



RESEARCH ARTICLE

Sen's multi-objective programming approach to resource optimisation in Uttar Pradesh's integrated farming system

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Abstract

The goal of the current study was to assess how well Uttar Pradesh farming households engaged in an integrated crop and animal production system use agricultural resources. The primary goal of research carried out in 2024 was to assess how best to allocate crop resources using Sen's multi-objective programming (MOP) technique to maximise revenue, create jobs and reduce input consumption in Sultanpur district of Uttar Pradesh. To achieve the intended representation, the region was purposefully chosen and 300.00 houses were chosen at random for the sample. The MOP model was used to determine the best combination of livestock and agricultural activities given the present resource constraints. A sample farmer with 1.75 ha of land earned an average of ₹34897400 annually, according to the results. However, by reallocating resources in accordance with the optimal plan, agricultural revenue might rise by 14.24 %, to ₹398652.00 annually. The findings showed a large reallocation of land to more profitable crops, particularly gram and rice. It was recommended that the paddy area increase from 0.54 ha to 1.35 ha and the cultivated area under gram increase from 0.14 ha to 1.27 ha to increase overall yields. Increasing the number of cattle is advised by the study since it can greatly improve dairy revenue and overall farm profitability under the integrated farming method.

Keywords: crop-livestock integration; integrated farming system; resource allocation; sustainable agriculture

Introduction

Due to its interdisciplinary approach to whole-farm management, the integrated farming system (IFS) has emerged as an effective strategy for addressing the challenges faced by small and marginal farmers. By integrating multiple farm enterprises and recycling agricultural surpluses and by-products within the farm, the system aims to enhance income generation and employment opportunities from small landholdings. To live at least marginally above the poverty level, farmers must be guaranteed a steady income. Production must advance or output must continuously increase to address the issues presented by the current economic, political and technological environment (1). The agricultural system approach is one of the most effective solutions in this situation because it enables the careful execution of several businesses and the building of site-specific systems based on the resources available, both of which are essential (2). In developing nations like India, an integrated agricultural system is seen as a potent instrument for managing human and environmental resources and is ideal for maintaining the livelihood of marginal and small farmers. The farming system comprises of several farm companies to which farm families allocate resources to utilise the existing businesses productively and raise the

profitability of the farm. They include farming for crops, livestock, aquaculture, agroforestry, horticulture and sericulture (3).

The term IFS refers to a group of linked, related and frequently interlocking production systems that are focused on a small number of crops, animals and related subsidiary businesses. These systems are designed to reduce the negative environmental effects of these businesses and optimise nutrient use in each system (4). Of the 64.57 million acres of net irrigated land in Uttar Pradesh, 48.16 % was made up of small and marginal holdings. Most of the population therefore depends on agriculture for subsistence, with semi-medium and medium holdings making up around 43.77 % and 8.07 %, respectively, of the state's total agricultural holdings (5).

In the state of Uttar Pradesh, the Sultanpur district receives the most annual rainfall (1054 mm) and has some of the finest soils. Due to years of monoculture without crop rotation, the productivity of the soil has somewhat declined. Several scholars have proposed a farming approach to achieve the objectives of poverty alleviation, food security, competitiveness and sustainability. However, because of their cautious learning process, lack of funding and desire to minimise risk, small and marginal farmers hardly ever make significant modifications to their agricultural system.

In the present study, significant data was presented. The limited application of Sen's multi-objective programming (MOP) in integrated crop-livestock systems in Uttar Pradesh was highlighted. The study hypothesised that the adoption of an IFS combining crop and dairy enterprises significantly enhances farm income, particularly among small and marginal farmers in Uttar Pradesh with limited landholdings.

Materials and Methods

The study's main objective was to assess how efficiently Sen's MOP method maximised farm resources.

Study area

Most people living in rural areas of Uttar Pradesh's 75 districts work in agriculture, with dairy farming being the main secondary profession following crop production. Dairy farming was specifically chosen for this study, which was carried out in 2024, since it is an important part of Sultanpur district's agricultural system. The research region was chosen using the purposive sampling technique.

