RURAL ECONOMY

PROJECT REPORT

Department of Rural Economy
Faculty of Agriculture and Forestry
University of Alberta
Edmonton, Canada

FACTORS INFLUENCING CAPITAL FORMATION IN SUBSISTENCE AGRICULTURE

L.P. Apedaile and A. Mainaly

Project Report 88-02

Acknowledgements

The financial assistance of the University of Alberta CIDA scholarship fund, the Fund to Support International Development Activities and the Department of Rural Economy is gratefully acknowledged.

FACTORS INFLUENCING CAPITAL FORMATION IN SUBSISTENCE AGRICULTURE

L.P. Apedaile and A. Mainaly

Executive Summary

The primary objective of this study was to test the hypothesis that the level of public capital influences private capital formation in subsistence agriculture. Other objectives were to estimate the effect of public capital on agricultural production, to determine the economic rationale of public capital formation, and to determine the distributional effect of public expenditure. Evidence was obtained from Surkhet District of Nepal. A comparative study was employed to accomplish these objectives and to test the hypotheses. A relatively developed region and a relatively less developed region were selected from within one agroclimatic zone in the District. The research was confined to farmers with land holdings between 0.35 and 2.1 ha. to minimise the distributional effect of public capital due to size of land holdings.

An unrestricted general production function of the Cobb-Douglas type fit the data best. Private capital formation and agricultural production of the farm families in the developed and less developed regions were compared with the help of an intercept dummy variable. Slope dummies were used to compare the contribution of the independent variables to the dependent variables in the developed and less developed regions. Finally, the social rate of return of expenditure on public capital formation was calculated to determine the economic justification of public capital formation.

The elasticities of private capital formation and agricultural production with respect to public capital are found to be 0.28 and 0.13 respectively and are statistically significant. These results show the importance of public capital in private capital formation and in agricultural production in the subsistence agricultural sector of a developing country. The economic rationale for public capital formation is justified by the 418 and 222 percent social rate of return of public capital in the less developed and developed regions respectively. Public expenditure on public capital is observed to be biased towards higher caste and literate farm families.

It is concluded that the formation of public capital, in the less developed region of a developing country is a prerequisite for the formation of private capital and for agricultural growth

and development. Public expenditure should be directed towards the least developed rural areas to maximise the social rate of return from limited financial resources within similar agroclimatic regions. Public capital should be formed evenly within areas of similar economic potential.

The Problem Setting

Foreign aid is the main financial source for development in Nepal, accounting for more than 44% of Nepal's development budget since the country started its first development plan in 1956. In the early sixties, India and the United States were the two main donor countries. In the seventies and onwards Nepal received aid from many more developed countries. Canada became one of these donor countries. In the present plan (7th plan), foreign aid accounts for almost seventy percent of Nepal's development budget, indicating near total dependence of Nepal upon foreign aid. The correlation between the development budget of Nepal and the amount of foreign aid received is 0.977[1].

Nepal has now completed six development plans. In all the plans agriculture was accorded high priority. However, economic indicators do not show any signs of development in the agricultural sector. Since 1970, the per capita agricultural output, labour productivity and land productivity have decreased significantly (FAO, 1986). All economic indicators show the failure of the general plan of His Majesty's Government of Nepal and of foreign assistance to develop agriculture.

Surkhet is one of the districts of Nepal where the government with the co-operation of foreign assistance has implemented integrated rural development (IRD). Surkhet is part of the Karnali Bheri Integrated Rural Development (K-BIRD) Program financed with Canadian assistance. Prior to 1979 there was hardly any public capital in the villages of this district. Within the K-BIRD program, investment in public works has been increased.

Capital formation and agricultural production by farm families in areas of Nepal with relatively higher amounts of public capital vis-a-vis areas with lower amounts of public capital can provide useful information on the response of farmers to government spending. On the one hand the information may be used to test the applicability of development models for subsistence agriculture in general. On the other hand it may provide useful information to planners in Nepal. The nature of the impact of public capital on private capital formation and agricultural production may improve the economic rationale used by both the government of Nepal and foreign aid donors for agricultural programs, which are currently unsuccessful.

