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and Rs. 293 respectively. The annual gross value of output per acre from agriculture proper is also very low and works out to Rs. 109 in 1950-51, Rs. 138 in 1955-56 and Rs. 162 in 1960-61 at constant prices. Thus the overall investments per acre constitute 7 per cent of the gross value of output per acre at the end of the First Plan and 7.4 per cent at the end of the Second Plan. During the Third Plan also it is expected that the proportion between the investment per acre and the estimated gross value of the output per acre will be more or less same. The rate of investment per acre appears to be too low to increase the rate of productivity in agriculture. Again the proportion between capital formation and investment in agriculture in the three Plan periods works out to 11.5 per cent, 17.6 per cent and 21.9 per cent respectively. Unless the savings through private investment in the rural sector is increased considerably, any addition of investment in public sector alone will hardly be able to increase the output considerably. All the possible fields of investments in agriculture either at the public sector or at the private sector and the harmonious utilisation of labour and material resources need to be fully explored during the Fourth and successive Plans so that the agricultural sector can contribute significantly to the national income of the country and meet the demand for agricultural commodities both for increased internal consumption due to higher rate of growth of population and for higher exports.

PACE AND PATTERN OF CAPITAL FORMATION ON FARMS*

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In India, the rate of industrial growth will largely depend on the quantum of surpluses made available by agriculture, which by far is the most important industry of the country. Before 'agriculture' could do so, it has itself to make a great leap forward. The pace and pattern of capital formation in agriculture therefore holds the key not only to agricultural but also industrial growth.

EXTENT, PACE AND PATTERN OF CAPITAL FORMATION

The value of capital stock held at two points of time (1950-51—1962-63), at constant prices, was calculated for a sample of 30 farms located in Block Swar in the Rampur district in Uttar Pradesh, belonging to different size-groups of holdings.[1] The total value of stock held in January-February,

* The paper is based on a study conducted by the author and Mr. M. L. Sudan, now in the Department of Economics, National Academy of Administration, Mussoorie, on behalf of the National Institute of Community Development.

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1. The selected farms were grouped under four size-groups, *viz.*, small (less than 5 acres) medium (5-10 acres), big (10-20 acres) and large (above 20 acres) and the number of farms taken from each size-group of holding was roughly in proportion to their total number in the population. More representation was, however, given to the bigger farms which have made visible forms of capital formation but were too small in number to come into the sample otherwise. In presenting aggregates, the magnitude was deflated to the extent we over-weighted such farms. The sample of farms selected for study was fairly representative of the village and the district where these were located. The enquiry was conducted personally by the author and one of his associates by the survey method.

1963, in the form of livestock, improved tools, implements and machinery, traditional tillage implements, bullock carts, farm housing and cattle sheds (residential buildings excluded), irrigation works and completed land improvement works,[2] was Rs. 209, Rs. 202, Rs. 240 and Rs. 478 per acre on the small, medium, big and large size farms respectively. This compares well with the value of capital stock held in 1951 (Jan.) which comes to Rs. 162, Rs. 129, Rs. 115 and Rs. 375 respectively.

Changes in the value of capital stock in the forms mentioned above, during this span of 12 years are shown in the Appendix. The overall rate of increase in the value of capital stock held by the sampled farmers was of the order of 30 per cent, *i.e.*, a simple rate of 2.5 per cent increase per year. The rate of increase in capital accumulation, however, varied between 28 per cent and 109 per cent during these 12 years on different size-groups of holdings. Farmers in the size-group of 10-20 acres more than doubled their assets. Increase in their assets was the highest recorded for any other category of farmers. The rate of increase in the value of capital assets was almost same in case of the smallest and the biggest cultivators. The annual rate of increase in their cases was only 2.3 per cent.

