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Vol XX
No. 1

ISSN 0019-5014

CONFERENCE
NUMBER

JANUARY-
MARCH
1965

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

that would increase farm income including price support measures would be helpful to capital formation.

Migration and resettlement of a community often lead to new ways of living at the cost of traditions and conservatism. Greater degree of capital formation in the village of Pabakhali is a development in the wake of new patterns of living. Growth of market, urbanization and greater progress of development efforts around Chadiapalli obviously induced new investment in this village including introduction of new crops on a large scale, introduction of improved variety of sugarcane and enhanced rate of application of fertilizers.

Similarly, inadequacy of development efforts in Hussainabad accounted for deficiency of this village in capital formation.

Development projects should, therefore, be so designed as to promote new institutions and patterns of living as well as a comprehensive credit system which would provide an effective stimulus to accumulation of physical capital—an essential condition for maintaining a continuous increase in agricultural production.

POSSIBILITIES OF CAPITAL FORMATION IN AGRICULTURE IN CUTTACK (ORISSA)

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In this paper an attempt is made to study the effects of irrigation and size of farms on capital formation in agriculture. The study is confined to Jagatsinghpur police station of Cuttack district in Orissa. The study refers to the year 1961-62.

Sampling Technique

Jagatsinghpur police station has 366 villages out of which 28 villages are unirrigated and the rest are canal irrigated. All the villages were stratified into irrigated and unirrigated villages and one from each category was selected at random with probability proportional to cultivating population. The sample villages were further classified into five size-groups of 0-2, 2-4, 4-6, 6-8, and above 8 acres. From each of the villages and from each of the size-groups, two farms were selected at random for the purpose of the study. Thus 20 holdings were selected out of the two sample villages. They constituted about 17.30 per cent of the total cultivated area of the sample villages. The enquiry was conducted by survey method.

Background of the Villages

In the irrigated village, the entire cultivated land is irrigated by canal whereas only 18 per cent of the net cultivated area of the unirrigated village is irrigated by one river channel for about 3 to 4 months in a year. Again, the unirrigated village is subject to frequent floods. Compared to the unirrigated village, there is greater importance of paddy (*khariif*) and potato (*rabi*) in irrigated village. Similarly, extensive *rabi* pulses like black and horse gram assume relatively greater importance in unirrigated village. However the difference in the crop pattern between the villages is not very wide. Another notable difference between the two villages is that proximity of rivers and large pastures make it possible for greater reliance on supplementary enterprises like fishery and dairy in the unirrigated village whereas no such facility is available in the irrigated village.

Estimates of Income

A study of capital formation in agriculture needs an analysis of income and expenditure so as to indicate the extent of investible surplus and to analyse the patterns of investment. The following section makes an estimate of income in both the sample villages. The total income of a farming family constitutes (a) farm income and (b) non-farm income. The former constitutes farm business income¹ from the main enterprises like dairy, fishery, forestry, poultry, etc. The non-farm income constitutes the earnings derived from different sources or professions like pottery, blacksmithy, weaving, services, etc.

Table I shows the difference in total income between the two villages and among the different size-groups of farms.

TABLE I—VARIATION OF TOTAL INCOME IN DIFFERENT SIZES OF FARMS UNDER IRRIGATED AND UNIRRIGATED CONDITIONS

				(In Rs. per farm)	
Size of farms (in acres)				Irrigated village	Unirrigated village
0—2	..	..	..	875·17	883·96
2—4	..	..	..	1,692·79	1,490·53
4—6	..	..	..	2,121·18	1,815·06
6—8	..	..	..	2,284·90	2,292·15
8 and above	..	..	..	3,012·73	3,124·20
Average	..	..	..	1,997·35	1,921·18

Table I shows that while the inter-farm difference in the total income is significant at 1 per cent level of probability with 4 and 10 degrees of freedom for numerator and denominator respectively, the inter-village difference in this regard is not significant. Since the total income is the combination of both farm business and non-farm income, there is need to split up the total income into its components to study how far irrigation as an important factor brings about increased farm

1. Includes net profit, family labour wages and interest on owned capital from individual enterprises.

business income. Table II points out the nature of variation of total farm business income. Since irrigational facilities affect the farm business income mostly from crop husbandry, the nature of variation of the same from this enterprise alone is considered here.

