



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Vol XXIV
No. 4

ISSN 0019-5014

CONFERENCE
NUMBER

OCTOBER-
DECEMBER
1969

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

The next important item on which capital expenditure would show sizable increase is in respect of purchase of agricultural implements and machinery. Mechanized farming has increased in popularity and received greater emphasis in policy. The demand for various agricultural machinery and implements is estimated to show sizable increase. For instance, the annual demand for tractors is estimated to increase steadily from 70,000 in 1969-70 to 90,000 in 1973-74. The Working Group on Agricultural Implements and Machinery for the Fourth Plan has made projections of demand for various implements and has also estimated the credit requirements for these implements. On these bases, the overall capital expenditure for purchase of agricultural implements and machinery during the Fourth Plan period could be estimated at Rs. 709 crores.⁴

In sum, capital expenditure of rural households in the three major items—land improvement, agricultural implements and machinery and minor irrigation—would thus add up to Rs. 2,169 crores during the five years 1969-70 through 1973-74 as indicated in Table I, the annual expenditure would be varying depending on the annual physical programme. The basic assumption in these estimates is that the programme envisaged during the Fourth Plan period would be implemented. At this stage it may be reiterated that these estimates, subject as they are to various limitations, are in the nature of “order of magnitude” figures.

LEVEL AND PATTERN OF INVESTMENT IN AGRICULTURE:
A MICRO CROSS-SECTION ANALYSIS OF A PROGRESSIVE
AND A BACKWARD AREA IN CENTRAL GUJARAT

B. M. DESAI*

*Research Associate
Indian Institute of Management, Ahmedabad*

OBJECTIVES

The paper seeks to answer the following three objectives at the farm level: (1) to determine the level and pattern of investment; (2) to examine the factors influencing the same; and (3) to examine the sources of financing investment.

However, before examining these objectives, the sample design adopted for the selection of areas and farmers and the concepts and methodology used in this paper may be stated.

4. The Working Group has worked out the credit requirement at Rs. 496 crores for the Fourth Plan period and assuming that the proportion of credit to total expenditure is 70 per cent, the overall expenditure could be derived at Rs. 709 crores. See Report of the Working Group for Formulation of Fourth Five-Year Plan Proposals on Agricultural Machinery and Implements, Ministry of Food and Agriculture, Government of India (mimeo.).

* The author is grateful to Dr. D. K. Desai, Indian Institute of Management, Ahmedabad and to Shri M. D. Desai, Agro-Economic Research Centre, Vallabh Vidyanagar, for their valuable suggestions. The help of Shri S. N. Chokshi in calculations is thankfully acknowledged.

Sample Design

The sample utilized for this paper was originally selected for a study on "Investigation into the Total Credit Needs for Farm Production in the Changing Agriculture" by the Group for Management in Agriculture and Co-operatives, Indian Institute of Management, Ahmedabad. This study adopted programming techniques to assess the demand for farm credit in the changing agriculture. A district (Baroda) with relatively high level of agricultural development in the Gujarat State was selected on a criterion evolved on the basis of three indicators, viz., per acre gross income from major crops, per acre consumption of nitrogen and per acre co-operative credit supplied.

A taluka each was randomly selected from four typical types of farming areas classified on the basis of proportion of area under different crops to the total cropped area. The selected talukas were Baroda, Sinor, Waghodia and Chhota Udepur. Two villages each were randomly selected from each of the four selected talukas after arranging the villages into descending order of their area irrigated and dividing them by median. There was, however, an exception in the case of Chhota Udepur taluka where irrigation was negligible. Consequently, the two villages in the taluka were randomly selected on fertilizer-use basis.

