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OPTIMUM COMBINATION OF CROP AND NON-CROP ENTERPRISES FOR INCREASING THE FARM INCOME

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Abstract

The present study was conducted in Western Uttar Pradesh. The selection of District was chosen purposively whereas a multistage simple random sampling technique was used to select the block, Villages and farmers. A total number of 80 farmers were selected randomly for primary data collection. The economics of different crops and livestock shows that, sugarcane provides highest net return of Rs. 62960.34 per hectare, after sugarcane, paddy provides net return of Rs.49442.52 per hectare. Sugarcane provides net return of Rs. 57065.21, Rs. 61933.31, Rs. 59235.47 and Rs.64722.28 on marginal, small, medium and large farms, respectively. A cow and buffalo provides net return of Rs. 10603.83 and Rs. 15110.84 per year on all farms. The analysis of existing pattern of resource use has enhanced the necessity of an appropriateplanning for the efficient utilization of available resource. Income and employment in existing plan is Rs. 203987.5 and 656.1 man days per year. Whereas, in another plan when income is maximized, the income goes to Rs. 242493.28 per year and employment goes to 790.06 man-days/year. The linear programming technique was used to formulate optimal plan. The plan developed by this technique is certainly going to benefit the farmers of study area.If farmers of the region were adopted alternative plan over existing plan so they may increase the farm income.

Introduction

The Indian population rising, declining land-man ratio and increasing mechanization in farm operations, agriculture alone is not able to provide adequate income and employment to household in India. Integration of farm enterprises provides better livelihood in terms of increased food production, higher net income, improved productivity, and reduced income imbalance between agriculture labor and urban factory worker. Introduction of appropriate farming systems has been proposed as one of the approaches to achieve better growth in agriculture and livelihood (National Commission on Farmers, 2005). Increase in non-farm employment has also become essential for improving income and living standard of rural population (Chadha, 1993 and Kumar *et al*., 2003). To meet the multiple objectives of poverty reduction, food security, competitiveness and sustainability, several researchers have recommended the farming systems approach to research and development. A farming system is the result of complex interactions among a number of inter-dependent components, where an individual farmer allocates certain quantities and qualities of four factors of production, namely land, labor, capital and management to which he has access (Mahapatra, 1994). Farming systems research is considered a powerful tool for natural and human resource management in developing countries such as India. This is a multidisciplinary whole-farm approach and very effective in solving the problems of small and marginal farmers. The approach aims at increasing income and employment from small-holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself (Behera and Mahapatra, 1999; Singh *et al*., 2006). In the commodity oriented market scenario, the focus is usually on a singular production system. The crop based research and development approach further isolated different farming system from each other. Integrated approach, however, had several distinct advantages such as, Security against complete failure of a system, Minimization of dependence for external inputs, Optimum Utilization of farm resources and Efficient use of natural resources sunlight, water and land etc.

As we all understand, the farmer is not working in isolation. His farming activities are constantly influenced by government policies, and bio-physical, sociological and economical factors. We should always remember that in India, akin to other third world developing countries, majority of farmers belongs to the category of marginal to small landholders. Their resource use capabilities are also low. More often than not, Indian farmers, in pursuit of supplementing their needs of food, fodder, fuel and finance, resort to adopt secondary enterprises. Self-reliance for household food needs has been an issue of prime importance to many million of them. On any given farm, farming sub-system or farming activities may comprise any one or the combination of; cropping (mono or multiple cropping), horticulture (vegetables, orchards plantation or floriculture), agro-forestry, livestock (milch animals/draft animals), poultry, fisheries, goat or sheep rearing, piggery, sericulture, mushroom cultivation, apiary; so on and so forth. So, farmers were required to adopt some non-crop beneficial and suitable enterprises in their farming system for enhancing the farm income.