---

[1] The correlation cofficient was calculated using the realised annual budget of Nepal from 1965/66 to 1984/85 and estimated budgets for 1985/86 and 1986/87.

Productivity of labour is the main basis for personal income in any economy. In the agricultural sector of Nepal, labour productivity has decreased over time (FAO, 1986). This decline suggests that labour is over-utilized in the production process or that other factors may be under used. The factor often responsible for a reduction of labour productivity is under-utilization of capital in agriculture. (Furtado, 1963). Capital is defined as human-made tools, equipment and land improvements including buildings, terraces and water systems, and animal draught power.

The rate of capital formation in subsistance agriculture can be determined as well as factors influencing that formation. The ability of farmers to save and to finance capital improvements, the willingness of farmers to invest, and the availability of public capital facilities could explain the rate of capital formation. Following Schultz (1964), the farmers in Surkhet District are assumed to be rational. The willingness of farm families to invest in capital is assumed. The other two factors, availability of public capital and ability to save, are the subject of this research.

In the past, public capital has been one of the main stimulating factors in private capital formation (Cairncross, 1962a; ECAFE, 1961; Shukla, 1968; Nurkse, 1954; Rosenstein-Rodan, 1944). There is also some evidence, mainly in underdeveloped countries, that no positive relationship exists between private capital formation and public capital formation (Goil, *et. al.* 1971; Mukerji, 1971). The question in this research is whether formation of public capital stimulates farm families to accumulate capital. The factors that are explored in this study are: (a) ability of the farmers to save and the formation of capital by them. (b) the availability of public capital and its effect on private capital formation of the farmers.

The factors responsible in the formation of private capital in a subsistence agricultural sector of a developing country are not well understood. There is insufficient empirical evidence on private capital formation in Nepalese subsistence agriculture to justify continuation of present government programs to promote agricultural modernisation. The research design minimizes value judgements through the sampling frame. A rigorous attempt is made to remove ethnocentricity in the approach to farmers for evidence.

The hypothesis of this study is related to the formation of public capital and its contribution to private capital formation and to agricultural production. Does public capital play any role in the

formation of private capital? Does public capital have any effect on agricultural production? What is the effect of public capital on the use of factors of production in subsistence agriculture? If public capital has a positive effect on private capital formation and agricultural production, is it factor and socially neutral? These are the questions that are addressed in this study.

Objectives of the Study

(a) The primary objective of this study is to test the hypothesis that the level of public capital influences private capital formation in the subsistence agricultural sector of a developing country.

(b) The second objective is to estimate the effect of public capital on agricultural production.

(c) The third objective is to determine the economic rationale of public capital formation.

(d) And the fourth objective is to determine the distributional effect of expenditure on public capital formation according to caste and literacy.

Method

Two aspects of the role of public capital in agricultural development were examined. The first was the influence of public capital on private capital formation by subsistence farmers. The second was the contribution of public capital, as a distinct factor of production, to agricultural production. Eight hypotheses were advanced formally for testing.

The principal problem faced in the research was the lack of data over time for farmers' behaviour in capital formation and production, to match with the time series data for public capital formation. The year to year data on public capital was also unsatisfactory due both to aggregation of types of capital and to reporting lags. These problems were overcome by identifying two groups of panchayats, nearly identical in every respect except for cummulative public capital formation over the most recent five year period. The group of less developed panchayats was in west Surkhet and the more developed group was in eastern Surkhet. Three panchayats were chosen from within each group based on the location of public services, the areas influenced by these services and homogeneity of agroclimatic and public capital characteristics. The data base for selecting the two groups of panchayats was district records and a fact finding trek to each panchayat to verify the written record.

Seventy one farmers were interviewed altogether. The farmers were selected at random from a sampling frame constructed for each panchayat. Only farmers cultivating between 0.35 ha. and 2.1

ha. were included in the sampling frame to avoid size non-neutral distributional effects of public capital on farmers' behaviour. The questionnaire was bilingual English and Nepali, translated twice independently in each direction and pretested. The questionnaire was administered in Nepali.

