486.6

3. Tara Shukla: Capital Formation in Indian Agriculture, Vora and Co., Bombay, 1965, p. 39.

4. P. G. K. Panikar, "Capital Formation in Indian Agriculture," *Indian Journal of Agricultural Economics*, Vol. XXIV, No. 4, October-December, 1969. He has developed a similar hypothesis.

Among the progressive farmers the highest proportion of investment is made in irrigation equipment by the medium and large farmers of Budaun. The less progressive farmers have also made similar investments but on a smaller scale. This brings out the great priority that all the progressive farmers give to irrigation.

Investments in farm machinery and vehicles are quite high for the large farmers both the progressive and the less progressive. This is due to the fact that multiple cropping and short duration crops need completion of processes well in time.

CONCLUSION

With the introduction of the new technology, the income levels of progressive farmers have considerably increased. There is a significant difference in the income levels of progressive and less progressive farmers in the different size-groups of holdings. A significant proportion of the gross income of progressive farmers is ploughed back into agriculture by the use of new inputs as HYV seed, fertilizers and irrigation. Considerable capital formation, unprecedented in the annals of Indian agriculture, is going on specially in farm machinery and owned means of irrigation by the progressive farmers. There are variations in the investment between progressive and less progressive farmers and also on different size-groups of holdings. This analysis shows that the new technology has created inequitable distribution of income as is evidenced by the variation between the incomes of progressive and less progressive farmers and also inequalities due to the pattern of working expenditures in new inputs and capital investments by these farmers.

IMPACT OF HIGH-YIELDING VARIETIES OF CROPS ON PATTERNS OF INCOME DISTRIBUTION

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The impact of high-yielding varieties is in evidence in various sectors of agricultural economy—land utilization, cropping pattern, employment of human and bullock labour and the levels of earnings of farmers thereby setting in Green Revolution in agriculture. The present study, however, is confined to income distribution as influenced by the high-yielding varieties programme.

Note : The data have been taken from a study entitled "An Appraisal of the Improved Technology on Farm Resources and Farm Returns in Kalyanpur Block, Kanpur," in progress, in the Division of Agricultural Economics, U.P. Institute of Agricultural Sciences, Kanpur.