Optimization of Resources under Settled and Shifting cultivation in the Hill Zones of Assam

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The present study was undertaken in the hill zone of Assam which comprised of Karbi Anglong and North Cacher Hill districts. Both the production systems of settled and shifting cultivation are followed in the zone. The study was based on primary data of 200 sample households out of which 100 sample households followed shifting cultivation and the rest 100 sample households followed the settled cultivation. The sample households were selected by using multistage random sampling procedure and selected households were categorized into three size groups based on area under settled and shifting cultivation using cumulative root frequency rule. Data pertained to the year 1999-2000 and were collected from the sample households by interview method of sampling using structured schedules. In total, 10 cropping sequences and 4 different crop mixtures were identified under settled and shifting cultivation respectively. The linear programming technique was used to prepare micro-level production plan over the existing production plan for sustainability under both the system of cultivation. Optimization of resources resulted in substantial increase in cropping intensity and cropping area. There were scope of increasing income and employment in all farm sizes under settled and shifting cultivation.

Keywords: settled and shifting cultivation, linear programming technique, optimization of resources

Introduction:

The agricultural production systems in the hilly areas differ from the plough cultivation in the plain areas. In one side highly modern agricultural cultivation practices flourishes while on other side age old agricultural practices dominates. Thus dualism in agriculture still persists in the hilly areas. This system of dualism determines the standard of living of people. Further, there are two distinct agricultural production systems in the hilly areas, viz., settled and shifting cultivation. The tribal people practice the shifting cultivation which is locally known as *jhuming* and this system is the first step of transition from hunting to food production system. Usually the settled cultivation is practiced in foothills and terraces' in gentle slopes. The production behaviour in both the system is more or less similar as crop mixtures are grown in both the production system. However, the productivity under settled cultivation is higher than that of shifting cultivation (Chauhan, 2000). This productivity differences lead to differences in livelihood standard of people. Therefore, it is necessary as well as important to know the livelihood standard of people under both the production systems.

Sustainable agriculture is that form of farming which produces sufficient food to meet the needs of the present generation without eroding the ecological assets and the productivity of the life.

In the light of increase population in the state of Assam, promotion of sustainable agriculture is the only solution to feed the people. Sustainable agriculture is that form of farming which produces sufficient food to meet the needs of the present generation without eroding the ecological assets and the productivity of the life supporting system of future generation (Thakur, A.C., 1995).

With the above highlighted facts, the present study is an attempt to study the (i) to study the various cropping sequences and crop mixtures under settled and shifting cultivation and (ii) to study the optimization of existing resources to develop optimum plan under settled and shifting cultivation.

The present is expected to help the researchers, planners, policy makers and field functionaries in general and the farmers in particulars in the hill zone. Further it is expected that the study will provide a broad basis for developing farm plans using a total approach which will not only enable a farmer to utilize his resources optimally over years which will ensure a sustainable production systems that will maintain ecological balance and soil fertility status..

Review of literature:

Saikia and Bora (1971) have observed that pattern of crop production under shifting and terrace cultivation in Meghalaya was mixed cropping.

Mishra and Ramakrishna (1981) have also reported that farmers usually cultivated root and tuber crops like potato, sweet potato, elephant ear, cereals like rice and maize, legumes like French bean and vegetables like cabbage, cauliflower etc. in the shifting cultivation.

Nagaraja (1989) have observed that the average monetary return of crop mixtures over monocropping was more per acre and labour requirement was also higher in Andhra Pradesh.

Gulgani and Sirohi(1972) have shown in a study that full benefit could be obtained by rational allocation of resources in Delhi. They showed that inclusion of dairy in production plan increase the farm return.

Katar and Rahim (1978) have identified and evaluated the optimal cropping systems for a typical watershed in U.P. hills by using linear programming model. The showed that the return over variable costs could be increased by as much as 89 per cent over the existing plan in improved technology backed by liberal credit in needed quantity adopted.

Sain (1978) has examined the optimal land use pattern in Punjab and observed that there was maladjustment in enterprise mix which was the vital cause for low farm income. He concluded that net return could be increased appreciably through proper allocation of resources.

Sankhayan and Cheema (1991) have attempted to probe into the variation of linear programming model of farm planning and its consequences in terms the results of optimum plans. Their study reveal that it was possible to obtain correct results through optimization of resources irrespective of the use gross return or gross margin.