The data for each group of panchayats was pooled on the basis of Kolmogorov Smirnov tests of distributional homogeneity across panchayats. The data was also tested for a comparison of the two groups of panchayats. The two groups, the one in western Surkhet and the other in eastern Surkhet were demonstrated to be from the same population except for a significant difference of means for most variables. The results of these statistical tests enabled the comparative study for the two groups of panchayats to proceed.

The hypotheses were tested using ordinary least squares regression. Intercept and slope dummy variables were employed to test for the effect of public capital on private capital formation and agricultural output. The marginal productivities of public capital in capital formation and production were calculated from the estimated elasticities at mean levels of the respective variables.

The Hypotheses

Two sets of hypotheses were developed. The first set of hypotheses was developed to test Hirschman's theory of "*development via excess capacity*" (Hirschman, 1960) and the second set was developed to test the economic justification of public expenditure in public capital formation.

To test Hirschman's theory both direct and indirect hypotheses are developed.

Hypothesis 1. The Direct Hypothesis is that the Availability of Public Capital Determines the Rate of Private Capital Formation: The null hypothesis is: the contribution of public capital to private capital formation in the developed and less developed groups of panchayats in Surkhet District are equal. The alternative hypothesis is: the contribution of public capital to private capital formation in the developed panchayats is greater than in the less developed panchayats.

Hypothesis 2. The Main Constraint of a Farm Family's Creation of Capital Appears to be Public Capital not their Ability to Save: As reported in Table 1, farm families in the less developed panchayats have higher average savings in comparison to the farm families in the developed region. Savings ability and capital formation are theoretically positively correlated (Hicks, 1960). Thus, if savings ability is the main determining factor in private capital formation, private capital formation in

Table 1 Observed Mean Value of the Variables in Six Panchayats of Surkhet District of Nepal, 1986.

Variables.	Unit.	Tatapani.	Ghatgaun.	Pokharikanda.	Ramghat.	Dasrathpur.	Sahare.
Family Size.	Persons.	6.92	7.75	6.36	4.60	5.23	6.75
Land Holdings.	Ropani.	22.00	22.99	25.74	16.50	21.22	18.07
Literacy*.	Persons.	6/12	8/12	10/11	11/12	11/12	9/12
Value of Ag. Product.	Rupees.	12953	9848	12422	11540	17577	12189
Upper Caste*.	Persons.	7/12	6/12	7/11	11/12	11/12	10/12
Cropping Intensity.		182	192	164	182	205	186
Savings.	Rupees.	17975	20685	26872	17734	14863	22241
Value of Capital Formation.**	Rupees.	6027	5545	6036	6619	4895	8670
Value of Capital stock.**	Rupees.	1267	1232	3980	4606	7634	10464
Value of Public** Capital (1986).	Rupees.	847281	316945	680367	3231748	3417276	1758549
Government Expenditure.***	Rupees.	278619	102507	127967	1041207	786369	497312
Population (1986)	Persons.	3955	2723	2154	4762	2960	6128
Households.	Number.	572	351	339	1035	566	908
Govt. Exp.*** Per Household.	Rupees.	487	292	377	1006	1389	548

* Shows the Ratio. ** Depreciated value. *** Expenditure in 1986.

Sources: Survey Results and Various Government Offices of His Majesty's Government, Nepal.

the less developed panchayats should be higher in comparison to the developed panchayats. Whereas, if public capital is the main determining factor in private capital formation, the developed panchayats should have higher average capital formation vis-a-vis the less developed panchayats. To test this view, the null hypothesis is: the contribution of savings to private capital formation in the developed and less developed panchayats are equal. The alternative hypothesis is: the contribution of savings to private capital formation in the developed panchayats is higher in comparison to the less developed panchayats.