Selection of block

Out of Sultanpur district's 14 blocks, Kurebhar and Dhanpatganj were specifically selected since they had the largest area used for this agricultural method. The list of blocks was arranged in ascending order based on the region that was being farmed.

Village selection

Using a simple random sample approach, 5 villages were randomly selected from each block after a list of all the villages in the selected blocks was compiled with assistance from the Block Development Office. Sarai Gokul, Madhavpur, Ratapur, Garthauli, Chandapur, Vitthalpur, Murli ka Purwa, Mahmoodpur, Mahilo Ashapur and Pratappur were the villages selected. This selection included around 6 % of the villages in Dhanpatganj block (121) and 8 % of the villages in Kurebhar block (168).

Selection of farmers

A list of every farmer operating in the chosen villages was created with the help of the Village Panchayat leader. Additionally, 10 % of respondents from the whole population in each village were selected as the study's sample using the stratified random sampling number table selection technique.

Data collection

To get primary data, farmers were questioned in-person using a pre-tested interview approach. To guarantee dependability and clarity, a pre-tested interview schedule that was organised was employed on 30 farmers who were not part of the sample. Secondary data was acquired from a variety of sources, including books, journals, reports, block and district office records, research papers, articles and district statistics reports. A total of 300 respondents were interviewed for this study.

Analytical tools

The main goal of the study's model is to maximise the yearly returns on resources that are held. It was able to calculate the net returns per hectare of crop using data from sample farmers. The costs that were paid out, such as the labor that was used, farmyard manure (FYM), fertilisers, insecticides, irrigation fees, etc., were immediately subtracted from the earnings. The model's resource constraints have an impact on how to maximise net returns (profit). It is believed

that markets for products and factors are entirely competitive. Numerous studies show that India's agricultural production uses less input than is ideal. Most research on resource optimisation placed their entire emphasis on increasing agricultural employment and revenue. The current study took a broader view of resource consumption optimisation, accounting for the scarcity of water resources and environmental damage caused by contemporary farming practices. As a result, the following objectives were added while creating the best farm plans.

In linear programming analysis, the phrase "optimisation" refers to the process of locating a saddle point. The best farm plans are those that meet all resource restrictions at the farm level and produce the highest possible value of the objective function. Deterministic linear programming was used to determine the greatest returns that rain-fed and irrigated farmers may achieve through the best distribution of different crops and livestock utilising the available resources. The definition of an optimal allocation is one that specifies the physical, technical and resource circumstances, identifies the activities to be carried out and indicates how much of each resource should be assigned to each activity to maximise net farm returns over the course of a year. The linear programming technique is chosen because, of all the analytical tools available, it is the most potent and effective instrument for dividing the limited agricultural resources among the numerous firms. When there are many limits and big, unusual solutions are required, the efficiency of the conventional budgeting tool decreases.

Maximisation of income

$$\text{Maximise } Z = \sum_{j=1}^n I_j X_j \quad (\text{Eqn.1})$$

Subject to the constraints,

$$\sum_{j=1}^n a_{ij} x_j \leq b_i \quad (\text{Eqn.2})$$

$x_j \geq 0$, $j = 1, 2, \dots, n$, $i = 1, 2, \dots, m$.

Where, Z = net returns from all crops included in the model, I_j = income from j^{th} activity measured in rupees per hectare of land, X_j = level of j^{th} activity in ha., a_{ij} = quantity of i^{th} input required per unit of j^{th} activity and b_i = quantity available of the i^{th} resource

Maximisation of employment

$$\text{Maximise } Z = \sum_{j=1}^n E_j X_j$$

Subject to the constraints,

(Eqn.3)

$$\sum_{j=1}^n a_{ij} x_j \leq b_i \quad (\text{Eqn.4})$$

$x_j \geq 0$, $j = 1, 2, \dots, n$, $i = 1, 2, \dots, m$.