This rate of annual appreciation of capital stock, although falls below the minimum necessary for putting farms on rising production curve, is not so particularly disappointing. Indeed even in U.S.A., agriculture showed only 1 per cent increase in physical farm capital during 1910-1920, no increase or even a slight shrinkage during 1920-1940 and again 1 per cent during 1940-1950.[3] Once O. V. Wells asked the question, "How much capital does agriculture need ?," and suggested that "an increase of about 1 per cent per year would be sufficient to support the upward trend in farm output."[4] The point to be stressed is that the rate of capital formation as such is not very meaningful. It is important to distinguish between additional capital investment of the old brand and additional investment involving new technology. Additions of capital investment, where technology is the same, may also mean under-utilisation and wastage. In fact in India, and also to some extent in this study the small farms are more capital intensive, largely because of the indivisibility of certain forms of capital. This state of over-capitalisation of certain farms has little direct bearing on the output. If, however, the additions to capital are made on farms, which were capital starved and therefore had high marginal productivity for additions to capital, the output may rise, consequent upon the increase in capital stock (even if of the same brand). The point to be emphasised is that the level of physical capital assumes meaning only within a given technological and institutional framework. In a changed technology, wherein the production functions of new capital inputs change, it is possible to produce more, even without any increase in the magnitude of capital.

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2. Completed land improvement works mostly involve the use of manual labour and were valued at the rates of wages paid to the hired labour employed in these projects and by imputing the family labour on the prevailing rates for hired labour at that time. However, the material used in land improvement projects was divided into "home-produced" and "purchased." For the material which was home-produced, value was imputed at the then market price; for the purchased material, the actual purchase price was taken. However, for inter-temporal comparisons, the prices were deflated or inflated to get the value of different projects at some constant price.

3. Alvin S. Tostlebe : Capital in Agriculture : Its Formation and Financing since 1870, Princeton, 1957, p. 13.

4. Contemporary Readings in Agricultural Economics, edited by H. G. Halcrow, Prentice Hall, Inc., 1955, p. 327.

The period of 12 years taken in this study, to measure the rate of capital formation, did not keep the same technological and institutional framework. It was replete with several changes. Theoretically, it could be expected that a change in the form of farm capital, particularly from wooden to iron plough, tractors, weeders, threshers, levellers and irrigation works (of better efficiency), will affect output more substantially than what the increase in the magnitude of capital may indicate. From the output side, therefore, it is change in the pattern or the structure of capital which assumes greater importance than the changes in the magnitude of capital.

PATTERN OF CAPITAL FORMATION

It can be seen from the Appendix that the greatest change has come in irrigation works. Investment in irrigation works has risen from zero to Rs. 6,950. This is a significant addition and should affect output directly as well as indirectly by stimulating the use of short-term working capital, *i.e.*, fertilizer. The next significant change occurred in farm housing and cattle shed. The value of these almost doubled in these 12 years. This, however, cannot be said to have directly affected the output and efficiency of farm business. Increases in the value of traditional tools and implements have lagged behind the increase obtained in the acquisition of improved implements, tools and machinery. This indicates a shift from low-income yielding old technology to high income yielding new technology. All additions to new technology, however, may not mean contribution to output. The value of investment in land improvement project other than those mentioned specifically, *i.e.*, irrigation, showed no change. The only item to show decline was livestock. The value of livestock held in 1963 was 16 per cent less than in 1951. This could perhaps be expected with a change in technology, particularly from bullocks to tractors. Quite logically, therefore, the capital formation in the shape of more and better cattle showed a decline. The reduction in the value of livestock, therefore, may not mean any reduction in output. Rather it may indicate increase in output because of the possibility of area under fodder crops being diverted to the raising of more profitable crops and also because of better input-output ratio achieved through substitution of bullocks by machines. It is under such conditions that the additions or reductions in the farm capital become misleading unless related to the technology.

PATTERN OF CAPITAL FORMATION AND FARM SIZE-GROUPS

In case of small farmers, while there was no change in the value of improved implements, tools and machinery held at two points of time, value of traditional tools and implements increased by as much as 86 per cent. Additional investment in old technology, short of that needed for an economic scale of operation, is worse than no additional capital investment at all. Added to this, these small farmers have made small additions to their livestock, and farm housing. These perhaps may indicate over-crowding of capital on these small farms. Addition of an irrigation well is, however, a welcome feature.