Hypothesis 3. Public Capital as a Limiting Factor to Private Capital Formation: Farm families accumulate capital efficiently, subject to the technical and socio-economic constraints they face (Schultz, 1964). So, a rational farmer will hardly accumulate capital beyond a certain maximum limit, determined by technological and socio-economic constraints. However, formation of public capital is expected to increase this maximum limit. If this hypothesis holds, the formation of public capital will reduce the negative effect of capital stock on private capital formation. As several public capital items have been created in the developed panchayats in the recent past, the farmer's maximum limit to accumulate private capital was expected to have increased in this region vis-a-vis the less developed region. To test this hypothesis, the null hypothesis is: the negative effect of capital stock on capital formation in the developed and less developed panchayats are equal. The alternative hypothesis is: the negative effect of capital stock on capital formation is smaller in the developed panchayats in comparison to that in the less developed panchayats.

Hypothesis 4. Public Capital as an Incentive to Adopt Capital Intensive Methods of Production:

(a)The size of land holdings was controlled in this study, so a small variability in the size of the land holdings of the farm families was expected to have little effect on private capital formation. However, due to the higher amount of public capital in the developed panchayats, the farmers in the developed panchayats were expected to use more capital per unit of land in comparison to the farmers in the less developed panchayats. To test this hypothesis, the null hypothesis is: private capital formation due to the variation in the size of land holdings is equal in both groups of panchayats. The alternative hypothesis is: private capital formation, due to the variation of the size of land holdings, is higher in the developed panchayats vis-a-vis the less developed panchayats.

(b) The geophysical conditions of the two groups of panchayats studied are similar resulting in similar cropping intensities. So, the cropping intensity may not have a significant effect on private capital formation under this condition. However, due to the higher amount of public capital in the developed panchayats, the relationship between cropping intensity and private capital formation in the developed panchayats was expected to be stronger when compared to that of the less developed panchayats. To test this idea, the null hypothesis is: private capital formation, due to the variation in cropping intensity, is equal in both regions. The alternative hypothesis is: capital formation, due to the variation in cropping intensity, is higher in the developed panchayats in comparison to the less developed panchayats.

Hypothesis 5. Caste as an Influencing Factor in Private Capital Formation: The farmers belonging to the higher caste were expected to accumulate more capital in comparison to the lower caste farmers. To test this hypothesis, the null hypothesis is: higher and lower caste farmers, with equal size of land holdings, accumulate equal amounts of capital. The alternative hypothesis is: with equal size of land holdings, higher caste farmers accumulate more capital in comparison to lower caste farmers.

Hypothesis 6. Literacy as a Determining Factor in Private Capital Formation: The literate farmers were expected to accumulate more capital in comparison to illiterate farmers. To test this hypothesis, the null hypothesis is: literate and illiterate farmers accumulate equal amounts of capital. The alternative hypothesis is: literate farmers accumulate more capital in comparison to illiterate farmers.

Hypotheses 7 and 8 were used to test the economic justification of expenditure in public capital. The economic justification of public expenditure in public capital was tested using Griliches (1964) technique. Public capital was included as an independent variable in an agricultural production function to facilitate the test. Direct and indirect hypotheses were developed to perform the test.

Hypothesis 7. The Direct Hypothesis to Test the Economic Justification of Expenditure in Public Capital: Public capital was expected to contribute to agricultural production in ways similar to other factors of production. The increase in public capital was expected to increase agricultural production. To test this hypothesis, the null hypothesis is: the contribution of public capital to agricultural production in the developed and less developed groups of panchayats are equal. The alternative hypothesis is: the contribution of public capital to agricultural production is greater in the developed

panchayats in comparison to the less developed panchayats.

Hypothesis 8. The Indirect Hypotheses to Test the Economic Justification of Public Expenditure in Public Capital:

(a) Public capital increases production by augmenting factors of production (Meade, 1952; McMillan, 1979; Manning & McMillan, 1982). Higher productivities of the factors of production in the developed panchayats in comparison to the less developed panchayats constitute evidence of the factor augmenting character of public capital and are a justification for expenditure in public capital. To determine the validity of this hypothesis, the null hypothesis is: the productivities of the normal factors of agricultural production (land, labor, capital,) in both regions are equal. The alternative hypothesis is: the productivities of the normal factors of agricultural production in the developed panchayats is higher than that in the less developed panchayats.