Farmers from among the selected villages were selected by the stratified random sample method. The farmers were first stratified into large (above 15 acres), medium (5-15 acres in three talukas and 7-15 acres in one taluka) and small (below 5 acres in three talukas and below 7 acres in one taluka) holding groups on their owned farm size basis. Each of these groups was further divided into two sub-categories, viz., high and low fertilizer users. And one farmer from each of these two sub-categories within each holding group in the selected village was randomly selected.¹

For the present paper, in which two talukas are treated as progressive (viz., Baroda and Sinor) and two as backward (Waghodia and Chhota Udepur), the sample size at the village and farmer level would be 4 and 24 each, respectively. The data were collected for the agricultural year 1968-69.

Concepts and Methodology

Capital accumulation is traditionally indicated by the growth of reproducible tangible wealth (RTW). In recent times, the concept of capital is not, however, identified with that of RTW and is considered to encompass intangible wealth, too. Samuelson defines capital goods as goods "produced by the economic system itself to be used as productive inputs for further production of consumption and other goods and services."² Ideally, the most liberal interpretation of the

1. Details of sample design are given in "Investigation into Total Credit Needs for Farm Production in the Changing Agriculture," D. K. Desai and B. M. Desai, which is under preparation.

2. Paul A. Samuelson: *Economics—An Introductory Analysis*, McGraw Hill Book Co., Inc., New York, 1958, p. 576. Also see Spitze's treatment in "Determinants of Capital Formation—Conceptual and Factual Considerations" in *Capital and Credit Needs in a Changing Agriculture*, edited by E. L. Baum, H. G. Diesslin and E. O. Heady, Iowa State University Press, Ames, Iowa, U.S.A., 1961.

term "capital" in which even human capital is included can be employed.³ However, we may consider only physical capital, in which case land, implements, irrigation, cattle, farm buildings and working capital can be included in the term "capital."⁴

The inclusion of working capital in "capital" is justified on two grounds. One, inasmuch as a farmer sets apart a portion of his income for expenditure on inputs such income acquires one of the important characteristics of capital, *viz.*, abstinence. Secondly, a judicious combination of working capital (for farm inputs) and durable capital (*i.e.*, farm assets) is essential to exploit the productivity potential of the latter and also to organize production on optimum lines. Thus working capital indirectly aids the process of capital accumulation. Our concept of capital thus includes both durable and working capital which may be termed "non-durable capital." However, these two forms of capital are treated separately as they are conceptually different. Durable capital represents an effort of a farmer to keep aside a part of the current income the fruits of which in the current year are not commensurate with the effort of the same year. As against this, investment in the form of working capital fructifies during or at the end of the same year.

The term 'durable capital' as employed here is composed of capital invested on major farm equipments (*e.g.*, tractor, iron plough, etc.), irrigation (*e.g.*, wells, lift irrigation devices, pipelines), cattle, cart and farm buildings (*e.g.*, godown, cattle shed, engine/motor room). The non-durable capital consists of working capital spent on seeds, fertilizers, farmyard manure, insecticides, irrigation, hired human labour, traction labour, feed and labour expenses on milch animals, etc. While the latter is examined with respect to the reference year, the former is studied with respect to the position at the beginning of this year and during the year. Further, investment made during the reference year in durable capital includes investment on additions to and improvements in land, besides the five items mentioned above. The gross values of items of durable capital have been considered whereas investment in non-durable capital represents the purchase price of inputs. We have adopted the expenditure instead of the inventory approach for the measurement of capital formation.

Sample Characteristics

The progressive area was superior to the backward area in respect of all the characteristics examined here (Table I). Thus, the socially progressive caste, *viz.*, Patidars in the progressive area is known for its enterprising farming. But, the socially backward castes and tribe, *viz.*, Rajputs, Baraiya, Koli, etc. in the other area are known for their apathetic attitude and for their limited economic horizons. Although the average operational as well as owned land was higher in the backward area as compared to that in the progressive area the soils in the latter were more fertile.

In the progressive area not only the modern lift irrigation facilities were more but the availability of water in wells was also better. As against this, the

3. Theodore W. Schultz, "Capital Formation by Education," *Journal of Political Economy*, Vol. LXVIII, No. 6, December, 1960.

