International Journal of Environment and Climate Change

Volume 12, Issue 12, Page 454-459, 2022; Article no.IJECC.93558
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

An Economic Analysis of Rainfed Paddy: A Study in Shivamogga District of Karnataka, India

Ruqsar Khanum [a*], Siddayya [a] and Arjuman Banu [a]

[a] *Institute of Agri-Business Management, UAS, GKVK, Bangalore-560065, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2022/v12i121482

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/93558

Original Research Article

Received: 17/09/2022
Accepted: 21/11/2022
Published: 06/12/2022

ABSTRACT

Rice is the most important human food crop in the world, directly feeding more people than any other crop. Tunga Bhadra Project (TBP) command area is called as Rice bowl of Karnataka. The study was conducted in the Shivamogga district of Karnataka, India during 2020-21 mainly for economic analysis of the cost and returns of rainfed paddy. A purposive sampling technique was used for the selection of the study area, Two taluks (Shikaripura and Soraba) of Shivamogga district were selected and from each taluk, two villages (Chikkajambur, Herejumbur, Andige and Ulavi) were selected and from each village 15 farmers were selected who were rainfed paddy growers. Thus the total sample constitutes 60 respondents. The analytical tools and techniques employed for assessing the objectives of the study are measures of central tendency and standard of cost and returns. The total cost of rainfed paddy cultivation was Rs. 26,330.65 fixed costs accounted for 19.02 per cent (Rs. 5,007.20) of the total cost and overall variable cost accounted for 79.92 per cent (Rs. 21,043.45) of the total cost of cultivation. Grain yields realized 15.23 quintals per acre and gross returns comprised of returns from both main-product (grain) and by-product returns (straw) is Rs. 34,689.78. Rainfed paddy gave a net return of Rs. 8,359.13 and returns over variable cost were Rs. 13,367.33. Returns per rupee of expenditure were 1.32. The study recommended that rainfed paddy cultivation required less cost cultivation which helps the farmer to earn a better income.

**Corresponding author: E-mail: ruqsarkhanumrukku10@gmail.com;*

Keywords: Rainfed paddy; cost and return; economic analysis.

1. INTRODUCTION

Paddy is the most prominent and widely cultivated food crop in the world. It is a staple food for about 60 per cent of the world's population. Rice is primarily grown and consumed throughout the Asian continent. India has the world's largest area under paddy, ranks second in paddy production after China and it became a significant rice consumer. Paddy has been grown in India since the beginning of time. According to De Candolle and Watt, cultivated paddy originated in south India however Vavilov says that India and Burma should be considered the origins of cultivated paddy. Rice (*Oryza sativa L*.) belongs to *the Gramineae* family. On the continents of Asia, Africa, and America, there are around 18 wild species of paddy. While *Oryza sativa* is grown throughout Asia and the Americas, *Oryza glaberrium* is solely grown in Africa. In the world, there are three subspecies of paddy: Indica (long grain), Japonica (round grain), and Javanica are the three types of rice (medium grain). Indica rice is primarily grown in the warm temperature zones of Indochina, India, Pakistan, Thailand, Brazil, and the southern United States of America, whereas Japonica rice is primarily grown in the cold climate zones of Northern China, Korea, Japan, and California. Javanica is only grown in Indonesia [1].

Paddy is an important cereal crop in the world. In a resolution passed by the United Nations General Assembly, the year 2004 was designated as the "International Year of Rice," This has huge ramifications for food security. It eloquently argued for a greater understanding of the importance of rising temperatures in reducing poverty and malnutrition. India is dealing with the issue of feeding its rapidly increasing population. By 2030, it is expected that 260 million tonnes of food grain will be required to meet global demand. The "Green Revolution" was sparked by modern technologies launched in the mid-1960s. The goal of new agricultural technology is to change traditional agriculture into a modern one. This technical change was met with enthusiasm in India. Food production is critical to the country's economic and human development. It is a crucial part of the food security mission. The importance of food security has progressively increased over the last few decades. Food security is now one of the world's most widely discussed and recognised issues. Rice is a major cereal crop in many parts of the world. Many traditional foods, including sorghum, millet, and most root and tuber crops, are often preferred to rice. Rice is the most important food crop for over 2.89 billion people in Asia, 40 million in Africa, 150.30 million in America, and 120 million in Nigeria, and is consumed by over 4.8 billion people in 176 countries. Shende and Bagde studied the economic consequences of pesticide use in paddy cultivation [2].

