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CAPITAL REQUIREMENT FOR OPTIMIZATION OF RESOURCE USE ON MARGINAL AND SMALL FARMS IN OLD ALLUVIAL ZONE OF WEST BENGAL**

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ABSTRACT

Estimation of capital requirement for modernisation of Indian farms of different sizes over different agro-climatic zones in India is an important and long felt need. The present paper has made an effort to estimate capital requirements while optimizing the resource use on marginal and small farms in the old alluvial zone of West Bengal. The district of Burdwan showing the minimum divergence between the districts's crop yield index and zonal average (i.e. 100) in absolute term was selected for the study. A total of 150 farm households (small and marginal) formed the primary units of this study.

Linear programming approach was applied considering that it might handle best the problem of estimation of capital requirement, among all other approaches.

The return over variable cost (ROVC), generated from the optimum plans, was found to be increased with the change in the level of technology in the order of existing to progressive and to recommended technology. Obviously capital requirement and ROVC increased with the increase in size of farms. It was also noticed that the capital requirement for optimum plans prepared considering progressive farmers' technology was comparatively lower than those in the plans prepared considering both existing technology and recommended technology in the study area. It was suggested that those optimal plan(s) required less capital and generated more ROVC (in other words, having higher ratio between ROVC and capital requirement) might be chosen for implementation.

The process of transformation of traditional agriculture to a modernized one gathered momentum in the mid sixties when the new technology was introduced to Indian agriculture. This marked the beginning of a new phase

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of agriculture with increased emphasis on capital inputs. The modern inputs were costly and hence, huge amount of investment was essential to boost up the agricultural production. Therefore "with the innovation in the agricultural production technology in the mid sixties, varieties, particularly of wheat, more responsive to higher doses of capital were evolved" (Maji, 1982.)

From those days the use of modern inputs was on the rise and hence the capital intensity also went on increasing. At the same time, the process of farm mechanization was also increasing at a faster rate. Thus the need for investment in farming business was increasing in keeping with the need for progressive modernisation. But capital, which is essential for undertaking such investment, is scarce not only at the national level but also at the state and farm levels. Moreover, the need for capital widely varies with the level of modernisation / technology, commodity mix and size of farms. Hence, estimation of capital requirement at different levels of technology (or modernization) over different groups of farm assumes great importance.

At present there is hardly any estimate of capital requirements for modernizing agriculture. Considering the importance and long felt need, an All India Workshop on "Capital Requirement for Modernization of Agriculture" was held in New Delhi in May, 1982. The workshop emphasised the immediate need to strengthen the data base for estimating the demand for capital as well as the input/output relationships for different agro-climatic regions in the country and also to develop appropriate analytical models and methodology for the purpose.

This paper aims at working out the capital requirement at different levels of crop production technology with respect to marginal and small farms in the old alluvial agro-climatic zone of West Bengal.

Methodology

Sampling Design

The study was conducted in the old alluvial zone of West Bengal, comprising the districts of Burdwan, Birbhum, Hooghly and Howrah. Burdwan was selected for the study as a comparatively better representative of the zone based on crop yield index on the assumption that levels of technology and presence of constraints in crop production were adequately reflected by these indices. The district showing the minimum divergence between its yield index and zonal averages (i.e. 100) in absolute term was

selected. The selected district was divided into four quadrants in an attempt to reduce heterogeneity in terms of agro-climatic features. A list of villages in the respective quadrants was prepared. A total of 25 villages from the district were selected with equal probability without replacement and proportional to the number of villages in the respective quardrants. Finally, in each sample village, six farmers-three each from the marginal and the small groups were selected with equal probability without replacement. Thus, 150 farm households formed the primary sampling units of this study.

Collection of Data

A structured survey schedule was prepared to obtain the relevant data from the sample farmers. Secondary information obtained from various government offices, namely, District Agricultural Office, Block Development Office, Bureau of Applied Economics and Statistics and Socio-Economic Evaluation Branch of the State Agriculture Department, Calcutta were used.