4. Tara Shukla : Capital Formation in Indian Agriculture, Vora & Co., Bombay, 1965, pp. 59-60. See also Spitze, *op. cit.*, p. 27.

TABLE I—DATA ON SOME SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FARMERS OF THE PROGRESSIVE AND BACKWARD AREAS

Characteristics	Progressive area	Backward area
1. Percentage of socially progressive caste farmers	83·3	16·7
2. Percentage of socially backward caste farmers	16·7	83·3
3. Percentage of illiterate farmers	4·2	58·3
4. Percentage of farmers having education beyond primary school level	75·0	12·5
5. Average operational holding (acres)	11·2	14·9
6. Average owned holding (acres)	11·5	15·2
7. Intensity of cropping—I (a) (per cent)	109·2	107·1
8. Intensity of cropping—II (b) (per cent)	175·9	148·4
9. Percentage of gross irrigated area to gross cropped area ..	70·7	26·9
10. Percentage of area under cash crops to gross cropped area ..	64·8	56·8
11. Percentage of irrigated cash crops to total cash cropped area ..	68·4	21·7
12. Percentage area under irrigated foodgrains to total area under foodgrains	78·4	40·5
13. Per farm business income (c) (Rs.)	7,539	2,404
14. Per acre farm business income (Rs.)	624	151
15. Per farm net household income (d) (Rs.)	10,698	3,762

(a) Intensity of cropping—I is defined as a percentage of gross cropped area to net sown area.

(b) Intensity of cropping—II is defined as a percentage of total season-acres to net sown area. This concept is adopted because long duration crops like cotton, tobacco, banana, etc., occupy land for more than one season and consequently less area would be available for double cropping.

(c) Farm business income is arrived at after deducting A₂ Cost on farming from value of crop produce imputed at farm harvest prices.

(d) Net household income includes farm business income plus net income from other occupations pursued by a farmer and his family. Net income from other occupations is computed after deducting cash and kind expenses on these occupations from gross income (cash and kind) earned from them.

backward area sample farmers faced water shortage in wells due to low water-table. Finally, a remarkably large average farm business income in the progressive area was because of the superior soils, better techniques of production used, higher managerial efficiency and high price crops like banana, tobacco, Co₂ Cotton, etc., grown by the selected farmers of this area.

LEVEL OF INVESTMENT IN DURABLE AND NON-DURABLE CAPITAL

Both per farm and per acre investment in durable capital in the progressive area was much larger than that in the backward area (Table II). Per farm investment in durable capital during the year in the progressive area was about five and

a half times that in the other area. Similarly, per acre investment in this type of capital during the year in the former was a little over seven times that in the latter.

TABLE II—PER FARM AND PER ACRE INVESTMENT IN DURABLE AND NON-DURABLE CAPITAL IN THE TWO AREAS

Investment in durable capital (Rs.)	Progressive area		Backward area	
	Per farm	Per acre	Per farm	Per acre
1. At the beginning of the reference year	11,756	1,050	6,528	437
2. During the year	2,316	207	416	28
3. Total investment at the end of the year	14,062	1,257	6,944	465
Investment in non-durable capital (Rs.)				
1. Farming	6,490	537	2,314	145
2. Livestock (milch)	543	213 per animal	396	75 per animal
Total	7,032	750	2,710	220

Per farm as well as per acre investment in non-durable capital in the progressive area was also much larger than that in the backward area (Table II). Indeed, per acre/animal investment in the former was nearly three and a half times that in the latter. More significantly, investment for farming was much larger than that for livestock in the progressive area compared to the situation in the other area. This indicates that in the backward area where the techniques of production were backward and where farming was characterized by high risks and uncertainty arising from natural hazards like semi-drought conditions, soil erosion due to ravines, etc., livestock was a keen competitor with farming for investible surpluses.