Research methodology

The study was conducted in Western Plain Zone of U.P., the District Meerut was selected purposively because it is one of the major sugarcane growing districts. Among the 12 development blocks of district Meerut two block namely-Daurala and Hastinapur selected randomly for the study purpose. A list of all the villages of selected block was prepared. Out of this, four villages were selected randomly. A list of all the sugarcane growers was prepared from the

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universe of selected 4 villages. A total number of 80 farmers were selected randomly. On the proportion of the farmer's falling in each village under different size group of farms i.e. marginal farmer's (0-1hectare), small farmer's (1-2 hectare), medium farmer's (2-4hectare) and large farmers (above 4 hectare).

Analytical Tools

Linear programming technique was used to optimize the resources use for farms of the study area and search out the most economic combination of crop and non-crop enterprises. Net income from different enterprises was calculated by subtracting the expenditure (Rs.) made on input materials (seed, fertilizer, plant protection measures, hired human labour, farm equipment and implements, water charges etc.) and expenditure on livestock management, such as feed and fodder, mineral mixture, medicine labour etc. from gross return.

(I) Mathematical Formulation of The Model

Programming approach of the following form was used use to optimize the return from Sugarcane Based Farming System.

(a) Objective function –I (Maximization of income)

n

$$\text{Maximize } Z = \Sigma C_j X_j$$
$$j=1$$

Where,

Z = Net returns (income) variable cost in rupees

C_j= net return over variable costs per unit of j-th activity in rupees

X_j = the level of j-th activity,

Subject to,

n

$$\Sigma a_{ij} x_{ij} \leq b_i$$
$$j=1$$

$$X_{ij} \geq 0$$

(i = 1, 2, 3,…….. m, resources)

(j = 1, 2, 3, …….n, activities)

Where,

a_{ij}= amount of i-th resource required for the j-th activity,

b_i = total available quantity of i-th resources.

For using this model the following sets of data were needed:

A. Data for technological matrix

B. Data on resource supply

C. Data on cost and return for different activities.

(A) Data for technological matrix

It is important to identify the activities for the model to obtain data for the matrix.

(i) Activities

There are mainly two crop seasons *i.e.* Kharif and Rabi in the study area. The crop grown during these seasons and livestock activities are considered as major activities *i.e.* Sugarcane, pady, jowar, urd, Arhar, Wheat, Mustard, Oat, Potato, Barseem, Cow and Buffalo denoted by X_1, X_2……..X_{12} respectively.

All the farmers do not perform all these activities. Most of the activities are being performed traditionally for the family consumption.

(B) Data on Resource Supply

There are four major constraints used in the model and are given below:

i. Land restriction

ii. Labour restriction

iii. Capital restriction

iv. Variation in cropping pattern

v. Data on cost and return for different activities

Results and Discussion

The analysis of existing pattern of resource use has enhanced the necessity of an appropriateplanning for the efficient utilization of available resource. Reviewing resource situation, it was decided to formulate optimal resource use plan for farms of study area. Linear programming technique has been used to formulate this plan. The analysis shows the level of income and employment in existing and alternative plan, cropping pattern in existing and alternative plan and livestock level in existing and alternative plan.

Level of Income and Employment in Existing and Alternative Plan on Sample Farms

Table 1 reveals that the income in existing plan is Rs. 203987.5 and employment in exiting plan is 656.1 man days per year. Whereas, in alternative plan when income is maximized, the income goes to Rs. 242493.28 per year and employment goes to 790.06 man-days per year. Table 1 also reveals that when income is maximized the income increased by 18.87 percent and employment by 20.41 percent over existing plan.