Where, Z = total employment of the farmers, E_j = employment of j^{th} activity measured in man-days ha⁻¹, X_j = level of j^{th} activity in ha., a_{ij} = quantity of i^{th} input required per unit of j^{th} activity and b_i = quantity available of the i^{th} resource

Minimisation of fertiliser use

$$\text{Minimise } Z = \sum_{j=1}^n F_j X_j \quad (\text{Eqn.5})$$

Subject to the constraints,

$$\sum_{j=1}^n a_{ij} x_j \geq b_i \quad (\text{Eqn.6})$$

$x_j \geq 0$, $j=1, 2, \dots, n$, $i=1, 2, \dots, m$.

Where, Z = Total fertiliser uses on the farm, F_j = fertiliser use per unit of j^{th} activity in kg/ha., X_j = level of j^{th} activity in ha., a_{ij} = quantity of i^{th} input required per unit of j^{th} activity and b_i = quantity available of the i^{th} resource.

Multi-objective programming model

It is anticipated that different optimisations won't always maximise all the objectives at once. In this case, it is decided to use multi-objective optimisation techniques. Sen's MOP approach was applied in the current study to simultaneously accomplish each goal. The MOP model can be described as follows:

$$Z^* = \frac{\sum_{j=1}^n I_j X_j}{W_1} + \frac{\sum_{j=1}^n E_j X_j}{W_2} - \frac{\sum_{j=1}^n F_j X_j}{W_3} \quad (\text{Eqn.7})$$

Subject to the constraints,

$$\sum_{j=1}^n a_{ij} x_j \geq b_i \quad (\text{Eqn.8})$$

$x_j \geq 0$, $i=1, 2, \dots, m$, $j=1, 2, \dots, n$.

Where, Z^* = maximisation (MOP), W_1 = income in income maximisation (I), W_2 = income in employment maximization €, W_3 = income in fertiliser minimisation (F).

Formulation of multi objective programming model

Max $Z_1 = 51000 X_1 + 105083 X_2 + 26000 X_3 + 18410 X_4 + 48500 X_5 + 47800 X_6 + 52000 X_7 + 44685 X_8 + 75602 X_9 - 300 X_{10} - 300 X_{11} - 0.07 X_{12} - 0.07 X_{13}$

Max $Z_2 = 68 X_1 + 127 X_2 + 35 X_3 + 38 X_4 + 62 X_5 + 55 X_6 + 50 X_7 + 82 X_8 + 99 X_9$

Min $Z_3 = 180 X_1 + 615 X_2 + 110 X_3 + 120 X_4 + 210 X_5 + 75 X_6 + 44 X_7$

Subject to

Crop land constraints = $X_1 + X_2 + X_3 + X_4 + 0.1 X_8 + 0.1 X_9 \leq 1.75$
(Kharif season)

= $X_2 + X_5 + X_6 + X_7 + 0.1 X_8 + 0.1 X_9 \leq 1.75$
(Rabi season)

Labour constraints = $68 X_1 + 127 X_2 + 35 X_3 + 38 X_4 + 41 X_8 + 49 X_9 \leq 120$ (Kharif season)

= $62 X_5 + 55 X_6 + 50 X_7 + 41 X_8 + 50 X_9 \leq 120$
(Rabi season)

Operating capital constraints

$18000 X_1 + 65000 X_2 + 12000 X_3 + 28000 X_4 + 11493 X_8 + 12820 X_9 \leq 55000$ (Kharif Season)

$28000 X_5 + 24000 X_6 + 18000 X_7 + 11493 X_8 + 12820 X_9 \leq 55000$ (Rabi season)

Applying the simplex procedure for obtaining the optimum combination for land of food crops and dairy through Temporally Ordered Routing Algorithm (TORA) computer-based software.

Software used

The optimal utilisation of the resources in integrated agricultural systems is analysed by the TORA, a piece of operation research software. A set of mathematical instructions or programs. In the area of operations research, it is an extremely user-friendly optimisation tool. Furthermore, TORA's menu-driven and windows-based design makes it especially user-friendly.