On the two biggest farms, investment in livestock has decreased by 32 per cent and investment in improved and traditional tillage equipment increased by 36 per cent and 35 per cent respectively. Pace of investment in farm housing has again topped the rates achieved in all other capital items. Increase in investment on traditional tillage tools and equipment has closely followed the increase in im-

proved one. This is partly because, after the initial purchase of tractors, tillers and other accessories, not much was added to improved equipment during the last 12 years. But in terms of money, while the investment in improved equipment increased from Rs. 20,003 to Rs. 27,199, it increased only from Rs. 1,724 to Rs. 2,341 on traditional equipment during this span of 12 years. This shows that the available money is being increasingly invested on new technology.

In between these two categories of farms, the remainders have increasingly spent on irrigation works, improved implements and farm housing. In the total addition to the value of capital stock, the share of different forms of capital is given in Table I.

TABLE

Capital items	Percentage share in the increase
1. Farm housing and cattle shed	36.6
2. Improved implements, tools and machinery	30.8
3. Irrigation works	25.6
4. Traditional tillage implements, carts, etc.	4.8
5. Land improvement	2.2

This gives an idea about the allocation of investible funds to different forms of capital. Although farm housing accounted for most of the additions, improved tillage technology and irrigation works have closely followed and taking the two together accounted for 61.2 per cent of the total additions in the value of capital stock. And here lies the promise of increased productivity in agriculture. The change in the value of capital stock, therefore, was not a case of mere additions, but additions of a different type and of a pattern which promises more than proportionate impact on the output.

FINANCING OF THE CAPITAL INVESTMENT

The value of capital stock held in January-February 1963 included carry-over of old capital, replacement through fresh purchases and net additions of new and/or more capital items. As has been already mentioned, there was a net addition of Rs. 26,290 worth of capital stock during this period. There was depletion of Rs. 4,263 in the value of livestock. There was, therefore, a net addition of Rs. 22,027 worth of capital in between these 12 years. The break-up of this amount according to the source of its availability is given in Table II.

TABLE II—FINANCING OF ADDITIONS TO CAPITAL STOCK
(The relative importance of different sources of finance in capital additions)

Size-groups of farms (acres)	Financing by Different Agencies (in per cent)					
	Domestic savings (other than family labour and home produced material)	Borrowings from money-lenders	Borrowings from Government	Borrowings from co-operatives	Family labour and home produced material	Relatives
0—5	46	—	—	8	11	35
5—10	53	—	12	15	8	12
10—20	62	7	—	25	3	3
20 and above	71	—	23	5	1	—

It is significant that the additions to capital stock was, by and large, financed from domestic savings. The role of moneylenders in the financing of capital investment was quite insignificant. Similarly, relatives except in case of small holders were not very important source of finance. Loans from Government and the co-operative societies have also become available for this purpose. The contribution of family labour and material was rather small.

FACTORS AFFECTING CAPITAL FORMATION ON FARMS

The pace and pattern of capital formation is governed both by the factors on the demand as well as supply sides. Although backward agricultural economies are, by definition, greatly in need of capital for the efficient use of their labour and for the exploitation of their natural resources, there are quite a few difficulties which limit the inducement to invest. The comparatively smaller size of holdings does not provide the scope of utilising capital to its full capacity. The smallness of the area over which capital is to be operated also limits the extent of benefit that can accrue to the farmer. Small annual increases in output, as a result of capital investment, are hardly a sufficient inducement for a small farmer to invest. The study showed that the proportion of small farmers owning visible forms of new capital is very small as compared to their proportion in the total farm families.

The rate of capital formation on predominantly small farms can, therefore, be accelerated either by providing the infinitely divisible forms of capital to suit various size ranges or by enlarging the effective area of operation over which a particular form of capital will be utilised. This would mean the ownership of capital, by the community or a group. In this study, acquisition of 'Levelling Karha,' 'Cultivator,' Olpad thresher and allied implements by the Panchayat helped farmers of even small holdings to use them and pay for in proportion to the time they kept in use.