Cropping pattern and level of livestock in Existing and Alternative Plan on different Size of Sample Farms

The cropping pattern and level of livestock in optimal plan is discussed here. Table 2 reveals that the area under sugarcane increased to 48.51 percent in optimal plan from 47.31 percent in existing plan. The area under paddy and potato is also increased in optimal plan. The area of paddy increased from 10.72 percent in existing plan to 20.56 percent in optimal plan. The maximum increment in area in optimal plan was found in potato. Area of potato is increased to 12.66 percent in optimal plan from 0.44 percent in existing plan. The area under wheat and jowar (Fodder) is decreased in optimal plan. Area of wheat is goes down to 5.92 percent in optimal plan from 20.10 percent in existing plan. The area of jowar (fodder) is also decreased from 12.39 percent in existing plan to 3.46 percent in optimal plan. The level of buffalo in optimal plan is increased to 3.0 numbers from 1.5 in existing plan. The level of cow is goes down to 0.0 in number in optimal plan from 0.8 in existing plan.

Graph 2 shows the level of different activities in existing and optimal plan (maximization of income).

Constraints faced by farmers

A number of factors were found to influence the returns from sugarcane based-farming systems in the study area.

These included fragmentation and subdivision of landholdings, scarcity of family labour on medium and large farms, scarcity of owned-fund, low availability of good quality seed, lack of transportation and marketing facilities, scarcity of water due to uncertain electricity, late payment of sugarcane by sugar factories, etc.

The Table-3 shows that fragmentation and sub-division of land and scarcity of water due to uncertain electricity are the most limiting constraints securing a score of 8 marks each out of 10. The table-3 also shows that Scarcity of family labour due to involvement in non farming activity, scarcity of owned fund, uncertainty of weather condition and high infestation of insect-pest and disease are the second most severe constraints to higher return in sugarcane based-farming system, securing a score of 7 marks each out of 10. The all rest constraints securing a score of 6 marks each out of 10, shows that all these constraints are also significantly affect the higher return in sugarcane based-farming system.

Conclusion

The analysis reveals that the income and employment can be increased through alternative farming plan. Reviewing the resource situation at farms level, it was decided to formulate optimal resource use plan. Optimal plan was formulate with an objective of maximization of income. The income increased by 18.87 percent and employment by 20.41 percent over existing plan through alternate plane. In the optimal plan area under sugarcane , paddy and potato increases significantly and number of buffalo just double in optimal plan. By constraints analysis, it was found that fragmentation and sub-division of land and scarcity of water due to uncertain electricity are the major constraint to higher returns in sugarcane based farming system in study area**.**

Suggestion

- Educating the farmers about farm management practices.
- Organize fertility and treatment camp regularly for livestock improvement and veterinary facility for livestock in rural areas.
- Efficient marketing system to sale their produce to consumers, without involvement of middleman.

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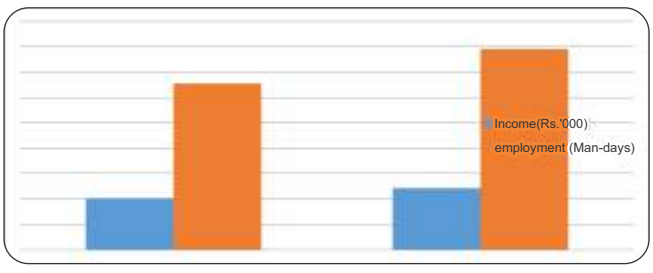
Table 1: Level of Income and Employment on existing and alternative plan

Particulars		Existing Plan	Alternative Plan
			Maximization of Income
Income (Rupees)		203987.5	242493.28 (18.87)
Employment (Man-days)		656.1	790.06 (20.41)