Goswami and Meenakshisundaram (1992) have studied about prospects of increasing farm income in traditional hill farms in Meghalaya using linear programming model and observed that systematic farm planning was a paying proposition under existing technology and with the existing resource base on the traditional hill farms.

Methods and Materials:

The present study was undertaken in the hill zone of Assam which comprised of Karbi Anglong and North Cacher Hill districts. Both the production systems of settled and shifting cultivation are followed in the zone. The study was based on primary data of 200 sample households out of which 100 sample households followed shifting cultivation and the rest 100 sample households followed settled cultivation. The sample households were selected by using multistage random sampling procedure and selected farmers were categorized into three size groups based on area under settled and shifting cultivation using cumulative root frequency rule[1]. Data pertained to the year 1999-2000 and were collected from the sample households by interview method using structured schedules. Linear programming Technique was used in the present study to develop the micro-level production for sustainability under settled and shifting cultivation. The technique is given below:

The linear programming of the following form was used to maximize the net return and employment for settled and shifting cultivation. Similar technique was also used by Singh and Rahim (1998) in U.P., and Sankhayan and Cheema (1991).

[1] Cochran, G.W. 1977. Sampling Technique. Wiley Eastern Limited, New Delhi Pp-127-129

$$\text{Max } Z = \sum_{J=1}^{n} C_j X_j$$

$$\text{Subject to } \sum_{J=1}^{n} C_j X_j \leq b_i \ (i = 1,2,3\ldots.m)$$

$$\text{And } x_j \geq 0 \ (j = 1,2,3\ldots.n)$$

Where,

Z = Net aggregate gross margin

C_j = Gross margin for j^{th} mixture under settled cultivation and / or gross margin for j^{th} cropping sequence under settled cultivation

X_j = Level of j^{th} mixture under settled cultivation and / or for j^{th} cropping sequence under settled cultivation

b_i = Level of resource constraints

a_{ij} = i^{th} input per unit of j^{th} mixture under settled cultivation and / or j^{th} cropping sequence under settled cultivation

The following two plans were developed to examine the various relaxations on the net aggregate gross margin and employment.

Plan I: It maximizes net aggregate gross margin of settled and shifting cultivation with existing resource

Plan II: It maximizes net aggregate gross margin of settled and shifting cultivation with

The simultaneous relaxation of capital and human labour hiring

Activities included in the plan:

Five categories of activities viz., crop (4 crop mixtures under shifting cultivation and 10 cropping sequences under settled cultivation), livestock, plantation crop (pineapple, mandarin orange, betel vine, banana, firewood, bamboo), labour hiring, and capital borrowing activities were incorporated in the plans.

Resource constraints:

The resource constraints in the programming model were crop area, labour and capital flexibility constraints.

Results and Discussion:

Identification of cropping sequence and crop mixtures under settled and shifting cultivation:

Among the various cropping sequence raised by the sample farmers under settled cultivation, CS 10 (*ahu* rice-*sali* rice-fallow) was the major cropping sequence followed by about 18% of the total sample farmers and accounting 37.46% of total cropped area. However CS 3 was the major cropping sequence followed in upland in terms of area coverage. In medium land CS-7 was the major cropping sequence followed by 9% of the sample farmers (Table1).

Crop mixture IV (rice + ginger + vegetables + turmeric + chilli + sesamum + mustard) was the dominant crop mixture under shifting cultivation adopted by 29% of the total farmers. This was followed by rice + maize + ginger+ vegetables + colocasia + marua (25%) and rice + ginger + vegetables + pumpkin + cotton + okra (23 %), and rice maize + ginger + vegetables + colocasia + pumpkin (23%) respectively (Table 2). The major difference occurred mainly on inclusion of one or more crops in the mixtures.

Thus it was evident from the table that mixed cropping system was followed by the farmers both in shifting as well as in settled cultivation. Similar results were also observed by Saikia and Bora (1971) in Meghalaya and Mishra and Ramakrishna (1981).

Effect of optimization on cropping pattern:

A comparison of optimal plans (PI) with those of existing plans (P0) showed the effect of optimization. The details of the optimum plans under settled and shifting cultivation are shown in Table 3a, 3b, 3c, and 4a, 4b, 4c. The Table revealed that the gross cropped area in the optimal plans PI in all the size of the farms recorded an increase over the existing plans. The highest cropping intensity was recorded on group II farms which increased from 113.18 per cent to 140.00 per cent. In the optimal plans CS 1 had occupied the highest area in group I farms (48.57 per cent).