In the year 2019-20, China was first in paddy production (30%) in global production followed by India (24%), Bangladesh (7%), Indonesia (7%), Vietnam (5%) and Thailand (4%) [3]. India has a production potential of 117.47 million tonnes per the year 2019-20. Paddy is one of the prime crops in the eastern and southern regions of India. During 2018-19, India's rice production reached a high of 116.42 million tonnes. Rice production increased by 3.66 million tonnes in 2017-18 and is now 8.62 million tonnes greater than the five-year average (107.80 million tonnes). Karnataka is India's largest rice-growing state, with an area of 1.32 million hectares and an annual production of 3.5 million tonnes in 2017-18 [3]. In Karnataka, Shivamogga district is one of the major districts for rainfed paddy cultivation and has an area of about 33,659 ha, production (576.25 tonnes) and productivity (17.12 q/ha) [4,5].

The present study focuses on the cost and returns of rainfed paddy in Shivamogga district comes under Southern Transition Agro-climate Zone in Karnataka and receives an average annual rainfall of 1813 mm [6]. In this area, farmers prefer to take up rainfed paddy cultivation because as this area receives more rainfall also paddy crop requires more water for cultivation so to encourage farmers to save local cultivars and to increase the area under rainfed cultivation as the area under rainfed cultivation decreasing year after year that is from last 10 years area under paddy declined from 15 lakh ha to 12 lakh ha. Rice is high water demanding crop and in today's world sustainability and intergenerational equity is given huge importance both nationally and internationally, merely cultivating irrigated rice using borewell or canal irrigation is not at all sufficient in today's world, we have to look at other options if we continue to do so, water the most scarce resource on earth will be exhausted, myopic use and extraction of water is not the answer [6].

2. METHODOLOGY

2.1 Study Area

The study was conducted in the Shivamogga district of Karnataka state as the district comes under the southern transition agro-climate zone of Karnataka. The climate and soil are suitable for rainfed paddy cultivation hence, most of the farmers cultivate the crop. The preliminary survey revealed that there are ample numbers of farmers cultivating rainfed paddy in the Shivamogga district i.e. 33,659 hectares (Annual report, Department of Agriculture, Shivamogga, 2021).

2.2 Data Sources and Sampling

1: Primary data

Data on the cost incurred and returns obtained in rainfed paddy production were collected from the farmers using a pre-tested schedule by personal interview method.

2: Sampling frame

Two villages each were chosen purposively from two taluks viz. Shikaripura and Soraba in the Shivamogga district then 15 farmer respondents from each village were selected i.e., Chikkajambur, Hirejambur Adige and Ulavi.

2.3 Analytical Tools

The analytical tools and techniques employed for assessing the objectives of the study are given below.

- Measures of central tendency
- Standard cost and returns

2.4 Estimation of Cost and Returns

Costs were classified into variable and fixed costs. Variable costs include the cost of inputs (seed, FYM, fertilizer and plant protection chemicals etc.), labour cost, bullock and machine labour and interest on working capital. Fixed cost includes land revenue, depreciation on farm implements, the rental value of land, and interest on fixed costs. The measurement and definitions of various cost components are as follows. A similar study was carried out by Suwanmaneepong S. et al. [7]. on Cost and return analysis of organic and conventional rice production in Chachoengsao province, Thailand.

a) Variable cost: The variable cost includes the following component
b) Variable cost = Input cost (cost of seedlings, farm yard manures, fertilizers and plant protection chemicals) + Labour cost (Land preparation, puddling, manures, fertilizers, intercultural operation and weeding) + Bullock and machine labour + Interest on working capital.
c) Fixed cost: The fixed cost contains the following components
   Fixed cost = Depreciation of assets + land rent + land revenue + interest on fixed capital