FACTORS INFLUENCING THE LEVEL OF INVESTMENT

We have analysed below the influences of certain economic factors, viz., size of operational holding, family size, net household income, extent of commercialization, extent of irrigated area and current borrowings (the last two being for analysing their influences on investment in non-durable capital only), on the level of investment. In this analysis we have assumed that the current levels relating to these six variables would be related to their past levels. Further, family size has been considered here as a proxy both for the labour supply and also for the family living expenditure of a farmer. Strictly speaking, for the former, family members engaged on the farm and hired labourers engaged by a farmer for his farm should be considered. However, for want of data we have selected family size as a variable. The extent of commercialization is measured by the percentage of cash cropped area to gross cropped area of a farmer. Finally, we have calculated the coefficients of simple correlation of "total investment" in durable capital and "investment in non-durable capital for farming" with the above-mentioned economic factors.

Durable Capital and Land

The coefficients of correlation between durable capital and operational land worked out to 0.35 (significant at 10 per cent only) for the progressive area as against 0.70 (significant at 1 per cent) for the backward area. These results would imply that a complementary relationship between these two factors was less significant and was weaker in the progressive area than that in the other area. This is because a large (50 per cent) part of investment in durable capital in the progressive area unlike in the backward area (25 per cent) was in irrigation which is a land-substituting capital-intensive resource.

The land-substituting character of irrigation did not give a negative 'r' between land and capital because investment in irrigation being in wells and modern lift irrigation devices requires heavy capital. But, the relationship between land and capital excluding irrigation was highly significant (at 1 per cent) and positive; they being 0.51 and 0.60 for the progressive and backward areas, respectively.

An important conclusion emerges from the above results. Land by itself has a highly significant complementary relationship with capital. However, the relationship becomes weaker, once investment in land-substituting capital (in this case irrigation) is made on a substantial scale.

Durable Capital and Family Size

The correlation coefficients between durable capital and family size were negative, low and insignificant in both the areas, they being -0.05 and -0.08 for the progressive and backward areas, respectively. In our context these results may be interpreted firstly as indicating a mild but weak substitutability between capital and labour. Secondly, the change in consumption expenditure on account of change in family size has a negative but insignificant influence on investment in durable capital. The probable reason for the insignificant nature of negative influence is that the factors other than consumption expenditure, e.g., availability of loans, high rate of return on capital, etc., may have a strong bearing on investment.

Durable Capital and Net Household Income

In both the areas, the relationship between these two factors turned out to be high, positive and significant at 1 per cent ; it being 0.51 for the progressive area and 0.70 for the backward area. Indeed, in the progressive area, of the four economic factors net income was most closely related to investment. But, in the backward area, investment was equally closely related to land and net income.

Durable Capital and Extent of Commercialization

The correlation coefficients between these two factors worked out to 0.31 and 0.33 for the progressive and backward areas, respectively. Both are significant only at 10 per cent. Hence the extent of commercialization did not have as strong influence as net income or land on investment in both the areas.

Non-durable Capital and Land

The correlation coefficients between non-durable capital for farming and operational land was 0.46 (significant at 5 per cent) for the progressive area as against 0.73 (significant at 1 per cent) for the other area. This would imply that investment in non-durable capital was more influenced by the changes in land in the backward area as compared to that in the progressive area.

Non-durable Capital and Extent of Irrigated Area

Normally one would expect positive relationship between these two factors. However, this was not the case in the backward area for which the value of 'r' was -0.33 (significant at 10 per cent only); for the progressive area the corresponding value was 0.44 (significant at 5 per cent). The negative coefficient for the backward area is due to (i) the sample farmers of this area though increased extensive farming did not intensify the use of other inputs necessary for irrigated and cash crop farming, and (ii) they also faced the shortage of liquid resources to obtain inputs.