TABLE II—DISPERSION OF FARM BUSINESS INCOME FROM CROP HUSBANDRY AMONG DIFFERENT SIZES OF FARMS WITH AND WITHOUT IRRIGATION

				(In Rs. per farm)	
Size of farms (in acres)				Irrigated village	Unirrigated village
0—2	..	..	..	291.57	206.92
2—4	..	..	..	650.56	502.71
4—6	..	..	..	934.91	636.39
6—8	..	..	..	1,510.39	562.73
8 and above	..	..	..	2,161.84	1,317.26
Average	..	..	..	1,109.85	645.20

It is evident from Table II that there is considerable difference of income between the farmers of the irrigated and unirrigated villages. The 'F' test also reveals that farm business income per farm between the two villages is significant at 0.01 confidence level. Since there is no major difference in crop pattern between the two villages, the above difference in the farm business income is due mostly to the difference in yield rates arising from irrigation.² Equally significant is also the difference in the income among different sizes of farms in both the villages. Further, it has also been observed that the farm business income from farm sources other than crop husbandry is significantly greater in the unirrigated village than in the irrigated village and that the relative importance of dairy, fishery, poultry, etc., is much greater in the latter village.³ With regard to the non-farm income from sources such as blacksmithy, carpentry, masonry, pottery, etc., the income difference between the two villages remains non-significant.

Levels of Consumption

Though income constitutes the main source of capital formation, it cannot alone determine the size of capital formation. The expenses on consumption has to be set apart from the total income to get an estimate of the surplus that may be available for investment in agriculture. Hence, an appraisal of the ability to save needs an estimate of the levels of consumption among the farmers having different sizes of farms with and without irrigational facilities.

The items included in the estimate of the levels of consumption are food clothings, housing, fuel and light, medicines, education, social ceremonies, intoxicants and other miscellaneous expenses. Table III shows that while an average family in the irrigated village spends Rs. 1,586.05 on consumption, its counterpart in the unirrigated village goes well above it by more than Rs. 200. This difference in levels of consumption appears to be significant.

2. *Vide* Risk and Uncertainty in Agricultural Production in Cuttack, *Indian Journal of Agricultural Economics*, Conference Number, Vol. XIX, No. 1, January-March, 1964, pp. 103-106.

3. *Ibid.*

TABLE III—DISTRIBUTION OF TOTAL LIVING EXPENSES AMONG VARIOUS FAMILIES OWNING DIFFERENT SIZES OF FARMS WITH AND WITHOUT IRRIGATION
(In Rs. per household)

Size of farms (in acres)				Irrigated village	Unirrigated village
0—2	..	..	..	686·03	765·70
2—4	..	..	..	1,381·15	1,370·76
4—6	..	..	..	1,653·95	2,131·22
6—8	..	..	..	1,793·66	2,063·02
8 and above	..	..	..	2,315·45	2,663·41
Average	..	..	..	1,586·05	1,798·82

Since there is no difference in income between the two villages, the difference in levels of consumption takes place mainly due to greater pressure of population in the unirrigated village. Population figures show that while the average size of family in the irrigated village is 6, it is 10·20 in the unirrigated village. The difference is significant at 1 per cent level of probability.

But between farms of different sizes, there is no significant difference in population pressure. Difference in consumption levels here is mainly due to variation in income. The "F" test reveals that the levels of consumption among different sizes of farms is highly significant. Further, the correlation coefficients between total income and family living expenses are estimated at 0·87 and 0·90 for the irrigated and unirrigated villages respectively. With 8 degrees of freedom both the coefficients are significant at 1 per cent level of probability. There is, therefore, a strong evidence for the existence of a positive correlation between the levels of income and family living expenses.

Before estimating the investible surplus between the irrigated and unirrigated villages with same level of total income and differing family expenses it is necessary to study their outstanding current loans.

TABLE IV—OUTSTANDING CURRENT LOANS PER FAMILY BETWEEN THE SAMPLE VILLAGES AND FAMILIES OWNING VARYING SIZES OF FARMS
(in Rs. per family)

Size of farms (in acres)				Irrigated village	Unirrigated village
0—2	..	..	..	110·00	120·00
2—4	..	..	..	86·00	90·00
4—6	..	..	..	45·00	102·50
6—8	..	..	..	50·00	77·50
8 and above	..	..	..	—	200·00
Average	..	..	..	58·20	118·00

Table IV shows that while the inter-village difference in the amount of outstanding current loans is significant at 5 per cent level of probability, between farms, difference is found to be non-significant. The volume of debt per family

in the irrigated village is much less than the corresponding amount in the unirrigated village. This is due to the fact that farmers in the unirrigated village are relatively worse off than their counterparts in the irrigated village due to frequent floods and pressure of population. It is further found that out of the total loans transacted, the farmers of the unirrigated village spend relatively more on consumption than on production. While 49.77 per cent of the total loans is utilised for consumption in the irrigated village, loans for consumption constituted 58.94 per cent in the unirrigated village.