3. RESULTS AND DISCUSSION

1: Labour utilization pattern in rainfed paddy cultivation (per acre)

Table 1 shows the number of workers employed in various operations such as land preparation, sowing/transplantation, FYM, fertilisation application, weeding, plant protection, harvesting, and post-harvest operations. From field preparation to post-harvest operations, 26.72 man-days of labour were used. The highest use of labour was for sowing/transplantation (8 man-days), followed by weeding (7.22 man-days), manure and fertilizer application (3 man-days) and land preparation (3 man-days) and showed a breakdown of labour as 29.94 per cent, 27.02 per cent11.23 per cent and 11.23 per cent respectively. A similar study was carried out by Kumar et al. [8]. on *the* Economic analysis of cost and return for basmati rice cultivation in the Jammu district of J&K state, India.

2: Bullock and machine labour utilization pattern in rainfed paddy cultivation (per acre)

Table 2 shows the operation-wise bullock and machine labour used. The results showed that bullock labour was used only for field preparation (1.2 days) while machine labour was used in rainfed paddy land preparation to harvesting. The total amount of machine labour used was 5.59 hours with maximum demand for machine labour (4.42 hours) for land preparation operations such as puddling, levelling, and crushing. Machine labour was used for harvesting (0.72 hours) and spraying (0.45 hours). In total machine labour used, harvesting and spraying machine labour accounted for 6.84 per cent and 0.17 per cent respectively. Bullock and machine labours were 1.2 days and 5.59 hours, respectively. A similar

study was carried out by Hamsa KR et al. [9] on Comparison of cost and returns of major food crops under central dry zone of Karnataka, India.

3: Resource use pattern in rainfed paddy cultivation (per acre)

Table 3 shows the overall breakdown of resource consumption in rainfed paddy cultivation. The total human labour used for rainfed paddy cultivation per acre was 26.72 man-days with a value of Rs. 7,164. Total bullock labour per acre was 1.2 days and machine labour was 5.59 hours worth Rs. 1,344 and Rs. 4,850.6 correspondingly. This led to the conclusion that for rainfed paddy production, human labour was more valuable than bullock and machine labour. The seed demand per acre was 22.81 kg worth Rs. 342.15, FYM requirement was 1.23 kg worth Rs. 3,013.5, fertiliser requirement was 150.50 kg worth Rs. 3,330.50 and pesticide requirement was 1.33 kg worth Rs. 704.90. It was deduced that fertiliser was required in greater quantities for rainfed paddy production than FYM, seed, or pesticides. A similar study was carried out by Gundu R [10]. Temporal variations in area, production and productivity of rice crop in three regions of Andhra Pradesh, India

3.1 Cost and Return in Rainfed Paddy Cultivation

1: Fixed costs

The cost of rainfed paddy cultivation fixed cost was Rs.5,007.20 and accounted for 19.02 per cent of the total cost. Among the different components of fixed cost, the highest component was the rental value of land (Rs. 4,250 per acre) followed by interest on fixed capital, land revenue and depreciation, which totalled Rs. 455.20, Rs. 48 and Rs. 254 respectively. A similar study was carried out by Jeet PK [11], on Production cost and efficiency of marketing of paddy in the Hanumangarh district of Rajasthan, India.

2: Variable costs

The overall variable cost was Rs. 21,043.45 and accounted for 79.92 per cent of the total cost of cultivation. Human labour was expensive Rs. 7,164 while bullock and machine labour together accounted for Rs. 6,149.6. Fertiliser accounted for Rs. 3,330.50 followed by FYM accounted for Rs. 3,013.5 followed by interest on working capital were also significant variable costs (Rs. 648.8), Pesticide (Rs. 704.9) and Seeds (Rs. 342.15). The total cost required for rainfed paddy cultivation was Rs. 26,330.65. A similar study was carried out by Kaur PJ et al. [12]. Production and marketing of basmati paddy in the Hanumanghar district of Rajasthan, India.

