Original Research Article

Economic Valuation of Provisioning Ecosystem Services from Groundnut Organic Farming

ABSTRACT

Provisioning ecosystem services from organic farming requires a holistic strategy that recognizes the interconnected relationships among ecological processes, agricultural productivityand the human well-being**.**Provisioning ecosystem services includes the cultivation of crops, fisheries and timber production, etc.The present study analysed the input use pattern of groundnut organic farmers and valuated the provisioning ecosystem services i.e., food from groundnut organic farming in Tamil Nadu. Market price method was used to valuate the provisioning ecosystem services. The results suggested that Panchakavya was widely used by majority of the organic farmers(69.70%)demonstrating its effectiveness in promoting sustainable farming practices. Additionally, the incorporation of green manure (63.64%) and farmyard manure (54.55%) highlights farmer's commitment to increasing soil organic matter, maintaining fertility, and optimizing crop yield.The valuation of provisioning services revealed that the economic value of the provisioning services from organic groundnut farming was estimated to be Rs. 2,750,17. These findings provide strong support for the adoption and promotion of sustainable organic farming.

Keywords: Provisioning ecosystem services; Organic farming; Valuation; Market price; Input use.

1. INTRODUCTION

Organic farming is an agricultural approach thatfocused on sustainability, environmental accountability and the welfare of ecosystems and consumers. Unlike conventional farming, which heavily depends on synthetic chemicals and genetically modified organisms, organic farming follows a set of principles and techniques aimed at reducing environmental impact and fostering biodiversity and soil health[1].This approach emphasizes the use of organic inputs such as compost, crop rotation, and biological pest control to enhance soil fertility and mitigate the risks associated with conventional agricultural practices[2]. Organic farming has gained global recognition as a response to the environmental challenges posed by conventional agriculture, such as soil degradation, water pollution, and loss of biodiversity. Consumers increasingly seek organic products due to concerns about the potential health impacts of chemical residues in conventional agriculture and a desire to support environmentally friendly practices[3].Provisioning ecosystem services refer to the benefits that

ecosystems provide to humans in the form of essential goods and resources. These services are crucial for meeting basic human needs and supporting various aspects of daily life[4][5]. The production of crops from organic farming is a significant component of provisioning ecosystem services[6].The ecosystem services of food and raw material produced from rice farming systems were valuated based on market price method [7][8]. The provisioning ecosystem services in rice farms were valuated in Odisha and the value of ecosystem services from rice farms were ranged from Rs. 90,533 to Rs. 1,23,441 per hectare per year which also includes rice straw as a raw material[9].The value of provisioning services included food, fodder and raw material was 1074 USD/ha/yr, 16390 USD/ha/yr, 1969 USD/ha/yr, and 75253 Rs/ha[10][11][12][13].Provisioning ecosystem services are essential for sustaining human life and economic activities. The responsible management of ecosystems is crucial to ensure the continued availability of these services while maintaining the health and resilience of natural environments. Sustainable practices and conservation efforts play a key role in safeguarding provisioning ecosystem services for current and future generations[14]. Keeping in this view, the specific objectives of the present study is to study the socio – economic characteristics of the groundnut organic farmers, to analyse the input use pattern of the sample farmers and to valuate the provisioning ecosystem services from groundnut organic farming.

2. MATERIAL AND METHODS

The study was carried out in two districts namely Salem and Dindigul districts of Tamil Nadu which had the highest percentage of area under organic certification. A list of certified organic farmers and their contacts in each district was obtained from Tamil Nadu Organic Certification (TNOCD) department. Purposive sampling was used to select the sample respondents. A total of 33 groundnut organic farmers were chosen from two districts. The primary data had been collected using a pre-tested interview schedule and the details regarding the information on profile of the sample respondents, input use, costs and returns forgroundnut cultivation were obtained from the sample respondents.

2.1 Analytical tools

Descriptive analysis viz., average and percentage analysis were used to analyse general characteristics, input use pattern, cost and returns of groundnut farmers.

2.2 Valuation of Provisioning Ecosystem Services

Market price method was used to valuate the provisioning ecosystem services. In this present study,the provisioning of ecosystem services is represented by the cultivation of a specific crop, namely groundnut.