Analytical Procedure

Three different approaches have been suggested by Maji (1982) to handle the problem of estimation of capital requirement for modernizing Indian agriculture.

The first approach, *albiet* crude and naive, is simple and conforms to the physical connotation of the word 'requirement'. In this approach, requirement of (and not the demand for) various agricultural commodities (crops, livestocks, etc.) need to be estimated with reference to a given year. Choice of technology is to be made next in respect of each crop, livestock, etc. for each agro-climatic situation with specified area or unit of production under each of them so that the estimated requirements of the commodities are met. The aggregate requirement of a particular form of capital can be estimated by multiplying the requirement per hectare or per animal as the case may be with the corresponding area or the number of animals and summing them up over all the crops, livestocks, technologies and regions.

The second approach to the problem is to estimate the demand for various types of capital engaged in production of different agricultural commodities either through production function or profit function analysis and to obtain a horizontal summation of these demand functions over commodities and regions.

Finally, the problem of estimation of capital requirement for modernising

agriculture may perhaps be best handled through programming approach. Specifically, linear programming (LP) model could be formulated in a manner to reflect, besides technological constraints, physical, agro-climatic, economic and social conditions. Being basically a planning model, it is free from most of the limitations of the earlier approaches. In particular, it works on the economic principles of allocation of scarce resources and considers economic and agro-biological interdependence among inputs and outputs. The demand for (not the requirement of) various forms of capital can be derived from the solutions of L.P. model by parameterising the appropriate coefficients of the technology matrix, prices and the availability of other resources that go along with capital.

Specification of the model

The formal stucture of the model in its deterministic form has been used for estimating capital requirement for different typical (sometimes called synthetic/representative) farm situation of different size groups in the study area. The model is based on the assumption that the farmer who makes the decision on the level of technology and use of capital is a profit maximizer.

Technology, for the purpose of the study, is given the connotation to include the package of practices involving both quality and quantity of inputs with the time and method of their applications as well as the corresponding level of output.

Three levels of technology have been considered. These are:

i) existing technology being practiced by ordinary farmers

ii) technology already adopted by the progressive farmers, and

iii) technology recommended by the research stations.

Under (i) and (ii) both the traditional and modern crop varieties have been considered with varying levels of other inputs in the package. However, only high yielding varieties are considered in (iii).

The Model :

Maximize $Z = \sum_{j=1}^{n} C_i X_j$ $(j = 1, 2, 3, ...n)$ -------(1),

Subject to $\sum_{j=1}^{n} a_{ij} X_j \leq b_i$ $(i= 1, 2, 3, ...m)$ ---------(2),

and $\sum_{j=1}^{n} X_j \geq 0$

where,

Z = Returns over variable cost (Rs.)

C_j = Returns over variable costs per unit of the activity (Rs.)

X_j = Units / levels of the j^{th} activity

a_{ij} = Requirement ($a > 0$) or contribution ($a < 0$) of one unit of the activity for the i^{th} constraint

b_i = The i^{th} constraint level (*kharif* irrigated and rainfed land, *rabi* and *boro* land, month wise availability of human labour, working capital and availability of credit).

Optimum plans vis a vis capital requirements
Marginal farms:

The average size of holdings of this category of farms in the selected (Burdwan) district was 1.92 acres, of which 1.49 acres and 0.43 acres were under *kharif* irrigated and rainfed situations respectively and 1.40 acres were suitable for *boro* and *rabi* crops. The average family labour supply per month was 43 mandays and a sum of Rs. 6214 was assumed to be the level of available working capital which was estimated considering the gross return from farm plus income from non-farm sources minus expenditure for home consumption.