3: Yield and returns

Table 5 contains information on yield and returns from rainfed paddy agriculture. Grain yields realized 15.23 quintals per acre. Gross returns comprised of returns from both main-product (grain) and by-product returns (straw). The gross returns per acre were Rs. 34,689.78. Rainfed paddy gave a net return of Rs. 8,359.13 and the returns over variable cost were Rs. 13,367.33. A return per rupee of expenditure was 1.32. A similar study was carried out by Sapkota NS, and Sapkota S [13] on Benefit-cost analysis of different rice varieties in Kapilvastu district, Nepal.

A similar study was carried out by Lakra N on Economic analysis of production, marketing and constraints of paddy in Dantewada district of Chhattisgarh, India [14].

Table 1. Labour use pattern in the cultivation of rainfed paddy (Per acre)

Sl. No.	Particulars	Men (Man-days)	Per cent	Women (Man-days)	Per cent	Total*	Per cent
1.	Land preparation	3	16.48	0	0	3	11.23
2.	Sowing/Transplantation	5	27.47	3	35.21	8	29.94
3.	Manure and fertilizer application	3	16.48	0	0	3	11.23
4.	Weeding	3.2	17.58	4.02	47.18	7.22	27.02
5.	Plant protection	1	5.49	1.5	17.61	2.5	9.36
6.	Harvester	1	5.49	0	0	1	3.74
7.	Post-harvest operation (loading and unloading)	2	10.99	0	0	2	7.49
	Total	**18.2**	**100**	**8.52**	**100**	**26.72**	**100**

Source: Author's Compilation
**Man- days*

Table 2. Bullock and machine labour utilization pattern in rainfed paddy cultivation (Per acre)

Sl. No	Particulars	BP (Days)	Per cent	Machine (Hr.)	Per cent
1.	Bullock (Days)	1.2	100	0	0
2.	Harvesting (Hr.)	0	0	0.72	12.65
3.	Tractor (Hr.)	0	0	4.42	77.68
4.	Sprayer (Days)	0	0	0.45	7.90
	Total	**1.2**	**100**	**5.69**	**100**

Source: Author's Compilation

Table 3. Resource use pattern in rainfed paddy cultivation (Per acre)

Sl. No.	Particulars	Quantity	Value (Rs.)
1.	Human labour (Man-days)	26.72	7164.00
2.	Bullock labour (Days)	1.20	1344.00
3.	Machine labour (Hours)	5.69	4850.60
4.	Seeds (Kgs)	22.81	342.15
5.	FYM (Tonnes)	1.23	3013.50
6.	Fertilizers (50 kg bags)	150.50	3330.50
7.	Pesticides (Kgs)	1.33	704.90

Source: Author's Compilation

Table 4. Cost of cultivation of rainfed paddy in Shivamogga district Rs. /acres

Sl. No.	Particulars	Quantity	Value (Rs.)	Percentage
1.	**Human labour**			
	Men (Mandays)	18.2	5460	20.74
	Women (Mandays)	8.52	1704	6.47
	Total		**7164**	**27.21**
2.	**Bullock labour and machine labour**			
	Tractor (Hrs)	4.42	3005.6	11.41
	Bullock (Days)	1.20	1344	5.10
	Harvesting (Hrs)	0.72	1800	6.84
	Sprayer(Days)	0.45	45	0.17
	Total		**6149.6**	**23.36**
3.	**Inputs**			
	Seed (kgs)	22.81	342.15	1.30
	FYM (Tonnes)	1.23	3013.5	11.44
	Fertilizer (50 kgs bags)	150.5	3330.5	12.65
	Pesticide (Lts)	1.33	704.9	2.68
	Total		**7081.05**	**26.89**
4.	Interest on working capital @ 7 per cent	**-**	648.8	2.46
	Total variable cost		**21043.45**	**79.92**
	Fixed cost			
1.	Depreciation	**-**	254	0.96
2.	Land revenue	**-**	48	0.18
3.	The rental value of land	**-**	4250	16.14
4.	Interest on fixed capital @ 10 per cent	**-**	455.20	1.73
	Total fixed cost	**-**	**5007.20**	**19.02**
	The total cost of cultivation	**-**	**26,330.65**	**100**