Thus, the economic value of provisioning service was calculated by,

Economic value of Provisioning Ecosystem service = Produced food and raw materials(kg/ha) x Market price of foodand raw materials (Rs/kg)[8].

Farmers in the study area obtained raw materials such as groundnut shell. It was used as a fuel, fertilizer which is rich in calcium & potassium in the study area.

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of the sample farmers

Table.1 provides insights into the demographic characteristics, education, family size, farming experience, and occupation of the sample respondents.

Majority of organic farmers fall within the age group of 31 to 50comprising 60.60 per cent of the totalrespondents.The mean age of the farmers was 41.82 years.The education level of organic farmers vary with the highest percentage having primary education (30.30 per cent)followed by those with secondary education (18.18 per cent).Majority of organic farmers (76 per cent) have family sizeranging from 2 to 4 members with a mean family size of 3.52.The mean farming experience of the organic farmers was 4.18 years. The mean farm size of the respondents was 0.47 ha. Above all, a predominant number of organic farmers (58 per cent) are solely engaged in agriculture.

Table 1. Socio-economic characteristics of the sample farmers

Variables	Categories	Organic farmers (N=33)	Percentage
Age (Years)	<30	6	18.18
	31 to 40	10	30.30
	41 to 50	10	30.30
	>50	7	21.21
Mean Age		41.82	
Education	Illiterate	5	15.15
	Primary education	10	30.30
	Secondary education	6	18.18
	Higher secondary education	9	27.27
	Graduates	3	9.09
Family size (Nos.)	1 to 2	5	15.15
	2 to 4	25	75.75
	More than 4	3	9.09
Mean Family size		3.52	
Organic farming experience (Years)		4.18	
Farm size	<1	4	12.12
	1 to 2 ha	29	87.88
Occupation	Agriculture only	19	57.58
	Agriculture + Business	9	27.27
	Agriculture + Service	5	15.15

Source: Field survey, 2023

3.2 Groundnut – Variety and Season

Groundnut *(Arachis hypogea)* is one of the most important food and oil crop cultivated in Tamil Nadu. It is rich in protein and oil content. Groundnut shell, groundnut oil and groundnut cake were the by-products obtained from groundnut. In the study area, farmers cultivated TMV-10 variety for organic farming. TMV- 10 is a semi-spreading variety with the crop duration of 105-120 days.

3.3 Input use pattern of organic groundnut farmers

Details on organic inputs used in organic groundnut farmers are given in Table 2. Majority of organic farmers (69.70 per cent) usedPanchakavya with a total quantity of 33.76 litres per hectare as an eco-friendly and effective organic liquid fertilizer that can significantly enhance the growth and yield of groundnut crops by promoting sustainable farming practices. A substantial portion of farmers (63.64 per cent) incorporated green manure which helps to increase the organic matter in soil and also reduce the proliferation of pests and diseases. More than half of the respondents (54.55 per cent) utilized farmyard manure (12.45 tonnes/ha) which helps in maintaining soil fertility and to enhance the crop yield.

Similarly, they used neem oil (54.55 per cent) followed by rhizobium (52 per cent), neem cake (48 per cent), gypsum (45 per cent), Phosphobacteria (45 per cent) and asafoetida (27 per cent) for enhancing the soil fertility, yield, suppressing the weeds and reducing pests and diseases.

It is also observed that the total cost incurred by groundnut farmers on organic inputs was Rs. 16,821 per hectare.

Table 2. Input use pattern of organic groundnut farmers

S.No	Inputs used by Groundnut Organic farmers	Number of respondents (N=33)	Qty/ha	Value (Rs/ha)
1	Panchakavya(lit)	23 (69.70)	33.76	4721.74
2	Green manure(tonnes)	21 (63.64)	5.95	133.47
3	Farm yard manure (tonnes)	18 (54.55)	12.45	675.00
4	Neem oil(ml)	18 (54.55)	6.95	361.16
5	Rhizobium (kgs)	17 (51.52)	2.03	81.26
6	Neem cake (ml)	16 (48.48)	126.02	2520.38
7	Gypsum (kgs)	15 (45.45)	326.04	880.31
8	Phosphobacteria (kgs)	15 (45.45)	2.20	85.80
9	Asafoetida (kgs)	9 (27.27)	2.50	7679.30
	Total			16820.70

Source: Field survey, 2023

3.4 Provisioning services from Organic Groundnut Farming

Provisioning services from groundnut organic farming includes food and raw material production.