Alternative Plans:
a) Existing technology (ET)

Only 6 plans are found to be appropriate under this situation. The area allotted to different crops under different plans are shown in Table 1. The cropping intensity varied from 135.57 per cent in P1 to as high as 177.60 per cent in P9.

b) Progressive Farmers' Technology (PFT)

Similarly, these 6 alternative plans have also been considered suitable for this given set of situation of the marginal farms with progressive farmers' technology. The cropping pattern under different alternative optimum plans is given in Table 2. The cropping intensity increased from 138.02 per cent in P5 to 169.27 per cent in P2. It is interesting to note that potato occupies the total irrigated *rabi* land, and IR-36 the total irrigated *kharif* land

Table 1 : Optimal Plans for Synthetic Marginal Farm in Burdwan District. (Existing Technology)

Average farm size = 1.92 acres

Crops / Activities.	P1		P2		P4		P5		P9		P10	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated)												
1. Dudkalma												
2. Daharnagra												
3. Sarunagra												
4. Kalamkati												
5. Jhingasal	0.35	13.45					0.11	4.15				
6. IR-36												
7. Swarna Pankaj	0.023	0.88	1.10	34.02	1.09	33.54	0.62	23.40	0.69	20.23	0.73	23.47
8. Pankaj												
9. Ratna	0.31	11.90	0.22	6.78	0.24	7.38			0.80	23.46	0.46	14.79
Kharif (Rainfed)												
1. Dudkalma												
2. Daharnagra												
3. Sarunagra	0.25	9.60										
4. Kalamkati												
5. Jhingasal	0.18	6.91					0.43	16.23				
6. Ratna			0.43	13.26	0.43	13.23			0.43	12.61	0.43	13.83

Boro												
1. Ratna												
2. IR-36												
3. CR-1036			1.11	34.22	1.07	32.92						
Rabi												
1. Mustard												
2. Wheat												
3. Potato			0.13	4.01	0.17	5.23						
4. Onion	0.31	11.9					0.13	4.91				
5. Cabbage	0.38	14.56	0.083	2.57	0.08	2.46	0.60	22.64	1.49	43.70	1.19	38.26
6. Tomato												
7. Sugarcane	0.80	30.73	0.17	5.24	0.17	5.23	0.76	28.84			0.30	9.65
Total Cropped Area	2.60	100	3.243	100	3.25	100	2.65	100	3.41	100	3.11	100
Cropping Intensity	135.57		168.91		169.27		138.02		177.60		161.98	

Table 2 : Optimal Plans for Synthetic Marginal Farm in Burdwan District. (Progressive Farmers' Technology)

Average farm size = 1.92 acres

Crops / Activities.	P1		P2		P4		P5		P9		P10	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated)												
1. Dudkalma												
2. Daharnagra												
3. Sarunagra												
4. Kalamkati	0.22	6.98					0.08	3.02			1.41	42.46
5. Jhingasal												
6. IR-36	1.01	32.06	1.12	34.46	1.32	40.70			0.65	24.53	1.49	43.70
7. Swarna Pankaj												
8. Pankaj												
9. Ratna			0.21	6.46								
Kharif (Rainfed)												
1. Dudkalma												
2. Daharnagra												
3. Sarunagra												
4. Kalamkati	0.43	13.65					0.43	16.23			0.43	12.89
5. Jhingasal												
6. Ratna			0.43	13.26	0.43	13.26					0.43	12.61

Boro												
1. Ratna			0.23	7.08								
2. IR-36	0.65	20.63										
3. CR 1036			0.84	25.85	1.07	33.02						
Rabi												
1. Mustard												
2. Wheat												
3. Potato	0.55	17.46	0.17	5.23	0.17	5.25	0.56	21.13	1.49	43.70	1.18	35.56
4. Onion	0.02	0.64					0.17	6.42			0.23	6.89
5. Cabbage			0.08	2.46	0.08	2.47						
6. Tomato												
7. Sugarcane	0.27	8.57	0.17	5.23	0.17	5.25	0.76	28.68			0.07	2.20
Total Cropped Area	3.15	100	3.25	100	3.24	100	2.65	100	3.41	100	3.32	100
Cropping Intensity	164.06		169.27		168.75		138.02		177.60		172.92	

(as in P9) when no restrictions on the area and credit are imposed.

c) Recommended Technology (RT)

Under this situation only five optimum plans have been considered suitable. Allocation of land under different crops in each optimum plan is given in Table 3. The cropping intensity remained more or less the same (ie. 154.69 to 155.21 per cent) under the alternative optimum plans. CR-1006 variety of paddy emerged as the most important crop for *kharif* irrigated land occuping more than 50 per cent of the total area in all the alternative optimum plans.

