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## APPENDIX I—(Concl.)

1	2	3	4	5	6	7	8	9	10
Non-cultivators									
VII.	Non-cultivating land-owners	1	—	—	5	—	—	—	—
VIII.	Landless tenants illegally evicted	6	—	5	—	—	5	—	25
IX.	Landless labourers	11	—	—	—	—	—	—	—
X.	Other non-agriculturist	2	—	—	—	—	—	—	—
		= 100	100	50	140*	—	—	1,300	250

\* Exclusive of land owned by absentee landlords residing outside the village.

## RATES OF GROSS AND NET CAPITAL FORMATION IN INDIAN AGRICULTURE AND FACTORS INFLUENCING THEM

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### HYPOTHESIS

In agriculture in under-developed economy, substitution between factors is likely to be low (since both the technical research and the knowledge of the people are likely to be low). If the elasticity of substitution between capital and labour is low, the percentage share of return to capital in total gross product tends to increase with the increase in labour supply. Besides, the increased demand for farm products on various scores leads to the increased derived demand for capital. It is because of this that we witness, contrary to general belief, a strong inducement to invest and therefore sizable savings with agriculturists. But this low factor substitution is both an asset and a liability. Whereas on one hand, a change in factor endowments in favour of one (here labour) would result in making expansion of the other (here capital) very attractive, on the other, this process of adjustment abruptly comes to an end, as soon as the pre-change factor ratios are approached. Any voluntary expansion of the 'other' factor beyond this point then becomes unattractive. This particular situation of low factor substitutability then acts both as a strong influence for capital to expand to catch up with labour, as well as a severe limitation to expansion beyond this to induce economic growth and a better deal for the co-operating labour. The impact of this phenomenon is that investment is largely made in traditional assets such as bullocks, implements etc. Land being the scarce factor, investment in irrigation which is a land-substituting form of capital also claims a lion's share.

## METHODOLOGY

This hypothesis is tested in a study on capital formation in durable physical assets in agriculture from 1935-36 to 1960-61. The durable physical assets include (i) Land, (ii) Irrigation, (iii) Work Animals and (iv) Farm Equipment.<sup>1</sup> Investment in houses is taken account of at a later stage. As this investment also represents the community's efforts to save, we have included total value of buildings and not a part of it which relates only to sheds, barns, etc., and which are of direct use in production.

We have adopted the Inventory approach to calculate Gross Capital Formation (GCF) and Net Capital Formation (NCF) in agriculture. The data on quantity of assets are derived quinquennially from published reports and censuses (Livestock Censuses, Agricultural Statistics in India and Population Censuses) and adjusted for changes in statistical coverage, gaps in data, etc. The values of these assets are calculated for the base year 1950-51 and on the basis of weights so determined aggregate quinquennial indexes are constructed for the remaining years. The estimates of GCF and NCF are based on these indexes. The GCF is obtained on the basis of net addition of assets plus replacement of assets during a particular quinquennium. Replacement is calculated on the assumption of zero rate of depreciation so long as an asset is in use and 100 per cent depreciation when it is scrapped. NCF refers to additions of the assets minus depreciation calculated on the basis of straight line methods of depreciation. Thus two different methods are used for calculating GCF and NCF. There is a major reason for this decision. GCF may be looked at from the point of expenditure incurred to maintain the working capacity of the asset plus additions to it. Empirically, this may mean provision made for depreciation plus additions to stock. Or it may also be looked at as replacement expenditure actually incurred plus additions to stocks. From the view-point of individual firms, the former method may be good for accounting purposes. From the view-point of community as a whole, however, 'replacement' is the real effort and the depreciation provision is only a notional effort. Hence the performance of the community gets directly reflected in the method followed by us. Further, provision had to be made in case of bullocks whose real value appreciates in fourth and fifth year and depreciates thereafter. The GCF in bullocks includes this appreciation in value. No such adjustment is done in case of NCF estimates.