NOTE: Figures in parentheses show percentage change over the existing plan

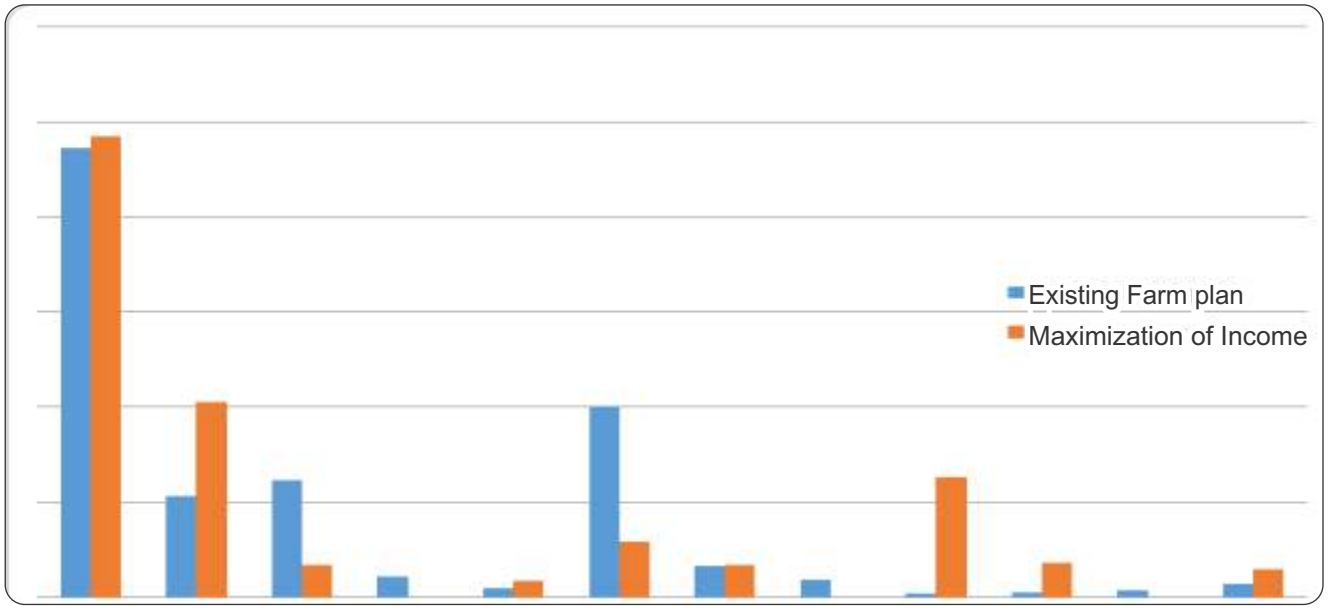


Graph 1: Level of Income and Employment in Existing and Alternative Plan

Table 2: Existing and optimal farm plan of Crops/ livestockfor sample farms

Crops/livestock	Existing Farm plan	Maximization of Income
Sugarcane	77.28 (47.31)	78.60 (48.51)
Paddy	17.52 (10.72)	33.32 (20.56)
Jowar (Fodder)	20.24 (12.39)	5.60 (3.46)
Urd	3.68 (2.25)	0.00 (0.00)
Arhar	1.60 (0.98)	2.80 (1.73)
Wheat	32.84 (20.10)	9.60 (5.92)
Mustard	5.48 (3.36)	5.60 (3.46)
Oat (Fodder)	3.12 (1.91)	0.00 (0.00)
Potato	0.72 (0.44)	20.52 (12.66)
Berseem (Fodder)	0.88 (0.54)	6.00 (3.70)
Gross Cropped Area	163.36 (100.00)	162.04 (100.00)
Cow	0.8	0
Buffalo	1.5	3

NOTE: Figures in parentheses show percentage to the total cropped area



Graph 2: Level of different activities in existing and optimal plan

Table 3: Constraints to higher returns in sugarcane based farming system in study area

S. No.	Particulars	Score out of 10 points
1.	Fragmentation and sub-division of land	8
2.	Scarcity of family labour due to involvement in non farming activity	7
3.	Scarcity of owned fund	7
4.	Low availability of good quality seed at low price	6
5.	Lack of transportation and marketing facilities	6
6.	Lack of know- How	6
7.	Uncertainty of weather condition	7
8.	Scarcity of water due to uncertain electricity	8
9.	Infertility problem in animals	6
10.	High infestation of insect-pest and disease	7
11.	Late payment of sugarcane by sugar factories	6

NOTE: Score out of 10 (10, most severe constraints, 0, no constraint)