While the cropped area in most of the size groups of farms remained the same in the optimal plans under shifting cultivation. However, the total cropped area in group I farms was suggested for crop mixture IV and CM I was eliminated from the optimal plan. This might be due to higher relative profitability of crops like spices, and oil seeds crops in CM IV as compared to CM I.

Effect of optimization on plantation crops:

As a result of optimization, mandarin, betelvine, and pineapple had occupied the highest area in Group I, Group II and Group III farms respectively. The percent of increase in area of mandarin, betelvine, and pineapple in the optimal PI were of the order of 488.89, 311.11 and 119.05 per cent in Group I, Group II and Group III farms respectively. The area under bamboo and firewood remained unchanged in the optimal plan I. This was mainly due to their lower profitability.

The area under the plantation crops under shifting cultivation also increased in the optimal plan over the existing plan except the Group I farms where it was reduced by 20.41 per cent in the optimal plan I. the area under plantation crops in Group II and Group III farms has increased by 178.26 and 239.13 per cent respectively. The area under firewood remained unchanged in optimal plan.

Effect of optimization on livestock:

As regard to animal enterprises a substantial increase in the number of goat and poultry in Group I and Group III farms were noticed (4 and 20 numbers). Poultry, goat and pig enterprises appeared in the optimal plan I of Group II and Group III farms respectively with 1,2 and 1, 1 numbers. Goat and poultry appeared to be remunerative animal activities on Group I and Group III farms as both these enterprises appeared in the optimal plan I with 4 and 20 numbers respectively.

A substantial increase in the number of goat, poultry and pig were noticed in all the farm groups under shifting cultivation. Amongst the animal activities, goat, poultry and pig were found to be more remunerative in group I, group II and Group III farms respectively.

Effect of optimization on labour employment:

The largest increase in human labour employment due to optimization of resources was noticed on Group III farms (196.63 per cent) and least (89.41 per cent) on Group II farms. This was due to fact of inclusion of optimal cropping sequences and labour intensive nature of the cropping sequences. However, in Group I farms, human labour was reduced (36.59 per cent) because of less number of animal activities and non inclusion of labour intensive cropping sequences in the optimal plan I. Similar results were reported by Hazarika (1992). This was due to fact of inclusion of optimal cropping mixtures and labour intensive nature of the cropping mixtures.

Like the settled cultivation, the largest increase in human labour employment due to optimization of resources was noticed on group II farms (204.71 per cent) and least (90.25 per cent) on group I farms.

Effect of optimization on net return:

Due to resource optimization, farm net return invariably increased in all the size group of farms under both settled and shifting cultivation. Similar results were reported by Goswami and Meenakshisundaram (1992) in traditional hill farms of west Garo hill of Meghalaya. This increase in farm net returns was due to optimal allocation of scarce

resources to various crops, animals and plantation crops and other crops. The inclusion of remunerative cropping sequences had lead to higher net return compared to the existing plan where the scarce resources were mostly mal-allocated. The largest increase in net returns was noticed on group II farms (233.61 per cent) and lowest (52.84 per cent) on group I farms under shifting cultivation.

Conclusion:

The above discussion highlighted that there was scope to increasing cropping intensity in all the size groups under settled cultivation through even with existing resources. Thus, the study revealed that the existing resource use was mal-allocated. Further, income and employment potentialities in all the sizes of farms increased considerably over the existing plan through optimization of existing resources under settled and shifting cultivation.

References:

Cochran, G.W. 1977. Sampling Technique. Wiley Eastern Limited, New Delhi Pp-127-129

Goswami and Meenakshisundaram, 1992. Prospects of Increasing Farm Income in Traditional Hill farms of west garo Hill district of Meghalaya. *Indian Journal of agricultural Economics*.47(2):247-254

Hazarika, D., 1992. Farming Systems Analysis under Flood Prone Situation. Unpublished Ph.D. Thesis Presented to AAU, Jorhat, Assam

Mishra, B.K. and Ramakrishnan, P.S., 1981.The economic yield and Energy Efficiency of Hill Agro-ecosystems at Higher Elevation of Meghalaya.