Return Over Variable Cost (ROVC)

Table 4 shows the returns over variable cost (ROVC) under different sets of alternative optimum plans prepared for the marginal farms of this district. Under the existing plan of production the marginal farms in the district of Burdwan could generate, on an average, an amount of Rs. 9658 as ROVC. A simple re-allocation of land and other resources using the same existing technology the farmers of this category could increase the ROVC by a minimum of 37 per cent to Rs. 13226 and a maximum of 76 per cent to Rs. 16997 over the existing ROVC of Rs. 9658. With the adoption of progressive farmers' technology the ROVC might even be increased to at least 226 per cent (Rs. 21824) under P2 and to a maximum of 358 per cent (Rs. 34588) under P9.

The increase in ROVC ranged from 117 per cent (Rs. 20980) to 240 per cent (Rs. 32771) under the recommended level of technology. It may be noted that the farmers of this category could increase their ROVC more by adopting the progressive farmers' technology than by using the recommended level of technology.

Capital Requirements

Capital requirement went up with the increase in ROVC over different sets of optimum plans. It was found that the capital requirements of the marginal farmers under different optimum plans by considering existing technology only had increased from Rs. 3419 as required under the existing cropping pattern to Rs. 5235 for P2 and to Rs. 9607 for P9, an increase by 53 per cent and 181 per cent respectively over the capital requirement under the existing cropping pattern.

Table 3 : Optimal Plans for Marginal Farm in Burdwan District. (Recommended Technology)

Average farm size = 1.92 acres

Crops / Activities.	P1		P2		P3		P4		P5		P9	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated & rainfed)												
1. Kalma												
2. Sarunagra												
3. Badsabhog	0.046	1.55										
4. Jhingasal												
5. IR-36	0.23	7.73										
6. IET 4094												
7. IET 6141												
8. IET 5656												
9. CR 1009												
10. Pankaj												
11. Ratna												
12. CR 1006	1.22	40.99	1.49	50.00	1.49	50.17			1.49	50.00	1.49	50.00

Boro										
1. Ratna	0.04	1.34			0.23	7.74				
2. IR-36										
3. IET 4094										
4. IET 6141										
Pre Kharif										
1. Til										
Rabi										
1. Mustard										
2. Potato	0.93	31.25	0.17	5.70	1.23	41.41	0.17	5.70	1.49	50.00
3. Rai	0.51	17.14	1.32	44.30	0.02	0.67	1.32	44.30		
Total Cropped Area	2.98	100	2.98	100	2.97	100	2.98	100	2.98	100
Cropping Intensity	155.0		155.21		155.69		155.21		155.21	

Table 4 : Return Over Variable Cost and Capital Requirement for Cropping Pattern

Table 4 : Return Over Variable Cost and Capital Requirement for Synthetic Marginal Farm in Burdwan District (Existing Technology).

(Rs.)

Particulars	Existing Cropping Pattern	Optimum plans					
		P1	P2	P4	P5	P9	P10
1. Return Over Variable Cost	9658.55	16074.78	13226.30	13238.06	16380.70	16996.59	16936.09
2. ROVC as Percentage of ROVC from Existing Cropping Pattern		166.43	136.94	137.06	169.60	175.97	175.35
3. Borrowing					627.23	3393.13	2500.00
4. Capital Requirement	3419.52	6214.11	5234.73	5356.13	6841.34	9607.24	8714.11
5. Capital Requirement Per Acre of Cropped Area		2376.33	1614.16	1648.04	2581.63	2817.37	2801.96
6. Capital Requirement as Percentage of Existing Cropping Pattern		181.72	153.08	156.63	200.06	280.95	254.83

Table 4 (contd.) : Return Over Variable Cost and Capital Requirement for Synthetic Marginal Farm in Burdwan District (Progressive Farmers' Technology).