Source: Author's Compilation

Table 5. Returns from the cultivation of rainfed paddy in Shivamogga district Rs. /Quintal

Sl. No.	Returns	Quantity	Price/unit (Rs.)	Total (Rs.)
1.	Main product (Quintals)	15.23	1926	29332.8
2.	By product (tractor load)	1.44	3720	5356.8
3.	Gross returns (Rs.)	**-**	**-**	34689.78
4.	Net returns (Rs.)	**-**	**-**	8359.13
5.	Returns over variable costs (Rs.)	**-**	**-**	13367.33
	Returns per rupee of expenditure	**-**	**-**	1.32

Source: Author's Compilation

4. CONCLUSION

It was found that, for rainfed paddy production, human labour was more valuable than bullock and machine labour. The fertilizer requirement was more than FYM, seed and pesticide. The total cost of cultivation of rainfed paddy was Rs. 21,043.45, net return was Rs. 8,359.13, return over variable cost was Rs. 13,67.33 and returns per rupee of expenditure was 1.32. It can be inferred that rainfed paddy cultivation was less expensive because farmers use rainwater in paddy cultivation and paddy is water demanding crop which helps to save water resources and avoid irrigation costs. Hence there is an opportunity to educate people about rainfed paddy cultivation to improve the farmer's income also government should encourage farmers towards rainfed paddy cultivation by providing subsidiaries on fertilizer which was required in greater quantities. A study showed usage of machine labour in rainfed paddy cultivation is less than bullock and human labour hence farmers should be made aware of improved agricultural practises through workshops and training programmes to help to achieve higher yields.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anjaneyelu M. Economic analysis of area production and productivity levels of paddy in India. EPRA International Journal of Economics and Business Reviews. 2015; 3(12):127-132.
2. Shende NV, Bagde NT. Economic consequences of pesticides use in paddy cultivation. Am Int J Res Hum Arts Soc Sci. 2013;4:25-33.
3. Food and Agriculture Organisation (FAO) Statistics of United Nation; 2019.
4. Annual report, Department of Agriculture, Shivamogga district of Karnataka; 2020.
5. Directorate of Economics and Statistics, Government of Karnataka; 2020.
6. District Administration, Shivamogga district of Karnataka; 2020.
7. Suwanmaneepong S, Kerdsriserm C, Lepcha N, Llones CA. Cost and return analysis of organic and conventional rice production in Chachoengsao province, Thailand. Organic Agriculture. 2020;10(4): 369-378.
8. Kumar N, Singh SP, Kachroo J, Singh H, Kumar C, Ahmed, N. Economic analysis of cost and return for basmati rice cultivation in Jammu district of J&K state. International Journal of Agricultural Sciences. 2013;9(2):674-677.
9. Hamsa KR, Murthy SPS, Gaddi GM. Comparison of cost and returns of major food crops under central dry zone of Karnataka. Journal of Agriculture and Veterinary Science. 2017;10(6):21-26.
10. Gundu R. Temporal variations in area, production and productivity of rice crop in three regions of Andhra Pradesh, M.Sc. (Agri.) Thesis (unpublished), Acharya NG. Ranga Agriculture University, Hyderabad, India; 2013.
11. Jeet PK. Production cost and efficiency of marketing of paddy in Hanumangarh district of Rajasthan. International Journal of Scientific Research. 2013;2(2):5-8.
12. Kaur PJ, Singh IP, Shirishsharma. Production and marketing of basmati paddy in Hanumanghar district of Rajasthan. Indian Journal of Agricultural Marketing. 2013;27(1):59-66.
13. Sapkota NS, Sapkota S. Benefit cost analysis of different rice varieties in Kapilvastu district, Nepal. International Journal of Applied Science and Biotechnology. 2019;7(2):222-226.
14. Lakra N, Gauraha AK, Banafar KNS. Economic analysis of production, marketing and constraints of paddy in Dantewada district of Chhattisgarh, India. International Journal of Current Microbiology and Applied Sciences. 2017; 4(2):108-115.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/93558