The first reason gets further support from the value of 'r', -0.54 and significant at 1 per cent, between working capital and extent of commercialization for the backward region sample. In the progressive area the value of 'r' between these two factors turned out to be insignificant and low, though positive (0.23). This suggests that the techniques of production in this area were also characterized by imbalance in input-mix, though they were much better than that with the backward area sample.⁵

Non-durable Capital and Family Size

The values of 'r' between these two factors in both the areas were negative, low and insignificant; they being -0.18 for the progressive area and -0.12 for the backward area. Thus, this result further strengthens the earlier analysis of relationship between durable capital and family size.

Non-durable Capital and Net Household Income

As in the case of durable capital, the relationship between non-durable capital and net income was high, positive and significant in both the areas; the values of 'r' being 0.47 (significant at 5 per cent) for the progressive area and 0.81 (significant at 1 per cent) for the backward area.

Non-durable Capital and Borrowings

The value of 'r' between these two factors for the backward area sample worked out to 0.66 (significant at 1 per cent) as against an insignificant negative value of 0.06 for the other area. The higher and significant 'r' in the former indicates that the constraint of liquid capital was greater in the backward area as

5. The per acre expenses on seeds, fertilizers, farmyard manure, irrigation and human labour were Rs. 74, Rs. 135, Rs. 84, Rs. 114 and Rs. 109, respectively for the progressive area sample as against the corresponding values, 15, 32, 18, 16 and 43 for the other area.

compared to that in the progressive area. But, even for the progressive area this worked out to 0.90 (significant at 1 per cent) when those observations in which farmers had not borrowed money, were excluded. This suggests that even in the progressive area the constraint of liquid resources was faced by some farmers, at least.

PATTERN OF INVESTMENT

Pattern of Durable Capital

The data as given Table III reveals that the pattern of investment in the backward area was characterized by the traditional assets like cattle, cart, land and its improvement (in the nature of replenishing of soil and bunding on account of soil erosion due to ravines and uneven topography), farm structures (mainly cattle sheds). But, in the progressive area the pattern was dominated by irrigation (oil engine, electric motor, and wells), tractor, farm buildings (engine/motor room and godown, besides cattle sheds) and land and its improvements (in the nature of replenishing of soil to maintain the balance in soil composition).

TABLE III—PATTERN OF INVESTMENT IN DURABLE CAPITAL IN THE TWO AREAS

(in per cent)

Farm assets	Progressive area		Backward area	
	Investment at the beginning of the reference year	Investment during the year	Investment at the beginning of the reference year	Investment during the year
1. Land and its improvements	—	16.1	—	35.9
2. Major farm equipment	—	57.7	9.6	5.4
3. Irrigation	56.2	17.0	25.7	12.0
4. Cattle	13.9	5.6	36.8	8.0
5. Farm Buildings	26.1	1.2	23.4	—
6. Cart	3.8	2.4	4.5	38.7

Pattern of Non-durable Capital

The relative shares of different inputs in the two areas were as shown in Table IV.

TABLE IV—PATTERN OF NON-DURABLE CAPITAL IN THE TWO AREAS

(in per cent)

Inputs	Progressive area	Backward area
Seeds	13.5	10.0
Farmyard manure	15.2	12.0
Fertilizers	24.4	21.7
Insecticides	0.2	0.2
Irrigation	20.6	11.0
Hired human labour	19.7	29.5
Traction labour	4.7	11.8
Others (land revenue and rent)	1.7	3.8

The "new" inputs like fertilizers and irrigation claimed a higher share in the progressive area as compared to that in the other area. Indeed, the relative shares of investment in human and traction labour in the backward area were remarkably greater than that in the progressive area.