(b) The increase in agricultural production due to cropping intensity was expected to be higher in the developed panchayats in comparison to the less developed panchayats. This was expected, because the developed panchayats enjoy a higher level of external economies generated from public capital when compared to the less developed panchayats. The null hypothesis is: the increase in agricultural production due to the increase in cropping intensity in developed and less developed groups of panchayats are equal. The alternative hypothesis is: the increase in agricultural production due to the increase in cropping intensity in the developed panchayats is higher in comparison to the less developed panchayats.

Results

The independent variables in the private capital formation equation were: ability of the farmers to save (savings), capital stock, public capital, size of land holdings, cropping intensity, caste and education. Savings, capital stock, size of land holdings, and cropping intensity were used to test Hirschman's theory of *development via excess capacity*. The statistical significance of the value of public capital in private capital formation confirmed Hirschman's theory. Private capital stock and formation in the developed panchayats of Surkhet District were found to be significantly higher in comparison to the less developed panchayats, indicating a positive relationship between private capital formation and public capital formation.

The significantly higher explanatory power of the variables, saving ability, size of land holdings and cropping intensity in the developed panchayats vis-a-vis the less developed panchayats of the District conform with Hirischman's theory. These results were a clear indication of the higher level of *absorptive capacity* (Milikan & Rastow, 1957; Meier & Bolwin, 1957)[2] or *ability to invest* (Hirschman, 1960) in the developed panchayats in comparison to the less developed panchayats. The higher level of *absorptive capacity* in the developed panchayats of the District was created by the higher amount of public capital in those panchayats all other things being equal.

An inverse relationship between private capital stock and private capital formation was determined to exist in both groups of panchayats. The lower coefficient for the developed region indicated the demand for private capital (capital formation) in the developed panchayats was significantly higher in comparison to the less developed panchayats. On the one hand, public capital, in the form of schools, communication services and agricultural service centers develops farmers' ability to adopt new techniques of agricultural production. On the other hand, public capital, in the form of roads, markets, co-operatives and input supplies, provides farmers with the necessary inputs to use these techniques. So, the higher demand for private capital in the developed eastern panchayats of the District may be attributed to a higher amount of public capital.

Public capital, cropping intensity and caste were included with private capital and labour as inputs in the production function. The difference in the level of agricultural output between the developed and less developed groups of panchayats within Surkhet District suggested the existence of a positive relationship between public capital formation and agricultural production.

Public capital is thought to influence private decisions on resource combinations through externalities. These externalities were tested by comparing the productivities of the factors of production in the developed and less developed groups of panchayats. As expected, the productivities of the factors of productions in the developed panchayats of Surkhet were significantly higher in comparison to those in the less developed panchayats. The variation in cropping intensity had significantly higher explanatory power in the developed panchayats vis-a-vis the less developed panchayats. This result lent further support to the existence of a higher level of technology in the

[2]Cited by Hirschman (1960, p. 37).

developed panchayats in comparison to the less developed panchayats.

The distributional effect of public capital was tested against caste and education of the farmers. These two variables were used anticipating that farmers belonging to a higher caste and who are literate may benefit more from the creation of public capital than farmers belonging to a lower caste and who are illiterate. These phenomena would not likely be confined to one area within the district. Consequently the test was made with the pooled data of both groups of panchayats. Caste constituted a significant influence on private capital formation, whereas it was insignificant in agricultural production. These results suggest that the upper and lower caste farmers are on the same production possibility curve regardless of the technique they use. In terms of techniques of production, the upper and lower caste farmers use capital intensive and labour intensive techniques respectively.

As public capital contributes significantly to private capital formation, farmers using capital intensive techniques of production benefit more in comparison to the farmers using labour intensive techniques. So, the result indirectly indicates the upper caste biased distributional effect of public capital. The results also suggest that the distributional effect of caste on public capital formation works through its factor augmenting character rather than through firm augmentation.