3.4.1 Groundnut production

Production of groundnut was calculated using variable cost and fixed cost approach (Table 3). The results revealed that the total cost of cultivation of groundnut was found to be Rs. 82512/ha which includes variable cost (Rs. 67762/ha) and fixed cost (Rs. 14750/ha). Among the variable cost, human labour accounted for major portion (24.14 per cent) followed by the value of organic manures and bio fertilizers (20.39 per cent).

The yield of groundnut per hectare was found to be 3274 kg with the market price of Rs. 80 per kg. Gross return from organiccultivation of groundnut were found to be Rs. 2.6 lakh per hectare and net return realized from organically produced groundnut was Rs. 1.78 per hectare.

Table 3. Costs and Returns of Groundnut under Organic cultivation (Rs. Per ha)

S.No	Particulars	Mean Value	Percent to total cost
Variable cost			
1	Value of Human Labour	19915.38	24.14
2	Value of Machine Power	6758.03	8.19
3	Value of Seeds	9906.00	12.01
4	Value of Organic Manures and Bio Fertilizers	16820.70	20.39
5	Irrigation Cost	3662.75	4.44
6	Value of post-harvest operations	8052.58	9.76
7	Miscellaneous Cost	1308.45	1.59
8	Interest on Working Capital	1337.58	1.62
A	Total Variable Cost	67761.46	82.12
Fixed cost			
1	Land Revenue	19.24	0.02
2	Depreciation	617.33	0.72
3	Rental Value of Owned Land	12772.73	15.48
4	Interest on Fixed capital	1340.93	1.63
B	Total Fixed Cost	14750.23	17.88
	Total Cost (A+B)	82511.70	100.00
	Yield (Kg/ha)	3274.05	
	Price (Rs/kg)	79.50	
	Gross Return	260286.98	
	Net Return	177775.28	

N=33

3.4.2 Raw material production

From Groundnut, farmers in the study area obtained groundnut shell as raw material. Groundnut shell rich in calcium and potassium was used as a fuel, fertilizer and also used as a organic manure. From 3274 kg of groundnut, they obtained 982 kg of groundnut shell.

3.4 Valuation of Provisioning Services

Provisioning services from groundnut organic farming was valuated by using market price method.

In this present study, 3274 kg of groundnut and 982 kg of groundnut shell was produced which fetches the market price of Rs. 80/kg and Rs. 15/kg. Therefore, the economic value of provisioning services was Rs. 2,75,107 per hectare.

Table 4. Economic valuation of Provisioning Services

S. No	Provisioning Services	Produce (kg/ha)	Market value (Rs/kg)	Estimated Economic Value (Rs/ha)
1	Food (Groundnut)	3274	79.50	260287
2	Raw material (Groundnut shell)	982	15	14730
Total Economic value of provisioning services (Rs/ha) = 2,75,017				

4. CONCLUSION

The present study provides valuable insights into the organic farming practices adopted by groundnut farmers, revealing a predominant use of eco-friendly inputs to enhance crop growth and yield. The diverse use of farm produced organic inputs including neem oil, rhizobium, neem cake, gypsum, phosphobacteria and asafoetida, further underscores the comprehensive approach taken by farmers to improve soil health, suppress weeds and reduce pest and disease incidence.

The study assessed the provisioning services of groundnut organic farming by employing the market price method. With a total production of 3274 kg of groundnut at the prevailing price of Rs. 80 per kg and 982 kg of groundnut shell at the prevailing price of Rs. 15/kg, the total economic value of the provisioning services was estimated to be Rs. 2,75,017. This valuation not only highlights the economic significance of groundnut organic farming but also underscores the tangible benefits provided by such sustainable agricultural practices. The results emphasize the potential for economic gains and the value of ecosystem services associated with organic farming methods, reinforcing the importance of promoting and investing in sustainable agricultural practices for both environmental and economic sustainability.

These findings support the adoption and promotion of sustainable organic farming, encouraging a shift towards practices that prioritize both agricultural productivity and environmental conservation.

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