(Rs.)

Particulars	Existing Cropping Pattern	Optimum plans					
		P1	P2	P4	P5	P9	P10
1. Return Over Variable Cost	9658.55	25717.59	21824.51	21927.98	28448.94	34588.13	31482.85
2. ROVC as Percentage of ROVC from Existing Cropping Pattern		266.27	225.96	227.03	294.55	358.11	325.96
3. Borrowing					1160.26	4372.62	2500.00
4. Capital Requirement	3419.52	6214.11	5206.31	5368.70	7374.37	10586.73	8714.11
5. Capital Requirement Per Acre of Cropped Area		1972.73	1601.94	1657.06	2782.78	3104.61	2624.73
6. Capital Requirement as Percentage of Existing Cropping Pattern		181.72	152.25	157.00	215.65	309.60	254.83

Table 4 (contd.) : Return Over Variable Cost and Capital Requirement for Synthetic Marginal Farm in Burdwan District (Recommended

Table 4 (contd.) : Return Over Variable Cost and Capital Requirement for Synthetic Marginal Farm in Burdwan District (Recommended Technology).

Rs.)

Particulars	Existing Cropping Pattern	Optimum plans				
		P1	P2	P3	P4	P9
1. Return Over Variable Cost	9658.55	28030.39	20980.13	30902.36	20980.13	32771.50
2. Percentage of ROVC from Existing Cropping Pattern		290.21	217.22	319.95	217.22	339.30
3. Borrowing						1073.56
4. Capital Requirement	3419.52	4963.54	3204.57	6214.11	3204.57	7287.67
5. Capital Requirement Per Acre of Cropped Area		1667.86	1075.35	2092.29	1075.35	2445.52
6. Capital Requirement as Percentage of Existing Cropping Pattern		145.15	93.71	181.72	93.71	213.13

Capital requirement per acre of cropped area was worked out as Rs. 1614, 1648, 2376, 2581, 2802 and 2817 for optimum plans P2, P4, P1, P5, P10 and P9 respectively.

Similarly, under the progressive farmers' technology the capital requirement per acre of cropped area was estimated at Rs. 1602, 1657, 1973, 2625, 2783 and 3105 for alternative plans P2, P4, P1, P10, P5 and P9 respectively. This indicates an increase in capital requirement by 52 per cent at the minimum to 210 per cent at the maximum.

With the adoption of recommended technology the capital requirements increased to Rs. 4964, Rs. 6214 and Rs. 7288 in P1, P3, and P9 respectively. However, a decrease in capital requirement was also noticed in P2 and P4. The requirement was only Rs. 3205 (Rs. 1075 per acre of cropped area) which was 94 per cent of the requirement under existing cropping pattern.

Small Farms

The average farm size of the sample small farmers was 3.58 acres of which 3.18 acres and 0.40 acres were under irrigated and rainfed situations respectively, and 2.33 acres were suitable for *boro* and *rabi* crops. The average family labour available per month, as recorded from the survey was 39 mandays. A sum of Rs. 12174 was estimated cash availability per annum.

Alternative Plans

a) Existing Technology (ET)

Four alternative (optimum) plans have been retained for final discussions under this category of farms. The allocation of cropped area to different crops under different optimum plans is shown in Table 5. Cropping intensity was the highest (165 per cent) in P3 followed by those in P4 and P11 (156 per cent each), and P11 (78 per cent). Among different crops grown, IR-36 and CR-1009 varieties of paddy appeared in all the plans in *kharif* season and tomato in *rabi* season.

b) Progressive Farmers' Technology (PFT)