FACTORS INFLUENCING THE PATTERN OF INVESTMENT

We have already found earlier that, by and large, investment in either of the two types of capital, as defined in the present paper, in the backward area was positively and highly significantly related to operational holding. The relation of family size with capital was negative and insignificant in this area. These results could be interpreted as indicating low factor substitution between land and capital and also between labour and capital. The impact of such phenomenon is that investment is largely made in traditional assets like cattle, implements, cart, and inputs like human labour, traction labour, etc.⁶ This hypothesis is supported by the results of the preceding section inasmuch as the farmers of the backward area invested mainly in more traditional assets like cattle, farm buildings, cart, land improvements and inputs like human labour, traction labour, etc. Further these farmers to an extent also preferred investment giving quick returns, e.g., cattle. [But, they did not invest as much in irrigation because, such investment was considered risky and uncertain of its returns due to low water-table and uncertain recharge of water in wells. On the other hand, the farmers of the progressive area who faced less risk in investing in irrigation and who were also enlightened and enterprising, stressed more on irrigation, besides tractor, fertilizer, better seeds, etc., in their investment pattern.] Consequently, both the types of capital had lower degree of complementary relation with the operational holding and had weak substitutability with labour. Finally, the absence of significant difference in the percentage share of fertilizers in the total investment in farm inputs between the two areas was partly due to the larger availability of credit in kind (fertilizers) from the co-operatives in the backward area.

SOURCES OF FINANCE FOR CURRENT INVESTMENT

The data on this aspect were collected for investment made during the reference year only. The relevant data as provided in Table V reveal that in both the areas owned funds were the major source of financing investment in both durable and non-durable capital. However, expectedly, owned funds claimed a much higher share for both the types of capital in the progressive area as compared to that in the backward area. Institutional credit was significant only in regard to finance for non-durable capital. Such credit was mainly relied upon by the backward area sample farmers. This type of credit taken by these farmers indicates lack of adequate owned working capital with them. The sample farmers of the backward area depended also on moneylenders and traders for their long-term credit requirements. This shows a scope for institutional credit agencies to replace the other credit agencies in regard to the provision of long-term funds, provided such credit is made available to farmers on reasonable and convenient terms. The need for the provision of such credit to farmers in the backward area was greater than that in the progressive area.

6. Tara Shukla : *op. cit.*, p. 39.

TABLE V—SOURCES OF FINANCE FOR INVESTMENT IN THE TWO AREAS

(in per cent)

Progressive area	Owned funds	Money-lenders	Traders	Co-operative societies	Relatives	Owned funds and co-operative society	Relatives and owned funds	Relatives and money-lenders
(a) Durable capital	97.1	—	0.6	2.3	—	—	—	—
(b) Non-durable capital	81.9	1.3	—	5.6	1.5	6.5	2.8	0.4
Backward area								
(a) Durable capital	71.0	12.8	14.0	2.2	—	—	—	—
(b) Non-durable capital	42.4	0.7	—	28.9	0.5	17.9	0.4	9.2

CONCLUSIONS

A few important conclusions may now be recapitulated. / The level of investment either in durable or non-durable capital in the progressive area was much larger than that in the backward area. The larger investment in the former was because the sample farmers were better off and were more enterprising and enlightened. It was also because these farmers unlike the farmers in the backward area did not face uncertainty and risks in long-term investment, particularly in irrigation, on account of such factors as low water-table, soil erosion due to ravines and uneven topography, low and uneven rainfall, etc. Consequently, in the backward area the complementary relationship between capital and land was much stronger than that in the other area. The influence of net income on capital was also most close in the backward area as compared to that in the progressive area. In both the areas, however, capital and family size were negatively correlated with each other though the relationship was insignificant. This indicated a weak capital-labour substitution, besides a negative, though insignificant influence of consumption expenditure on capital formation. Nevertheless, the impact of the above phenomenon on the pattern of investment was not the same in the two areas. Thus, investment in the progressive area was largely composed of investment in irrigation and to a lesser extent in modern farm equipment, besides "new" inputs. In the backward area, investment was largely in traditional forms of assets and inputs.

Owned funds were the major source of finance for investment in both the areas. However, the dependence on credit, both institutional and private, for the two types of capital was much larger in the backward area. /