## GCF AND NCF IN AGRICULTURE

The estimates of GCF and NCF worked out on the basis of methods described above for the years 1935-36 to 1960-61 are laid out in the following tables. The estimates are for each quinquennium and for assets grouped differently as under: (i) Implements only; (ii) Implements and Bullocks; (iii) Implements, Bullocks and Irrigation; (iv) Items in (iii) + Land. These groupings help us to analyse the composition of capital formation. At this stage no distinction is made between capital formation in private and public sectors. Besides, investment in houses is not considered here mainly because between 1935-36 to 1960-61

1. Implements and machinery covered by Livestock Censuses only are included. That means some important implements like seed drills, hoes, harrows, etc., and all small implements do not get included in this study. However, the percentage of these unaccounted assets to total value of assets is hardly 0.9 and hence the actual under-estimation of the rate of change in the overall indexes would not be consequential.

only two firm and independent estimates regarding houses are available.<sup>2</sup> This estimate, however, is built on the basis of adjusted data for inter-censal years and will be referred to later on.

TABLE I—GROSS CAPITAL FORMATION IN AGRICULTURE IN INDIA: 1935-36 TO 1960-61

Years	(in 1950-51 year constant prices)				(in thousand rupees)			
	Implements only	Implements and bullocks with appre- ciation	Implements, bullocks and irrigation	Implements, bullocks, irrigation and land				
	(i)	(ii)	(iii)	(iv)				
1935-36 to 1940-41 .. .. .	1,060,620	17,043,304	21,297,722	23,243,866				
1940-41 to 1945-46 .. .. .	988,018	16,607,425	18,007,432	19,444,584				
1945-46 to 1950-51 .. .. .	1,714,830	19,980,792	22,164,034	21,265,814				
1950-51 to 1955-56 .. .. .	1,592,028	20,538,721	26,546,931	30,873,359				
1955-56 to 1960-61 .. .. .	2,391,838	23,185,515	32,786,790	37,038,412				

A few observations from the GCF data can be made. For nearly three quinquennia—1935-36 to 1950-51—the total GCF did not vary materially. It, however, spurted up in the following quinquennia—by 45 per cent between 1950-51 to 1955-56 and by 19 per cent between 1955-56 to 1960-61. Secondly, in any single quinquennium largest single contribution came from bullocks. In spite of this, the trend in total GCF in the last decade is not influenced by the trend in GCF in bullocks. Though the major contribution to total GCF is still from bullocks, the upward trend is mainly the result of expanding gross investment in irrigation. This important change indicates a major break with the past. A small but perceptible rising trend in GCF in implements and machinery also indicates the same phenomenon.

TABLE II—NET CAPITAL FORMATION IN AGRICULTURE IN INDIA : 1935-36 TO 1960-61

Years	(in 1950-51 year constant prices)				(in thousand rupees)			
	Implements only	Implements and bullocks	Implements, bullocks and irrigation	Implements, bullocks, irrigation and land				
	(i)	(ii)	(iii)	(iv)				
1935-36 to 1940-41 .. .. .	63,650	1,861,327	3,766,462	5,712,607				
1940-41 to 1945-46 .. .. .	—47,464	386,323	372,502	1,809,655				
1945-46 to 1950-51 .. .. .	570,110	3,024,357	2,661,099	1,762,879				
1950-51 to 1955-56 .. .. .	284,389	1,836,474	5,229,995	9,556,424				
1955-56 to 1960-61 .. .. .	475,117	2,410,013	7,445,255	11,690,878				

2. 1961 estimate became available at a very late stage of the study.

Data on NCF reveal two striking features : (1) compared to GCF, NCF is relatively low; (2) the trend in NCF is different from that in GCF. Both these features are important. The proportion of NCF to GCF declined during 1935-36 to 1950-51 though it improved thereafter. The total GCF was nearly 4.01 times larger than NCF during 1935-36 to 1940-41, and 10.18 times larger during 1940-41 to 1945-46 and as much as 12.06 times larger during 1945-46 to 1950-51. Thereafter, GCF was only 3.23 and 3.16 times larger than NCF during 1950-51 to 1955-56 and 1955-56 to 1960-61 respectively. This means much of the earlier capital formation in agriculture was mainly to maintain the existing capacity. In contrast, the growth of assets has been rapid during the last decade. The compositional trend in NCF compares with that of the GCF and suggests break with predominance of investment in bullocks and is reflected in rapidly expanding investment in irrigation and improved implements.