Literacy, in contrast to caste, was significant in agricultural production, but insignificant in explaining capital formation. The results appear awkward, but they are consistent with Welch (1970) and Nelson & Phelps's (1966) theories of education relating to development. These results are interpreted in the following manner. An educated farmer produces higher agricultural output, because of his technical (worker effect of Welch, 1970), allocative and selective efficiencies. That is to say, the educated farmers are more productive, because knowingly they do not waste resources. They employ inputs in the proper ratio and they select the right amount of input in the production process. The increase in efficiency due to education has nothing to do with the factors of production such as level of capital formation. Thus the effect of education on private capital formation and agricultural production would not be related. However the upper caste farmers are more literate than the lower caste farmers (survey results). As the literacy of a farmer is a result of public capital (in the form of schools), the upper caste farmers benefit more from public capital than do the lower caste farmers.

This result suggested education as one of the sources of agricultural growth. So, formation of public capital in the form of schools may be one of the ways to develop the subsistence agriculture of Nepal. Literacy (education) in its relationship to private capital appears to be firm augmenting rather than capital augmenting. In this case the firm is the farm family organisation.

The social rate of return, in this study, is interpreted as the additional tangible benefit realised by farm families due to public expenditure in the formation of public capital. The estimated social rate of return on public capital is 2.22 and 4.18 Rupees worth of agricultural output per year in the more developed and less developed parts of Surkhet District respectively. These estimates appear reasonable, and are similar to Easter *et al* (1977) and Antle's (1983) elasticity of agricultural production with respect to infrastructure[3]. The social rate of return calculated in this study confirmed the economic justification of expenditure in public capital. The estimated social rate of return also suggested that public capital demonstrates a diminishing marginal productivity. This was evidenced by the smaller social rate of return of public capital in the developed panchayats in comparison to the less developed panchayats. This result suggests that the formation of public capital in the less developed region is more beneficial in comparison to the developed region.

Conclusions

The hypothesis of this study was that the formation of private capital by subsistence farm families in a less developed district, Surkhet, of a developing country, Nepal, is constrained by the availability of public capital. Public capital was a significant variable explaining private capital formation of the farmers. This result was in conformity with Hirschman's theory of "*development via excess capacity*". The contribution of public capital to the formation of private capital also revealed that farm families in the developed region of Surkhet District accumulate more capital in comparison to farm families in the less developed region of the District. Considering this result, it may be concluded that capital formation by subsistence farmers depends upon the availability of public capital.

---

[3] The estimated elasticity of agricultural production with respect to public capital in this study is 0.13. Easter *et al* and Antle's (1983) estimated elasticity of agricultural production with respect to infrastructure for the districts of India and 47 less developed countries were 0.133 and 0.191 respectively.

The average savings ability of farmers in the developed region was lower in comparison to the farmers in the less developed region of the District. However, the formation of private capital was higher in the developed region vis-a-vis the less developed region. This result supported the conclusion that the formation of private capital by subsistence farmers depends upon the availability of public capital. The rate of return on private capital formation (i.e. investment in capital) appears to be enhanced where investment in public capital has occured. The ability of farmers to save is not the primary determining factor in a subsistence farmer's process of accumulating capital.

Hirschman's view that the formation of private capital in a less developed part of a developing country is possible only after a minimum level of the formation of public capital applies in Surkhet District of Nepal. Both the direct and indirect results of this research lend empirical validity to Hirschman's theory. Thus Hirschman's theory may be used to determine polices to hasten capital formation by subsistence farmers in rural areas of a developing country similar to Nepal.

The estimated production function equations revealed that the contribution of public capital to agricultural production is positive and statistically significant. The productivities of the factors of production in the developed panchayats of Surkhet were significantly higher than those in the less developed panchayats. These findings lead to the conclusion that public capital likely plays a significant role in the growth and development of the subsistence agricultural sector of a developing country similar to Nepal.

The social rates of return on public expenditure confirmed that public expenditure to form public capital in Surkhet District of Nepal, is economically beneficial. The social rate of return of public expenditure in the less developed part of the District was higher than that in the developed part of the District. Consequently to maximise the social rate of return to scarce financial resources, expenditure should be directed toward the less developed parts of the district, not concentrated in a few panchayats.

To summarize the conclusions, the results showed that public capital was one of the essential factors in the development of subsistence agriculture in a less developed region of a developing country. On the one hand it helps farm families to accumulate capital. On the other hand it contributes to increased agricultural production and to the productivities of the factors of production.