Nagaraja , B., 1989. Effect of Crop Mixtures on Income and Employment: A Case Study of Anantapur District. *Indian Journal of agricultural Economics*. 43(2):342-343

Saikia, P.D. and Bora, D.,1971.Pattern of Crop Production under Shifting and Settled Cultivation – A Study in Garo Hills, Meghalaya. *Indian Journal of agricultural Economics*. 43

Sain, K.,1978. Economic analysis of Shifting Cultivation. *Indian Journal of agricultural Economics*. 33(4):65-70

Sankhayan, P.L., Prihar, R.S. and Cheema, H.S.,1991. Developing Optimum Cropping Plans for a Typical Punjab Farm with Multiple Objectives by Using Compromise Programming. *Indian Journal of agricultural Economics*.43(2):147-174

Singh, K. and Rahim, K.M.B. (1998). Identification and Evaluation of Optimal Cropping Systems for a Typical Watershed in U.P. Hills. *Indian Journal of agricultural Economics*.33(4):772-780

Thakur, A.C., 1995. Farming Systems Research for Sustainable Agriculture. Proceedings of seminar of agricultural Science Society, North east India. 86-99

Table 1: Identification of Cropping sequences Across Various Size Groups under Settled Cultivation

Cropping sequence	Group-I		Group-II		Group-III		All	
	Number	Area	Number	Area	Number	Area	Number	Area
A. Upland:								
1. Ginger	4 (10.53)	0.35 (3.31)	3 (9.38)	1.18 (3.67)	5 (16.67)	4.95 (9.18)	12 (12.00)	2.16 (6.68)
2. Turmeric	3 (7.89)	0.42 (3.97)	4 (12.50)	1.23 (3.78)	3 (10.00)	2.43 (4.50)	10 (10.00)	1.36 (4.21)
3. Ahu rice-sesamum-mustard	5 (13.16)	1.81 (17.14)	2 (6.25)	2.75 (8.46)	2 (6.67)	3.33 (6.17)	9 (9.00)	2.63 (8.17)
4. Ahu rice-fallow-mustard	3 (7.89)	0.29 (2.75)	3 (9.38)	2.15 (6.62)	2 (6.67)	2.30 (4.26)	8 (8.00)	1.58 (4.87)
5. Fallow-sesamum-mustard	2 (5.26)	0.67 (6.34)	3 (9.38)	1.40 (4.31)	3 (10.00)	1.36 (2.52)	8 (8.00)	1.14 (3.57)
B. Medium land:								
6. Ahu rice-maize-fallow	2 (5.26)	0.78 (7.39)	3 (9.38)	3.41 (10.49)	2 (6.67)	5.00 (9.27)	7 (7.00)	3.06 (9.46)
7. Ahu rice-fallow-vegetables	4 (10.53)	1.20 (11.36)	3 (9.38)	3.04 (9.35)	2 (6.67)	3.33 (6.17)	9 (9.00)	2.52 (7.79)
8. Colocasia	3 (7.89)	0.50 (4.73)	3 (9.38)	1.44 (4.43)	2 (6.67)	2.54 (4.71)	8 (8.00)	1.49 (4.61)
C. Low land:								
9. Fallow – Sali rice – fallow	5 (13.16)	1.57 (14.87)	4 (12.50)	5.60 (17.23)	2 (6.67)	5.65 (10.47)	11 (11.00)	4.27 (13.21)
10. Ahu rice – Sali rice - fallow	7 (18.42)	2.97 (28.13)	4 (12.50)	10.30 (31.69)	7 (23.33)	23.06 (42.74)	18 (18.00)	12.11 (37.46)
Total	38 (100)	10.56 (100)	32 (100)	53.95 (100)	30 (100)	53.95 (100)	100 (100)	32.33 (100)

Figures in parentheses indicate percentages to total sample farmers and gross cropped area

Table 2: Identification of Crop Mixtures across Various Size Groups under Shifting Cultivation

Crop Mixtures	Name of Crop Mixture	Group-I	Group-II	Group-III	All
Rice + maize + ginger + vegetables + colocasia + marua	CM I	8 (25.00)	11 (27.50)	6 (21.43)	25 (25.00)
Rice + maize + ginger + vegetables + colocasia + pumpkin	CM II	9 (28.13)	9 (22.50)	5 (17.86)	23 (23.00)
Rice + maize + ginger + vegetables + colocasia + pumpkin + cotton + okra	CM III	6 (18.75)	10 (25.00)	7 (25.00)	23 (23.00)
Rice + ginger + vegetables + turmeric + chilli + sesamum + mustard	CM IV	9 (28.13)	10 (25.00)	10 (35.71)	29 (29.00)
Total		32 (100)	40 (100)	28 (100)	100 (100)