Results and Discussion

A simplified representation of the fundamental data required to build a linear programming model of dairy farming and land use is shown in Table 1. The household considered in the study has 1.75 ha of land that is meant for paddy, sugarcane, urd, pigeon pea, wheat, mustard and gram production. The household expected net income was ₹51000.00 ha⁻¹ from paddy, ₹105083.00 ha⁻¹ from sugarcane, ₹26000.00 ha⁻¹ from urd, ₹18410.00 ha⁻¹ from pigeon pea, ₹48500.00 ha⁻¹ from wheat, ₹47800.00 ha⁻¹ from mustard and ₹52000.00 ha⁻¹ from gram. Revealing study about the dairy net income obtained per cow was found ₹44685.00/annually and ₹75602.00/annually per buffalo. The household is interested in a cropping combination of (Crop + Dairy) that helps them to maximise their total annual net returns. Of prime importance is whether this crop enterprise production is optimal (6, 7). As Sugarcane is annual crop that's why it is mentioned in both kharif and rabi but their values are calculated only once in analysis.

Sen's MOP paradigm was used in the study from Table 2 to optimise resource consumption throughout a 1.75 ha area of an IFS (8). Using a combination of crop production and dairy farming, the main crops were pigeon peas, wheat, mustard, gram, urd (black gram), sugarcane and rice. The study's use of optimisation techniques was intended to encourage resource efficiency as well as income enhancement (9). Through efficient resource allocation, the household's current yearly net income of ₹348974.00 may rise by 14.24 % to ₹398652.00 according to the findings. Additionally, there would be more job prospects as labour days increased from 480.00 to 545.00 per year.

Table 2 also showed a considerable reduction in fertiliser consumption, from 697.00 kg to 378.00 kg, which represented a significant environmental advantage. These findings align with those of, who said that MOP raised revenue by 7.00 % (3). Nonetheless, the study's larger advantages demonstrate how much can be accomplished by methodically improving integrated crop-livestock systems to raise smallholder farmers' incomes and sustainability. These results are in line with previous research that found the MOP method raised farm income by roughly 7.00 %. Nonetheless, the greater potential for methodically enhancing integrated crop-livestock systems to boost smallholder farmers' income and sustainability is highlighted by the higher gains seen in this study (10).

The investigation's findings are shown in Table 2. The results show that 1.75 ha farmers currently make ₹348974.00 per year. With better resource reallocation using the MOP technique, income might grow by 14.24 % to ₹398652.00. Despite their apparent near-peak efficiency, farmers can still benefit from optimisation, especially when it comes to labour and input consumption. Fertiliser use may

Table 1. Linear programming matrix for farmers under

Crop	Earnings (ha)	Area (ha)	Days of labour man (ha)	Capital of Operations (ha)	Fertiliser (kg ha ⁻¹)	Area in the top 20 %	20 % or less (minimum area ha ⁻¹)
Kharif							
Paddy (X ₁)	51000.00	0.54	52.00	18000.00	180.00	1.50	0.17
Sugarcane (X ₂)	105083.00	0.77	127.00	65000.00	615.00	1.99	0.23
Urd (X ₃)	26000.00	0.13	35.00	15000.00	90.00	0.31	0.04
Pigeon pea (X ₄)	18410.00	0.11	38.00	12000.00	120.00	0.18	0.02
Rabi							
Wheat (X ₅)	48500.00	0.45	62.00	28000.00	210.00	0.86	0.22
Mustard (X ₆)	47800.00	0.19	55.00	24000.00	75.00	0.29	0.12
Gram X ₇	52000.00	0.14	50.00	22000.00	44.00	0.31	0.06
Sugarcane (X ₂)	105083.00	0.77	127.00	65000.00	615.00	1.99	0.23
Dairy (Per milch animal)							
	Income	Land (Fodder crop)	Labour (Man days)	Operating capital	Feed cost	Top 20 % (maximum area ha ⁻¹)	Bottom 20 % (minimum area ha ⁻¹)
Cow (X ₈)	44685.00	0.10	82.00	22985.00	18783.00	0.31	0.06
Buffalo (X ₉)	75602.00	0.10	99.00	25640.00	18652.00	0.31	0.06

Source: Survey data 2024.