#### PUBLIC AND PRIVATE INVESTMENT IN AGRICULTURE

Public investment may be considered an exogenous factor. It may be geared to suit either anti-cyclical measures or war efforts or the development plans. It is therefore not related to the investment capacity of the community. So far we have seen GCF and NCF in agriculture as a result of combined efforts—by the agricultural community as well as by the public sector. It is necessary to disaggregate these in order to gauge separately the strength of private investment in agriculture.

The public investment is both direct and indirect. To get total direct public investment we add up investment in irrigation, land reclamation and tractors by the State. Before 1950-51 we have assumed tractors to be entirely in the private sector as data regarding State investment in them became available only after this. We have also assumed that land reclamation was entirely the result of private efforts before 1950-51. For irrigation entire investment in public canals plus four-fifth of investment in tanks in Bombay and Madras States is taken as public investment. The data on indirect contribution by the State, *i.e.*, loans and subsidies are adequately available for the last decade. But we do not know how the various loans or subsidies are used by the recipients and what assets are created with their help in the agricultural sector. We have assumed that the entire quantity was used for the purposes of creating assets for productive use only. These assets may be just the replacement of the old or they may be net additions to the productive capacity in the sector. As we have no evidence on this score from the published data we have used the proportion of total NCF to total GCF in agriculture during the period as the basis. Looking to the fact that long-term investment in agriculture are generally self-financed this again may be a liberal assumption.

The share of public and private investments in total GCF and NCF in agriculture is given in Table III.

The contribution of public sector in GCF is practically insignificant up to 1950-51, though it has jumped up to nearly 10 per cent in the last decade. Compared to this, the contribution in NCF is quite sizable and it has tended to increase in recent period. In spite of this, the predominance of private investment both in GCF and NCF is discernible even during the last decade when public investment was stepped up.

TABLE III—PERCENTAGE OF PUBLIC AND PRIVATE INVESTMENT TO TOTAL INVESTMENT

Years	Public sector investment				Private investment	
	Direct		Indirect		Gross	Net
	Gross	Net	Gross	Net		
1935-36 to 1940-41 .. ..	2.68	10.25			97.32	89.75
1940-41 to 1945-46 .. ..	0.82	3.15			99.18	96.85
1945-46 to 1950-51 .. ..	1.78	22.06			98.22	77.94
1950-51 to 1955-56 .. ..	8.28	24.07	2.35	0.77	89.41	71.25
1955-56 to 1960-61 .. ..	9.68	28.07				

The predominance of private investment over public effort is also borne out by the analysis of the situation regarding debts and borrowings. Information available on various aspects such as (1) relation of liabilities to assets, (2) duration of outstanding loans and use of borrowings which can shed some light on this problem is mostly available at a point of time from various studies. If we grant that intra-sectoral loans may be liabilities to the individuals but for a sector they are mere transfers, equities of the sector as a whole would be over 96 per cent of the total value of assets including land according to Rural Credit Survey<sup>3</sup> findings. Evidence regarding duration of debt as obtained from various studies such as Follow-Up Surveys of the Reserve Bank of India suggests a decline on the average. A study made by Dr. J. P. Bhattacharjee and others<sup>4</sup> clearly indicates that debts older than five years formed a mere 3 per cent of the total.

Data given in Rural Credit Follow-Up Surveys reveal closer correspondence between capital expenditure and borrowings or debt than between family expenditure and borrowings or debt. These results are fitted to district data and therefore closer relationship may be due to better technical potentiality for investment in these districts. Even otherwise, the earlier results would imply that the debt is amortised much before the asset runs out its life. This would only mean that adequate savings may not be initially available for investment but subsequent to the investments, savings increase with which debts are repaid. In the long run dominance of personal savings therefore prevails.

#### INCOME AND INVESTMENT

Income data for the period under study are obtained from time-series study made by Dr. K. M. Mukerjee<sup>5</sup> and National Income estimates of Central Statistical Organisation and adjusted to our base period to make them comparable with our investment series. Table IV gives the comparison of GCF with the value of gross crop production and NCF with net agricultural income for

3. Report of the Committee of Direction, All-India Rural Credit Survey, Volume I—The Survey Report, Part 2 (Credit Agencies), Reserve Bank of India, 1957, p. 3, Table 18.1.