Figures in parentheses indicate percentages to total sample farmers

Table 3a: Optimum Farm Plans for Settled Cultivation with existing Resources for Group I Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CS1	Ha	0.009 (3.21)	0.17 (48.57)
CS2	Ha	0.011 (3.93)	-
CS3	Ha	0.048 (14.14)	-
CS4	Ha	0.008 (2.86)	-
CS5	Ha	0.018 (6.43)	-
CS6	Ha	0.021 (7.50)	-
CS7	Ha	0.032 (11.43)	0.08(22.86)
CS8	Ha	0.032(11.43)	-
CS9	Ha	0.013 (4.64)	0.08(22.86)
CS10	Ha	0.088 (31.43)	-
Settled land	Ha	0.25(100.00)	0.35 (100.00)
Pineapple	Ha	0.033	0.027
Betelvine	Ha	0.011	-
Banana	Ha	0.021	-
Mandarin	Ha	0.009	0.053
Firewood	Ha	0.013	0.013
Bamboo	Ha	0.004	0.004
Total plantation land	Ha	0.091	0.097(6.59)
Cattle	Number	0.320	-
Buffalo	Number	0.920	-
Poultry	Number	6.05	-
Goat	Number	2.42	4.00
Pig	Number	1.45	-
Gross Cropped area	Ha	0.28	0.35
Net Cropped area	Ha	0.25	0.25
Cropping intensity	%	113.18	140.00(23.70)
Human labour	Man days	82.00	52.00(-36.59)
Bullock labour	Man Days	32.00	13.00(-59.38)
Working capital	Rupees	9869.00	7910.00(-19.85
Net return	Rupees	5958.00	7040.38(18.17)

Figures in parentheses indicate percentages to total cropped area

Table 3b: Optimum Farm Plans for Settled Cultivation with existing Resources for Group II Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CS1	Ha	0.037 (3.89)	-
CS2	Ha	0.038 (4.00)	0.306(40.26)
CS3	Ha	0.086(9.05)	-
CS4	Ha	0.067 (7.05)	-
CS5	Ha	0.434 (45.68)	0.154(20.26)
CS6	Ha	0.107 (11.26)	-
CS7	Ha	0.095(10.00)	0.300(39.47)
CS8	Ha	0.045(4.74)	-
CS9	Ha	0.175 (18.42)	0.130(15.79)
CS10	Ha	0.134(14.11)	1.20(15.79)
Settled land	Ha	0.76(100.00)	1.01 (100.00)
Pineapple	Ha	0.027	0.040
Betelvine	Ha	0.018	0.074
Banana	Ha	0.024	-
Mandarin	Ha	0.011	-
Firewood	Ha	0.014	0.014
Bamboo	Ha	0.008	0.008
Total plantation land	Ha	0.172	0.136(-20.93)
Cattle	Number	0.47	-
Buffalo	Number	0.94	-
Poultry	Number	1.44	1.00
Goat	Number	2.66	-
Pig	Number	9.06	2.00
Gross Cropped area	Ha	0.95	1.01
Net Cropped area	Ha	0.76	0.76
Cropping intensity	%	125.00	132.89(6.31)
Human labour	Man days	85.00	161.00(89.41)
Bullock labour	Man Days	33.72	46.00(36.42)
Working capital	Rupees	9938.00	20846.00(109.76)
Net return	Rupees	5851.00	8230.06(23.78)

Figures in parentheses indicate percentages to total cropped area

Table 3c: Optimum Farm Plans for Settled Cultivation with existing Resources for Group III Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CS1	Ha	0.165 (9.17)	-
CS2	Ha	0.081 (4.50)	-
CS3	Ha	0.111(6.17)	-
CS4	Ha	0.077 (4.28)	-
CS5	Ha	0.045 (2.50)	0.547(30.27)
CS6	Ha	0.167 (9.28)	-
CS7	Ha	0.111(6.17)	0.665(36.80)
CS8	Ha	0.085(4.72)	-
CS9	Ha	0.188 (10.44)	0.245(13.56)
CS10	Ha	0.768(42.67)	0.350(19.37)
Settled land	Ha	1.55(100.00)	1.807 (100.00)
Pineapple	Ha	0.042	0.090
Betelvine	Ha	0.017	-
Banana	Ha	0.014	-
Mandarin	Ha	0.022	0.002
Firewood	Ha	0.017	0.017
Bamboo	Ha	0.011	0.011
Total plantation land	Ha	0.123	0.123
Cattle	Number	0.67	-
Buffalo	Number	0.83	-
Poultry	Number	8.33	20.00
Goat	Number	3.50	1.00
Pig	Number	2.07	1.00
Gross Cropped area	Ha	1.80	1.807
Net Cropped area	Ha	1.55	1.55
Cropping intensity	%	116.02	116.58(0.48)
Human labour	Man days	89.00	264.00(196.63)
Bullock labour	Man Days	35.00	117.00(234.29)
Working capital	Rupees	10468.00	26000.00(148.38)
Net return	Rupees	6213.00	10032.28(61.47)