Similarly, the six optimum plans P1, P2, P3, P4, P9 and P10 have been considered for progressive farmers' technology. The cropping intensities under these plans were 107, 101, 165, 155, 165 and 165 per cents, respectively (Table 6). *Ratna* variety of paddy was found in almost all the alternative plans for both the irrigated land and rainfed land in the *kharif*

Table 5 : Optimal Plans for Synthetic Small Farm in Burdwan District. (Existing Technology)

Average farm size = 3.58 acres

Crops / Activities.	P1		P3		P4		P11	
	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated)								
1. Dudkalma								
2. Daharnagra					0.33	5.92		
3 Sarunagra								
4. Kalamkati								
5. Jhingasal								
6. IR-36	0.18	6.41	2.77	46.87	1.32	23.7	1.43	25.67
7. Swarna Pankaj								
8. Pankaj								
9. Ratna								
10. CR 1009	0.30	10.68	0.41	6.94	0.89	15.98	0.89	15.98
11. CR 1010								
Kharif (rainfed)								
1 Dudkalma								
2. Daharnagra					0.4	7.18	0.40	7.18
3. Sarunagra								
4. Kalamkati								
5. Jhingasal								
6. Ratna			0.40	6.77				

Boro								
1. Ratna								
2. IR-36								
3. IR-50					1.33	23.88	1.33	23.88
4. CR 1036								
Rabi								
1. Mustard								
2. Wheat								
3. Potato					0.33	5.92	0.33	5.92
4. Onion	0.42	14.95						
5. Cabbage								
6. Tomato	1.79	63.7	2.33	39.42	0.33	5.92	0.33	5.92
7. Sugarcane	0.12	4.27			0.33	5.92	0.33	5.92
Total Cropped Area	2.81	100	5.91	100	5.57	100	5.57	100
Cropping Intensity	78.49		165.08		155.59		155.59	

Table 6 : Optimal Plans for Synthetic Small Farm in Burdwan District. (Progressive Technology)

Average farm size = 3.58 acres

Crops / Activities.	P1		P2		P3		P4		P9		P10	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated)												
1. Dudkalma	0.44	11.52										
2. Daharnagra												
3. Sarunagra												
4. Kalamkati												
5. Jhingasal												
6. IR-36												
7. Swarna Pankaj			0.29	8.03			0.44	7.91				
8. Pankaj												
9. Ratna	0.69	18.06	0.41	11.35	3.18	53.51	2.40	43.16	3.18	53.84	3.18	53.81
10. CR 1009			0.19	5.26								
Kharif (rainfed)												
1. Dudkalma	0.40	10.46										
2. Daharnagra												
3. Sarunagra												
4. Kalamkati												
5. Jhingasal												
6. Ratna			0.40	11.08	0.40	6.77	0.49	7.19	0.40	6.77	0.40	6.77

Boro												
1. Ratna												
2. IR-36												
3. IR-50							0.42	7.55				
4. CR 1036												
Rabi												
1. Mustard												
2. Wheat			1.47	40.72			0.91	16.37				
3. Potato			0.33	9.14			0.33	5.93	1.67	28.27	0.57	9.65
4. Onion	1.14	29.84			0.14	2.37						
5. Cabbage					0.56	9.48	0.33	5.93	0.66	11.12	1.76	29.78
6. Tomato	1.11	29.06	0.33	9.14	1.63	27.58						
7. Sugarcane	0.04	1.08	0.19	5.26			0.33	5.93				
Total Cropped Area	3.82	100	3.61	100	5.91	100	5.56	100	5.91	100	5.91	100
Cropping Intensity	106.70		100.84		165.08		155.31		165.08		165.08	

season. Some land was devoted to *boro* paddy (IR-50) only in P4, other plans did not allocate any land to *boro* crops. However, *rabi* crops, like tomato and onion, and to some extent, potato and cabbage were included in the optimal plans.

c) Recommended Technology (RT)

The same sets of alternative plans, as in progressive farmers' technology, have been finally considered for discussion in this case also and are presented in Table 7. The cropping intensities worked out to be 99 and 107 per cents in P1 and P2 respectively, and about 165 per cent in all other plans. CR-1006 variety of paddy for *kharif* season, and potato and rai (mustard) for *rabi* season appeared as the dominant crops.