Table 2. Income, employment and fertiliser consumption under the integrated farming

System's current and alternative plans					
Item	Current level	Maximum income	Maximum employment	Minimum fertiliser	Sen's MOP
Income (₹)	348974.00	401235.00 (14.98)	394312.00 (12.99)	337740.00 (-3.22)	398652.00 (14.24)
Employment (Days)	480.00	545.00 (12.54)	560.00 (16.67)	472.00 (-1.67)	545.00 (13.54)
Fertiliser Use (kg)	697.00	900.00 (29.12)	584.00 (-16.21)	275.00 (-60.55)	378.00 (-45.77)

Source: Survey data 2024.

drastically decrease from 697.00 kg to 378.00 kg, but employment might rise from 480.00 to 545.00 man-days. These results are in line with earlier research that found that the MOP strategy increased revenue in Eastern Uttar Pradesh by 7.00 % while reducing water use by 6.00 %. However, the current study demonstrates that by implementing integrated crop-livestock systems with multi-objective optimisation, even efficient farmers can attain additional improvements in resource utilisation and profitability (10).

For the farmers in the research region, a cropping plan that is both effective and current have been designed and the results are shown in Table 3. The chart shows that farmers earned ₹348974.00 using their current integrated farming strategy; thus, If the farmer moves his activities and uses the best technology and management strategies, the present strategy might boost revenue by up to ₹398652.00.

The income-enhancing strategy would reduce the amount of land used for sugarcane cultivation from 0.77 ha to 0.15 ha, pigeon pea cultivation from 0.11 ha to 0.02 ha and urd cultivation from 0.13 ha to 0.03 ha, while paddy cultivation would increase from 0.54 ha to 1.35 ha during the kharif season in the research region. In the rabi season, farmers would plant more gram (from 0.14 ha to 1.27 ha) and less mustard (from 0.19 ha to 0.04 ha), wheat (from 0.45 ha to 0.09 ha) and sugarcane (from 0.09 ha to equal kharif levels). In both seasons, 0.20 ha of land would be planted to fodder crops, as indicated by Table 3.

In terms of dairy, Table 3 shows that farmers now maintain an average of 2.49 buffaloes and 3.32 cows. Income would be increased to 5.00 cows and 4.00 buffaloes under the optimal plan. As we found from the result that farmer can increase numbers of livestock and there is no need to increase fodder cultivation land as other crops help to fulfill the fodder needs for livestock (11).

Table 3. Existing and optimal plan under integrated farming system

Crops	Current area (ha)	Ideal area (ha)
Kharif		
Paddy (X ₁)	0.54 (15.42)	1.35 (38.57)
Sugarcane (X ₂)	0.77 (22.00)	0.15 (4.28)
Urd (X ₃)	0.13 (3.71)	0.03 (0.86)
Pigeon pea (X ₄)	0.11 (3.14)	0.02 (0.57)
Fodder	0.20 (5.71)	0.20 (5.71)
Rabi		
Wheat (X ₅)	0.45 (12.85)	0.09 (2.59)
Sugarcane (X ₂)	0.77 (22.00)	0.15 (4.28)
Mustard (X ₆)	0.19 (5.42)	0.04 (1.14)
Gram (X ₇)	0.14 (4.04)	1.27 (36.29)
Fodder	0.20 (5.71)	0.20 (5.71)
Gross cropped area	3.50 (100.00)	3.50 (100.00)
Dairy	Existing number	Optimal number
Cow (X ₈)	3.32	5.00
Buffalo (X ₉)	2.49	4.00

Source: Survey data 2024.

These results are in line with previous research demonstrating that crop diversification toward high-value commodities, like rice, in irrigated regions may greatly boost farmers' income, particularly when bolstered by efficient market and procurement mechanisms (12, 13). Additionally, it has been discovered that livestock intensification helps smallholder farmers by functioning as insurance against crop failure and as a reliable source of income (14, 15).