Net Amount Available for Capital Formation

An estimate can now be made of the extent of net amount available for capital formation in agriculture with and without facilities for irrigation in different size-groups of farms. The relevant data are presented in Table V.

TABLE V—EXTENT OF NET AMOUNT AVAILABLE FOR CAPITAL FORMATION IN DIFFERENT SIZE-GROUPS OF FARMS IN THE TWO CATEGORIES OF VILLAGES

Size of farms (in acres)	(in Rs. per farm)	
	Irrigated village	Unirrigated village
0—2	79.10	—1.73
2—4	225.64	29.77
4—6	322.23	—418.66
6—8	444.24	151.63
8 and above	697.28	260.79
Average	353.11	4.36

N.B. The net amount available for capital formation has been computed by deducting from the total investible surplus the outstanding current loans.

Table V shows that the net amount available for capital formation is much greater in the irrigated village than in the unirrigated village. This is due to, as has been indicated earlier, the fact that in the unirrigated village, more is spent on consumption owing to pressure of population. There is also a substantial rise in investible surplus with the increase in the size of farms. This is indicative of the fact that larger farms have significantly greater scope for securing net available surplus for capital formation than the smaller ones. The deviation marked in the third size-group of the unirrigated village may be ascribed to sampling fluctuation.

Capital Formation

The net fund available is only an indication of the ability of farmers to save under varying conditions. The actual size of capital formation may be more or less than the net fund available. The following estimates are prepared to bring out the extent of capital investment in the two villages and under different size-groups with and without irrigation.

TABLE VI—EXTENT OF NET CAPITAL FORMATION AS PERCENTAGE OF TOTAL INCOME FOR FAMILIES OWNING DIFFERENT SIZES OF FARMS IN IRRIGATED AND UNIRRIGATED VILLAGES

Size of farms (in acres)		(in Rs. per farm)							
		Capital formation		Total income		Capital formation as percentage of total income			
		Irrigated village	Unirrigated village	Irrigated village	Unirrigated village	Irrigated village		Unirrigated village	
0—2	.. ..	47.75	23.30	875.17	883.96	5.46		2.62	
2—4	.. ..	145.20	80.56	1,682.79	1,490.53	8.52		5.41	
4—6	.. ..	275.70	115.37	2,121.18	1,815.06	12.99		6.32	
6—8	.. ..	425.60	210.38	2,284.90	2,292.16	18.63		9.18	
8 and above	.. ..	580.68	350.00	3,012.73	3,124.20	19.27		11.20	
Average	.. ..	294.99	155.92	1,997.35	1,921.18	14.77		8.11	

The above estimate of the net capital formation has been arrived at after allowing for the normal depreciation and repair charges of the capital assets. The average investment on capital formation by the farmers in the irrigated village is significantly higher than that of the unirrigated village. Between farms, the difference in this regard is also highly significant. The inference that can be drawn from this is that, irrigation has got a significant effect on the volume of capital formation as judged from the percentage of income devoted to capital investment. In estimating the net amount available for capital formation, it has been pointed out that the farmers in the irrigated village have greater possibilities of securing surplus for investment on farms than their counterparts in the unirrigated village. Even if the volume of capital formation is considered independent of total income and the net investible surplus, the farmers in the unirrigated village are found to be unmindful of any improvement on their farms. The reason is not far to seek. The greater frequency of flood and complete absence of remedy from drought introduce greater risk and uncertainty in agricultural production.⁴ Therefore, the farmers of the unirrigated village have less reliance on land and consequently low incentive to invest on crop husbandry. Apart from the fact that larger farms have significantly greater investment on acquisition of capital goods, there is evidence of strong positive correlation between the sizes of farms and volume of investment both in irrigated and unirrigated villages; the coefficients being 0.94 and 0.93 respectively. Both the correlation coefficients are significant at 1 per cent level of probability with 8 degrees of freedom. In larger farms the income per farm is greater which ultimately results in a larger amount of surplus in these farms. Thus a substantial farmer is capable of investing more in the acquisition of new assets than a small farmer.