Return Over Variable Cost (ROVC)

It may be seen that with an optimal allocation of land and other associated resources a small farmer can increase his income (ROVC) by at least 5 per cent as suggested by P11 and by 74 per cent through P3 under the existing technology (Table 8).

Under the progressive farmers' technology the surplus (ROVC) could be increased by a minimum of 12 per cent through P2 and a maximum of 104 per cent through P9.

Similarly, ROVC recorded for different plans under recommended technology are 117, 118, 165, 200, 217 and 230 per cents over the ROVC under existing cropping pattern for P2, P1, P4, P3, P10 and P9, respectively.

Capital Requirements

The capital requirements were estimated at Rs. 4459, 10618, 12174 and 12347 for implementation of optimal plans P1, P3, P4, and P11 respectively under the existing technology. These capital requirements were higher than the one required under the existing cropping pattern by 44, 105, 120 and 122 per cents, respectively.

Similarly, under the progressive technology the capital requirements of an average small farm were found to be Rs. 5794, Rs. 6446, Rs. 12174, Rs. 11655, Rs. 16481 and Rs. 14674 for the optimal plans P1, P2, P3, P4, P9, and P10 respectively. Expressed as percentage of the capital requirement under the existing cropping pattern, these figures become 57, 64, 1210.1, 116, 63 and 145 per cents, respectively.

Table 7 : Optimal Plans for Synthetic Small Farm in Burdwan District. (Recommended Technology)

Average farm size = 3.58 acres

Crops / Activities.	P1		P2		P3		P4		P9		P10	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Kharif (Irrigated & rainfed)												
1. Kalma												
2. Sarunagra												
3. Jhingasal												
4. Badsabhog	0.37	10.48	0.33	8.64								
5. IR-36												
6. Ratna												
7. Pankaj												
8. IET 4094												
9. IET 6141												
10. IET 5656												
11. CR 1009												
12. CR 1006	1.33	37.68	1.36	35.60	3.58	60.57	3.58	60.58	3.58	60.57	3.58	60.57

Boro												
1. Ratna	0.38	10.76	0.45	11.78	0.5	8.47						
2. IR-36												
3. IET 4094												
4. IET 6141												
Pre-Kharif												
1. Til												
Rabi												
1. Mustard												
2. Potato	0.39	11.05	0.33	8.64	1.33	22.50	0.33	5.59	2.33	39.43	1.89	31.98
3. Rai	1.06	30.03	1.35	35.34	1.0	16.93	1.49	35.25			0.44	7.45
Total Cropped Area	3.53	100	3.82	100	5.91	100	5.90	100	5.91	100	5.91	100
Cropping Instensity	98.60		106.70		165.08		164.80		165.08		165.08	

Table 8 : Return Over Variable Cost and Capital Requirement for Synthetic Small Farm in Burdwan District (Existing Technology).

(Rs.)

Particulars	Existing Cropping Pattern	Optimum plans			
		P1	P3	P4	P11
1. Return Over Variable Cost (ROVC)	23635.99	29676.73	41099.22	24806.08	24859.06
2. ROVC as Percentage of ROVC from Existing Cropping Pattern		125.55	173.88	104.95	105.17
3. Borrowing					173.32
4. Capital Requirement	10088.93	4459.37	10617.18	12174.18	12347.50
5. Capital Requirement Per Acre of Cropped Area		1586.96	1796.55	2185.66	2216.78
6. Capital Requirement as Percentage of Existing Cropping Pattern		44.20	105.24	120.67	122.38

Table 8 (Contd) : Return Over Variable Cost and Capital Requirement for Synthetic Small Farm in Burdwan District (Progressive Technology).

(Rs.)