More money invested in public capital for the subsistence farm sector of Nepal would promote development because the social rate of return of such investment is substantial. To maximise this rate of return, public capital should be spread evenly in rural areas where agriculture exists. With limited financial resources, formation of public capital in a few regions does not seem to be a proper strategy for rural development.

References

Antle, J. M. (1983a) "Infrastructure and Aggregate Agricultural Productivity: International Evidence". Economic Development and Cultural Change, Vol. 31, pp. 609-619.

Antle, J. M. (1983b) "Infrastructure and Agricultural Productivity: Theory, Evidence and Implication for Growth and Equity in Agricultural Development". In Growth and Equity in Agricultural Development, A. Maunder & K. Ohkawa (eds.). International Association of Agricultural Economists & Institute of Agricultural Economics, Oxford, pp. 181-192.

Cairncross, A. K. (1962a) "The Contribution of Foreign and Domestic Capital to Economic Development". In Factors in Economic Development. Frederick A Praeger, Publisher, New York. pp. 39-74.

Easter, K. W., M. E. Abel & G. Norton. (1977) "Regional Differences in Agricultural Productivity in Selected Areas of India". American Journal of Agricultural Economics, Vol. 59, pp. 257-265.

ECAFE. (1961) "Capital Formation in Agriculture: A Case Study in Uttar Pradesh, India". Economic Bulletin For Asia and the Far East, ECAFE, Bangkok, Thailand, Vol. 12, pp. 29-48.

FAO. (1986) Inter-Country Comparisons of Agricultural-Production Aggregates. FAO, Rome.

Furtado, C. (1963) "Capital Formation and Economic Development". In The Economics of Underdevelopment, A. N. Agarwala and S. P. Sing (eds.). A Galaxy Book, New York. pp. 309-337.

Goil, R. M. & B. P. Ratnavat. (1971) " Capital Formation in India with Special Reference to the Agricultural Sector". In Studies in Capital Formation, Savings and Investment in a Developing Economy, P. C. Malhotra & A. C. Minocha (eds.). Somaiya Publications PVT. LTD, Bombay, India. pp. 216-226.

Griliches, Z. (1964) "Research Expenditures, Education, and the Aggregate Agricultural Production Function". The American Economic Review, Vol. LIV, pp. 961-974.

Hicks, J. R. (1960) "Thoughts on the Theory of Capital, the Corfu Conference". Oxford Economic Papers , Vol. 12, pp. 123-132.

Hirschman, A. O. (1960) The Strategy of Economic Development. New Haven: Yale University Press, USA.

Mainaly, A. Factors Influencing Capital Formation in Subsistence Agriculture. Unpublished M.Sc. Thesis, University of Alberta, Edmonton, 1988.

Manning, R, & J. McMillan. (1982) "The Scale Effect of Public Goods on Production-possibility Sets". In Production Sets, M. Kemp (eds.). Academic Press, New York, pp. 119-133.

McMillan, J. (1979) "A Note on the Economics of Public Intermediate Goods". Public Finance, Vol. 34, pp. 293-299.

Meade, J. E. (1952) "External Economies and Diseconomies in a Competitive situation". Economic Journal , Vol. 62, pp. 54-67.

Mukerji, K. (1971) "A Note on the Measurement of Capital Formation". In Savings and Investment in a Developing Economy, P. C. Malhotra & A. C. Minocha (eds.). Somaiya Publications PVT. LTD. Bombay, India. pp. 69-76.

Nurkse, R. (1954) "International Investment Today in the Light of Nineteenth-Century Experience". Economic Journal, Vol. 64, pp. 744-58.

Rosenstein-Rodan, P. N. (1944) "Problems of Industrialisation of Eastern and South-Eastern Europe". Economic Journal, Vol. 53, pp. 202-211.

Schultz, T. W. (1964) Transforming Traditional Agriculture. New Haven, Yale University Press.

Shukla, T. (1968) "Investment in Agriculture". Economic and Political Weekly, Vol. 3, pp 1729-1732.

Welch, F. (1970) "Education in Production". Journal of Political Economy. Vol. 78, pp. 37-59.