Another important feature of farming, which perhaps affect the demand for capital very considerably, was the extreme state of fragmentation. Even the bigger farms are not free from this. Fragmentation almost precludes any scope for investment in irrigation wells, fencing, farm housing, and various land improvement projects. Because of the physical difficulty of utilising these capital items optimally, the demand for capital remains at a low ebb. Drainage, irrigation channels, fencing and other projects like terracing and bunding, etc., can be planned and executed region-wise and not ownership of the fragments-wise. Here, also, consolidation of holdings, and community action and organisation is needed to increase the scope and therefore demand for capital.

Demand for capital investment in agriculture has been affected by considerations of its marginal productivity in agriculture compared to its productivity in alternative channels of investment. By and large, the innovations in agriculture give low marginal productivity as compared to productivity ratio obtained in alternative channels of investment, for example, moneylending, cane-crushing and plying buses and trucks. A few of the bigger farmers in the village have diverted their savings to non-agricultural pursuits, because of smaller incentive to invest in agriculture. Innovations of high productivity capital as different from the present slow, invisible and low productivity forms of capital, can increase the demand for capital investment in agriculture.

The peculiar physical, soil and geographical conditions of the area also affect the demand for capital. To give an instance, the villagers reported that underground water in sufficient quantities is not available even when the soil is bored deep up to 500 ft. Therefore, it is unprofitable to invest in the construction of tubewells.

To sum up the situation on the demand side, it can be said that the demand for capital is quite limited, not absolutely but relatively, although it may still be larger than the supply. But since the intensity of demand for capital affects the magnitude of capital supply in the long run, if not in the short-run, the demand factors assume importance. The demand for capital can substantially be increased by providing divisible (optimally suitable) forms of capital, in a technical continuum. The only available alternative of wholly sophisticated and modernised forms of capital to the existing traditional technology, presents the problem of technical discontinuum. This necessitates highly discrete and complex resources-combination changes. Community or co-operative servicing, the study reveals, has to play a very important role. Innovations of high marginal productivity have to take the place of only marginally and peripherally productive alternatives available at present. And lastly, investment in social capital either by the local village community or by the State has to proceed in order to provide a critical minimum necessary to induce the farmers to invest.

In the absence of profitable investment opportunities for which the marginal return of capital is well above its marginal cost, it is no surprise that the increased availability of money (from co-operatives and government) resulted in its misuse and wastage.

FACTORS AFFECTING THE SUPPLY OF CAPITAL

The bottlenecks on the demand side are no doubt important, but these are by and large such as can be corrected through internal action, which is within the competency of a country, howsoever under-developed it might be. In contrast, the difficulties on the supply side are more insurmountable and present real problem in capital formation.

Low Capacity to Save

Low savings, due to low levels of incomes, is all too familiar a situation in Indian farming. Table III summarizes the income-expenditure pattern of 30 selected farm families for the year 1962-63.

Table III shows that in the first two size-groups, the level of income was so low that hardly any savings were possible. The two bigger size-groups did exhibit some capacity to save, and were saving. Interestingly enough, the smallest and the biggest size-groups of holdings did not borrow from outside. Small farmers, because of their below-subsistence living, have a high propensity to consume the increments in their output, made possible through the investment of borrowed capital. They, therefore, view the chances of repayment bleak and are reluctant to be drawn into further indebtedness which often becomes sticky. The big farmers, perhaps, do not find any need to borrow, as their domestic savings are sufficient to finance their limited programme of capital investment.

TABLE III—AVERAGE INCOME-EXPENDITURE PER FARM FAMILY : 1962-63

(In rupees)

Size-groups of farms	Income from farm	Income from other occupations	Borrowings	Total family income	Expenditure on farming*	Expenditure on conspicuous consumption	Expenditure on social ceremonies, litigations	Total repayment during the year	Investment in farm capital†	Residual (expenditure on family consumption)
1	2	3	4	5	6	7	8	9	10	11
I	352	60	—	410	93	—	45	—	40	222
II	881	30	103	1,014	215	22	80	26	87	584
III	2,987	33	50	3,070	1,033	51	35	92	337	1,522
IV	13,514	3,200	—	16,714	3,411	1,586	1,370	—	650	9,697

* Expenditure on farming includes only paid-out expenses.
† Only fixed capital has been considered. Circulating capital has been included under farm expenses in column 6.