Investment Pattern

The quantum of average capital formation per family presented above can be split up into various constituents of investments made to increase the productivity of land. Table VII illustrates the same.

4. *Op. cit.*, p. 102.

TABLE VII—CONSTITUENTS OF THE AVERAGE CAPITAL INVESTMENT PER FARM AND THEIR PERCENTAGE TO THE TOTAL BETWEEN THE TWO CATEGORIES OF VILLAGES

Particulars of investment	Investments (in Rs.)		Percentage to Total	
	Irrigated village	Unirrigated village	Irrigated village	Unirrigated village
Equipment	27·18	14·25	9·21	9·14
Land	50·50	20·10	17·12	12·83
Land reclamation	55·70	37·27	18·88	23·90
Buildings	34·89	37·92	11·83	24·32
Irrigational structure	41·47	7·08	14·06	4·54
Orchard	22·05	8·85	7·48	5·68
Livestock	63·20	30·55	21·42	19·59
Total	294·99	155·92	100·00	100·00

Table VII shows the relative importance of various productive investments made on the farms between the two sample villages. Farm animals are most important assets of the farmers. This has almost equal importance in the two villages. Next to livestock comes investment on land reclamation. This item of investment is relatively more important in unirrigated village since the removal of sand deposited on the fields is very expensive and frequent. It means that while the farmers of the irrigated village invest on increasing the productivity of land, their counterparts in the unirrigated village spend a considerable amount of money on maintaining the existing level of the productivity of land. A greater percentage of the investment is in the shape of farm buildings in the unirrigated village. The frequent occurrence of flood necessitates greater investment on permanent farm buildings. The other constituents of capital formation however do not present a sharp difference.

Summary and Conclusions

(i) Though the irrigated village has relatively higher level of farm business income from crop husbandry, the total income of farms in the irrigated and unirrigated villages remains same due to greater reliance of the latter on supplementary enterprises.

(ii) Though the level of total income remains same between the irrigated and the unirrigated villages, the farmers of the former have better ability to save due partly to less family expenses arising out of smaller family members and partly to less outstanding current loans.

(iii) The farmers in the irrigated village invest relatively more money per farm both in absolute quantity and in terms of percentage to total income on the acquisition of new capital assets and on improvement of farms. The difference is ascribed to greater dependence of the farmers in the irrigated village on crop husbandry. Due to greater frequency of floods and conspicuous absence of any remedial

measures from drought, the farmers of the unirrigated village have less reliance on land. This discourages them to bring about improvement on their farms.

(iv) It is observed that larger farms have significantly higher level of income, greater family expenses, superior ability to save as reflected by the net investible surplus and relatively more of investment on the improvement of land.

A STUDY OF FARM INVESTMENT IN THREE VILLAGES IN ORISSA

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In a predominantly agricultural State like Orissa, economic development is intimately connected with agricultural development. The modernisation and improvement of agriculture with the help of technical advances necessitate large amounts of capital investment per agricultural unit. The larger the proportion of current output that the cultivating families are able to invest in their farms, the greater would be the increase in the productivity of land and therefore the rate of economic development. But as most of the cultivating families are living just on the subsistence level, it is often found that many cultivating families consume a very large proportion of their output to the neglect of investment on their lands. In order to make an investigation on the pattern of farm investment, a survey was conducted in some of the villages of Orissa in August, 1964.

Methodology

The data presented in this paper were collected in three villages, namely, Barodia (to be known hereafter as village No. I), Nuadhan (village No. II) and Damodarpur (village No. III). All the three villages are situated in the Cuttack district of Orissa. Of these three villages, No. I and No. II were selected from the non-irrigated and irrigated villages of a development block respectively on the basis of stratified random sampling method and No. III was selected according to convenience of collection of data. Originally the idea was to conduct the survey in four villages—two from the irrigated area and two from the non-irrigated area which was exposed to flood, drought and other natural uncertainties. As information from the fourth village which is situated in non-irrigated area could not be obtained in time, ultimately three villages only were taken for the study. The total number of cultivating families in the village No. I was 100 and 40 families were selected, thus giving a representation of 40 per cent of the families in the sample. Similarly, in the village No. II out of a total number of 75 cultivating families 30 were selected on the basis of random sampling method thus giving a representation of 40 per cent. In the village No. III out of 51 cultivating families,