4. Sahajapur, West Bengal: Socio-Economic Study of a Village, Santiniketan, 1958, p. 116.

5. K. M. Mukerjee: Planning and Public Sector in an Underdeveloped Economy, University of Calcutta, 1958 (Mimeo); and "A Note on the Long-Term Growth of National Income in India 1900-01 to 1952-53," Papers on National Income and Allied Topics, Edited by V.K.R.V. Rao and others, Indian Conference on Research in National Income, Vol II, Bombay, 1962.

five quinquennia from 1935-36 to 1960-61. Separate percentages are worked out for private and public investments. The estimates of GCF and NCF in housing are also added at this stage.

Taking total investment from all sources, private and public, the total GCF in agriculture absorbed during the period 1935-36 to 1960-61 nearly 8 to 12 per cent of the current flow of real (*i.e.*, in constant value) gross value of crop output. To this, if GCF on account of housing and small implements is added the total GCF would amount to nearly 10 to 15 per cent of the current flow of real gross value of crop output. The rate of GCF as percentage to gross income has tended to increase mildly during 1935-36 to 1960-61 and this rising trend is accounted by both private and public investments. What is more important is the fact that the percentage of GCF to gross value of agricultural output has more or less remained constant over a sufficiently long period of twenty-five years.

As regards net investment, we obtain a slightly different picture from the same table. The percentage of NCF to net agricultural income has been low being in the range of 1 to 5. Unlike GCF it has fluctuated from quinquennium to quinquennium, the rise being more profound during 1950 to 1960.

It is necessary to note that the above results do not take into account working capital such as manure, seeds, inventory stock, etc. This may not make material difference so far as NCF is concerned but the percentage would be raised by 2 to 3 points in case of GCF.

#### IMPLICATIONS

Now the point is : is this rate of investment in agriculture adequate? But the answer to this question depends on another question : What is an adequate rate of investment? Lewis' rate of net investment of 12 per cent or more of net national income refers to the economy as a whole. The common experience of most of the advanced economies that this rate of investment gives self-sustained growth of economy is a noteworthy fact. However, there is no common pattern of relationship of agriculture with the rest of the economy.

We can make a tentative calculation regarding the rate of investment necessary for sustained growth of per capita production, treating agriculture as a closed sector. If we assume population to increase at 2 per cent per annum, production should increase at 3 per cent per annum for per capita income to rise. With the ratio of capital/output being constant at 1 (excluding land from capital) reproducible capital should grow at the rate of 3 per cent. The net investment should then be at the rate of 3 per cent of the net income. If land is included in the stock of capital and capital/output ratio is assumed to be 4, the net investment required would be 12 per cent of the net income. The rate of investment that actually obtains is much below this.

The next question that should naturally arise is : What factors make the level of investment in agriculture what it is? The explanation for this would provide an insight into the process of capital formation in agriculture in under-developed economies.



TABLE IV—PERCENTAGE OF CAPITAL FORMATION IN PHYSICAL DURABLE ASSETS TO AGRICULTURAL INCOME

Years	Gross Capital Formation as Percentage to Gross Agricultural Income					Net Capital Formation as Percentage to Net Agricultural Income									
	Private CF excluding housing		Public CF		Total	Housing		Grand Total	Private CF excluding housing		Public CF		Total	Housing	Grand Total
	Direct	Indirect	Direct	Indirect		Direct	Indirect		Direct	Indirect	Direct	Indirect			
1935-36 to 1940-41 ..	9.50	0.245	—	—	9.74	2.56	12.30	2.54	0.290	—	2.83	—	0.69	2.14	
1940-41 to 1945-46 ..	7.92	0.074	—	—	7.99	2.73	10.72	0.84	0.888	—	0.93	—	0.22	1.15	
1945-46 to 1950-51 ..	9.01	0.168	—	—	9.18	2.71	11.89	0.70	0.199	—	0.90	—	0.43	1.33	
1950-51 to 1955-56 ..	10.50	0.867	0.275	—	11.64	3.04	14.40	4.23	1.025	0.108	5.36	—	0.60	4.76	
1955-56 to 1960-61 ..	10.35	1.038	—	—	11.67	—	—	4.03	1.224	—	5.36	—	—	—	

The volume of capital stock in agriculture is a result of this level of investment of community's resources. We may now observe the extent of capital stock—both gross and net—within the agricultural sector for the period under study and the extent of demand generated for it as represented by the index of labour in agriculture. The indexes of gross capital stock, net capital stock and labour in agriculture are given in Table V. Capital stock refers to farm equipment, bullocks and irrigation only. Land is excluded for the purpose of present analysis.