The availability of savings is, however, not the function of income levels alone. The income-incremental-saving-ratio too is important. The marginal propensity to save, to vary the jargon, depends not only on the absolute levels of incomes, but on the relative levels of real incomes. This is because, individually, consumptions are inter-related and not independent. This holds true in villages which are a more closely knit community. The table shows large disparities in the income levels of the farmers in the same village. And it is doubtful, if increments in the incomes of small farmers shall not be spent on the forms of consumption, which is already prevalent among the bigger farmers. The bigger farmers also are likely to invest in conspicuous consumption, as they try to emulate the consumption standards of city dwellers. The supply of capital for productive investment can greatly be increased by diverting the savings from conspicuous consumption, social ceremonies and litigations. The table indicates that even at conservative estimates, investment in farm capital can be trebled if the expenditure on non-productive items is reduced to half, if not zero. The mobilization and diversion of this potential source of capital supply is indeed a tremendous task and involves, besides other things, the availability of capital with high marginal productivity.

Besides this, it is germane to the theme of capital formation, that the role which the proverbial surplus labour on Indian farms can play is examined briefly. Nurkse exposed the vast possibilities of constructing capital through the employment of surplus idle man-power, without much additional cost. His thesis has been examined for empirical implications in an over-populated country like India. It was found that great scope for augmenting the capital supply in India exists in agriculture even without population transfers as envisaged by Nurkse. Projects like bunding, levelling, drainage lay outs, repair and construction of irrigation channels, etc., can be taken up without or with very little additional capital. In this village, this possibility was examined in some detail. It was found that the marginal productivity of labour in these land improvement projects depends on several factors, for example, on the visible and perceptible intensity of water-

logging and soil erosion, etc. It was found that labour productivity of these projects under normal situations, as was the case in this village is quite low, although not zero. Normally, when additional doses of labour are cost-free (as they had to be fed any way), they should be used to the point of zero returns.

But this does not happen. The surplus and cost-free family labour is withheld from entering into the process of production (constructing capital through labour) because at the level of low marginal returns from labour, the marginal utility of leisure overtakes the low marginal utility available through the low marginal additions of labour to output. If, however, subsistence is not being met, the marginal utility of added output goes very high with the result that even small additions to output becomes worthwhile, even if it means the working of labour at very low marginal productivity. This was not the situation in the village, by and large. And, therefore, to put it bluntly, the returns to the labour working on these projects are low, slow and very gradual. And therefore, the available surplus of labour opt for leisure rather than working on land improvement. And hence the utilisation of surplus and under-employed labour for capital formation was very small in the village."[5]

APPENDIX

INDEX OF INCREASE/DECREASE IN THE VALUE OF CAPITAL STOCK

(at constant prices) in the Year 1962-63 (January-February, 1963) taking the value of stock held at 1951 as 100

Size-groups of farms (acres)	No. of farm units inves-tigated	Live-stock	Improved imple-ments, tools and machi-nery	Tradi-tional tillage imple-ments, carts, etc.	Farm housing and cattle shed	Irriga-tion works	Land improve-ment	Average of all items
0—4.99	13	106	100	186	102	(rose from zero to Rs. 847)	—	128
5.00—9.99	12	119	500	109	168	(rose from zero to Rs. 2,430)	290	157
10.00—19.99	3	96	450	100	560	(rose from zero to Rs. 1,213)	(rose from zero to Rs. 246)	209
20 and above	2	68	136	135	193	(rose from zero to Rs. 2,460)	100	128
Total	30	84	140	127	204	(rose from zero to Rs. 6,950)	195	130

5. For further reading, John W. Mellor, "The Use and Productivity of Farm Family Labour in Early Stages of Agricultural Development," *Journal of Farm Economics*, Vol. XLV, No. 3, August, 1963.