Figures in parentheses indicate percentages to total cropped area

Table 4a: Optimum Farm Plans for Settled Cultivation with existing Resources for Group I Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CM1	Ha	0.07 (19.44)	-
CM2	Ha	0.09 (25.00)	-
CM3	Ha	0.07(19.44)	-
CM4	Ha	0.13 (36.11)	0.36(100.00)
Jhum land	Ha	0.36(100.00)	0.36 (100.00)
Pineapple	Ha	0.013	0.020
Betelvine	Ha	0.010	0.010
Banana	Ha	0.007	-
Mandarin	Ha	0.003	-
Firewood	Ha	0.006	0.006
Bamboo	Ha	0.003	0.003
Total plantation land	Ha	0.049	0.039(-21.41)
Pig	Number	1.14	1
Cattle	Number	0.37	1
Buffalo	Number	0.78	1
Poultry	Number	7.92	-
Goat	Number	2.36	5.00
Gross Cropped area	Ha	0.36	0.36
Net Cropped area	Ha	0.36	0.36
Cropping intensity	%	100.00	100.00
Human labour	Man days	77.74	147.90(90.25)
Working capital	Rupees	9588.00	7500.00(-21.78)
Net return	Rupees	4882.00	7462.02(52.84)

Figures in parentheses indicate percentages to total cropped area

Table 4b: Optimum Farm Plans for Settled Cultivation with existing Resources for Group II Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CM1	Ha	0.17 (21.52)	0.79(100.00)
CM2	Ha	0.19 (24.05)	-
CM3	Ha	0.22(27.85)	-
CM4	Ha	0.21 (26.58)	-
Jhum land	Ha	0.79(100.00)	0.79(100.00)
Pineapple	Ha	0.008	0.030
Betelvine	Ha	0.006	0.010
Banana	Ha	0.003	0.020
Mandarin	Ha	0.002	-
Firewood	Ha	0.0006	0.0006
Bamboo	Ha	0.003	0.003
Total plantation land	Ha	0.023	0.064(178.20)
Pig	Number	2.23	1
Cattle	Number	0.77	-
Buffalo	Number	0.74	-
Poultry	Number	5.97	99.62
Goat	Number	2.31	-
Gross Cropped area	Ha	0.79	0.79
Net Cropped area	Ha	0.79	0.79
Cropping intensity	%	100.00	100.00
Human labour	Man days	76.67	175.00(128.25)
Working capital	Rupees	8878.80	10220.00(15.11)
Net return	Rupees	4607.30	12984.57(181.83)

Figures in parentheses indicate percentages to total cropped area

Table 4c: Optimum Farm Plans for Settled Cultivation with existing Resources for Group III Farm

Activities	Unit	Existing Farm Plan (P0)	Optimum Farm Plan (PI)
CM1	Ha	0.23 (18.35)	0.67(53.17)
CM2	Ha	0.18 (22.22)	-
CM3	Ha	0.38(30.55)	-
CM4	Ha	0.37 (29.37)	0.59(46.83)
Jhum land	Ha	1.26(100.00)	1.26(100.00)
Pineapple	Ha	0.004	0.030
Betelvine	Ha	0.004	0.040
Banana	Ha	0.005	-
Mandarin	Ha	0.002	-
Firewood	Ha	0.003	0.003
Bamboo	Ha	0.005	0.005
Total plantation land	Ha	0.023	0.078(239.13)
Pig	Number	1.10	2.00
Cattle	Number	0.17	-
Buffalo	Number	2.14	0.138
Poultry	Number	1.34	-
Goat	Number	2.80	-
Gross Cropped area	Ha	1.26	1.26
Net Cropped area	Ha	1.26	1.26
Cropping intensity	%	100.00	100.00
Human labour	Man days	72.20	220.00(204.71)
Working capital	Rupees	9486.80	11000.00(15.95)
Net return	Rupees	4736.30	15800.00(233.61)

Figures in parentheses indicate percentages to total cropped area