TABLE V—INDEXES OF CAPITAL STOCK AND LABOUR IN AGRICULTURE

(Base: 1950-51)

Years	Gross capital stock	Net capital stock	Labour
1935-36	88.55	81.85	86.37
1940-41	92.01	91.87	91.93
1945-46	93.94	92.86	95.80
1950-51	100.00	100.00	100.00
1955-56	108.66	114.01	109.91
1960-61	126.97	133.75	120.82

It would be seen from the above data that all the three indexes have more or less kept pace with each other. The indexes in fact are worked out for the past beyond 1935-36 stretching up to 1920-21, but for the sake of comparability with the earlier estimates on GCF and NCF we have given here indexes from 1935-36 onwards. The value of coefficient of correlation between gross capital stock and labour worked out from 1920-21 to 1960-61 is found to be  $r=0.9836$ .<sup>6</sup> This is positive, high and statistically significant and is indicative of near parallel movement of capital and labour. This near parallel movement would imply a high complementarity between the two. The net stock has increased rapidly compared to gross stock especially in the period between 1950-51 and 1960-61. The value of coefficient of correlation between net stock and labour also would be significant.

It may be stated that the capital index used here includes public irrigation, *i.e.*, capital created in public sector. It would be interesting to know whether the same high complementarity between capital and labour exists when only private efforts in investment are taken into consideration. The value of coefficient of correlation between private irrigation, bullocks, implements and machinery on one hand and labour on the other, is  $r=0.9633$  which is positive, high and statistically significant.

The per capita rate of investment has been maintained at low and even declining levels of per capita income. Even at low levels of income the economy finds enough savings to invest. And though the level of investment has been low, compared to that in advanced agriculture or compared to perhaps what is

6. This value of coefficient of correlation is based on limited observations, *i.e.*, eight in all. Of them, four observations for labour are interpolated. They should, therefore, be taken for whatever they are worth.

necessary for our agriculture to grow, it is sufficiently high to match the growth in labour and maintain the level of farm production. The latter is borne out by the fact that the capital/output ratio has remained more or less constant between 1920 and 1960. According to our calculations this has varied between 100.00 to 103.26 during the period.

These constant ratios—constancy between capital/labour and capital/output—probably provide a major explanation for the level of investment that obtains in Indian agriculture. Constant capital/labour and capital/output ratios will give constant labour/output ratio. Now if labour changes exogenously and technological change is absent, output would change in the same proportion and so also capital. The equilibrium is maintained at a lower level.

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## CAPITAL GROWTH IN INDIAN AGRICULTURE

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The purpose of this study is to indicate the inter-relationship between farm capital, labour and output and changes in the capital structure of Indian agriculture during the years 1949-50 to 1960-61. India is taken as a typical under-developed agricultural society. Generally for such a society with its problems of increasing population growth and the consequent demographic pressure, uneconomic land utilisation, static and undeveloped technologies, falling agricultural productivities and farm incomes, relatively small saving ratio, and virtual social and economic stagnation, the problem of agricultural development directed towards a long run objective of self-sustained growth can very largely be viewed as a problem of farm investment and capital formation. The process of agricultural development in India viewed in this way is subject to many inherent obstacles.

### OBSTACLES TO AGRICULTURAL DEVELOPMENT

#### *Structural Obstacles*

Firstly, the small size of land holdings, poor soil, inadequate rainfall, adverse land-man ratio, and surplus, but unproductive, animal stock act as structural obstacles to this development. Their solution may be assumed to be a function of additional farm investments, because any expenditure incurred for consolidation of land holdings, constitution of optimum and co-operative farms, supply of natural and organic fertilizers and farm machinery, the construction of irrigation works and distributory canals and the improvement of animal stock, involves mobilization of monetary and real resources and ultimately improves the agricultural structure by creating permanent farm assets.