Particulars	Existing Cropping Pattern	Optimum plans					
		P1	P2	P3	P4	P9	P10
1. Return Over Variable Cost	23635.99	36282.10	26409.12	47565.60	36065.18	48183.56	48079.55
2. ROVC as Percentage of ROVC from Existing Cropping Pattern		153.50	111.73	201.24	152.58	203.86	203.41
3. Borrowing						4306.79	2500.00
4. Capital Requirement	10088.93	5793.78	6445.81	12174.18	11655.52	16480.97	14674.18
5. Capital Requirement Per Acre of Cropped Area		1516.69	1785.54	2059.92	2096.31	2788.65	2482.94
6. Capital Requirement as Percentage of Existing Cropping Pattern		57.42	63.88	120.66	115.52	163.35	145.44

Table 8 (Contd) : Return Over Variable Cost and Capital Requirement for Synthetic Small Farm in Burdwan District (Recommended Technology).

(Rs)

Particulars	Existing Cropping Pattern	Optimum plans					
		P1	P2	P3	P4	P9	P10
1. Return Over Variable Cost	23635.99	27872.27	27737.58	47216.34	38940.93	54329.01	51186.38
2. ROVC as Percentage of ROVC from Existing Cropping Pattern		117.92	117.35	199.76	164.75	229.85	216.56
3. Borrowing						4478.97	2500.00
4. Capital Requirement		4515.72	4372.10	12174.18	8430.07	16653.15	14674.18
5. Capital Requirement Per Acre of Cropped Area		1279.24	1144.52	2059.92	1428.82	2817.79	2482.94
6. Capital Requirement as Percentage of Existing Cropping Pattern		44.75	43.33	120.66	83.55	165.06	145.44

Capital required for adoption of the recommended technology was Rs. 4516, Rs. 4372, Rs. 12174, Rs. 8430, Rs. 16653 and Rs. 14674 in optimal plans P1, P2, P3, P4, P9 and P10 respectively. In terms of percentage of the capital requirement for the existing cropping pattern these figures were 45, 43, 121, 84 165 and 145 per cents, respectively.

Conclusion

It is interesting to note that the capital requirement in some of the optimum plans prepared under the progressive farmers' technology was lower than those in the plans under the existing technology and/or the recommended technology. In some plans under the recommended technology the capital requirement was less than that under the existing technology.

Return Over Variable Cost (ROVC) was generally found to increase as the technology progressed from the existing level to progressive farmers' level and finally to the recommended level.

Obviously, capital requirement and ROVC increased with the farm size. It may also be noted that performance of the plans formulated considering the provision of hired labour option (in P3) in both the categories of farms and in some cases with the provision of hired labour (in P9) has been best among all of the plans formulated under different sizes of farms and under different level of technology.

Reference:

Maji, C.C. (1982). Capital requirement for modernization of Indian agriculture-- some methodological investigations. Paper presented in the workshop on "Capital Requirement for Modernization of Agriculture". Division of Econometric Analysis, IASRI, New Delhi.

Note

Twelve different alternative optimum plans were formulated considering three different levels of technology for each of the different sizes of farms.

Optimum Plan 1 (P1) : Considering all the activites taken up seperately under three different levels of technologies (as the case may be), and local resource endowment as the constraints.

Optimum Plan 2 (P2) : P1 plus restrictions on area under some crops.

Optimum Plan 3 (P3) : P1 with provision for hired labour

Optimum Plan 4 (P4) : P3 plus restrictions on area under some crops has been incorporated.

Optimum Plan 5 (P5) : P1 with provision of (unlimited) credit

Optimum Plan 6 (P6) : P1 with provision of (limited) credit

Optimum Plan 7 (P7) : P2 with provision of (unlimited) credit

Optimum Plan 8 (P8) : P2 with provision of (limited) credit

Optimum Plan 9 (P9) : P3 with provision of (unlimited) credit

Optimum Plan 10 (P10) : P3 with provision of (limited) credit

Optimum Plan 11 (P11) : P4 with provision of (unlimited) credit

Optimum Plan 12 (P12) : P4 with provision of (limited) credit