Conclusion

In a 1.75 ha integrated farming system (IFS), this study shows that Sen's Multi-Objective Programming (MOP) paradigm greatly increases revenue, sustainability and resource usage efficiency. Income increased by 14.24 %, employment increased from 480.00 to 545.00 labour days and fertiliser consumption decreased by 697.00 kg to 378.00 kg when crops and dairy were allocated

optimally. Reallocating land to high-value crops like gram and rice and raising livestock intensity were the main drivers of improvements. The results demonstrate the efficacy of multi-objective programming in fostering sustainable agricultural intensification and validate that integrated crop-livestock systems are more advantageous for smallholder farmers than crop-only farming.

Recommendation

- Encourage integrated farming practices through government initiatives.
- Support the expansion of cattle with loans.
- Boost the procurement processes for crops like gram and paddy.
- Promote sustainable methods and effective input utilisation.

Limitations

- Static assumptions in the model.
- Absence of risk and uncertainty analysis.
- Using average farm data.

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Authors' contributions

AM carried out survey questionnaire preparation, data collection, formulation and data analysis. AM and TT prepared and wrote the initial draft. AKB and PNJ assisted in the collection, cleaning and organisation of secondary data. RY, RN and MT assisted in conducting the survey, contributed to data analysis and helped prepare the final draft of the manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards

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During the preparation of this work, the authors used Quill Bot to make minor corrections in grammar and English. After using this tool, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

References

1. Devi S, Kumar P. Resource use efficiency and sustainability of integrated farming systems in India. *Agric Syst.* 2021;190:103107.
2. Behera UK, France J. Integrated farming systems and livelihood security of small and marginal farmers in India. *Curr Sci.* 2016;110:1109–15.

3. Kumar A, Singh DK. Livestock production systems in India: an appraisal across agro-ecological regions. *Indian J Agric Econ.* 2008;63:577–97.
4. Jayanthi C, Balusamy M, Chinnusamy C, Sankaran N. Integrated farming systems: a pathway for sustainable agriculture. *Indian J Agron.* 2003;48:198–203.
5. Kumari M, Singh OP, Meena DC. Optimizing cropping pattern in eastern Uttar Pradesh using Sen's multi-objective programming approach. *Agric Econ Res Rev.* 2017;30:285–91. <https://doi.org/10.5958/0974-0279.2017.00049.0>
6. Gill MS, Singh JP, Gangwar KS. Integrated farming system and agricultural sustainability. *Indian J Agron.* 2009;54:128–39. <https://doi.org/10.59797/ija.v54i2.4790>
7. Kumar S, Shivani. Multi-objective optimization in agriculture: applications for smallholder farmers. *Agric Econ Res Rev.* 2022;35:75–86.
8. Singh VR. Socio-economic profile of farmers in Prayagraj district of eastern Uttar Pradesh. *International Journal of Current Microbiological and Applied Sciences.* 2019;8:1445–54. <https://doi.org/10.20546/ijcmas.2019.811.170>
9. Government of India. Agricultural census 2015–16: all India report. New Delhi: Ministry of Agriculture and Farmers Welfare; 2016.
10. AO. Sustainable food and agriculture: an integrated approach. Rome: Food and Agriculture Organization; 2018.
11. NITI Aayog. Doubling farmers' income through integrated farming systems. New Delhi: Government of India; 2021.
12. Singh K, Singh R. Role of integrated farming systems in improving farm income and employment in India. *J Rural Dev.* 2020;39:455–72.
13. Chand R. Doubling farmers' income: strategy and prospects. New Delhi: NITI Aayog; 2017.
14. Birthal PS, Jha AK. Economic losses due to constraints in dairy production in India. *Indian J Anim Sci.* 2005;75:1470–5.
15. Reddy V, Mahajan GR, Paramesh V, Singh V. Socio-economic status of livestock farmers: a benchmark analysis. *Econ Aff.* 2017;62:335–40. <https://doi.org/10.5958/0976-4666.2017.00017.1>

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