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NV Shende

Head, Department of
Agricultural Economics, &
Statistics, Dr. P.D.K.V. Akola,
Maharashtra, India

VJ Rathod

Assistant Professor, Department
of Agricultural Economics &
Statistics Section, College of
Agriculture, Nagpur,
Maharashtra, India

UT Dangore

Assistant Professor, Department
of Agricultural Economics &
Statistics Section, College of
Agriculture, Nagpur,
Maharashtra, India

NT Bagde

Assistant Professor, Department
of Agricultural Economics &
Statistics Section, College of
Agriculture, Nagpur,
Maharashtra, India

Corresponding Author:**NV Shende**

Head, Department of
Agricultural Economics, &
Statistics, Dr. P.D.K.V. Akola,
Maharashtra, India

Economic analysis of black rice cultivation

NV Shende, VJ Rathod, UT Dangore and NT Bagde

Abstract

The present study Economic Analysis of Black Rice Cultivation was undertaken with a view, to study the socio-economic characteristics of selected cultivator, to estimate the cost and returns and to identify the constraints in production of Black Rice. For the present study primary data was collected from 30 farmers of thirteen villages from five tahsils of Nagpur district for year 2019-20. The standard cost concept was used to estimate cost of cultivation, The perception regarding constraints for cultivation of Black Rice in Nagpur district were tabulated and interpreted.

The total average family size was 5 members. Only 6.67 per cent black rice growers are illiterate and rest of them have educated. The gross cropped area was 8.24 ha and the cropping intensity was 161.25 per cent. The per cent share of area under kharif crop was higher 62.01 per cent followed by the rabi crop 37.99 per cent. The labour was the major input for black rice cultivation, i.e. 38.53 per cent. The total human labour required was 83.13 mandays per hectare. The percentage share of cost A and cost B were 62.59 per cent, whereas 98.92 per cent in total cost. The cost A and cost B incurred by the farmers in the cultivation of black rice was Rs. 57295.48 and Rs. 90554.15 per hectare respectively. The per quintal cost of production of black rice was Rs. 3493.09. The per hectare net returns received by the farmers was Rs. 126486.78, Rs. 93228.11 and Rs. 92241.02 at cost "A", "B" and "C" respectively. The input-output ratio at cost A was 3.21. However, at cost "C" input-output ratio was 2.01. It indicates that the black rice cultivation was profitable. 100 per cent farmer express the unavailability of high yielding seed was the major constraint in the district. It is also observed that the production technology is lacking in the area which stated by the farmer. The attack of wild animal on crop was major problem which was expressed by 25 (83.33 per cent) farmers.

Keywords: Cost, returns, input-output, constraints

Introduction

Rice is mainly grown in Kokan and eastern Vidarbha region of Maharashtra. In Maharashtra area under rice cultivation is about 14.18 lakh ha. and productivity of rice is 16.56 qtl./ha. Vidarbha region contribute the productivity of rice is about 12-15 qtl./ha. Due to the low productivity rice crop does not give much more profit to farmer. Therefore adoption of high yielding and new varieties of rice is very essential. Which helps in increasing the productivity of rice as well as income of farmers with consideration of above mentioned things in 2018 there is taken the experiment of cultivation of black rice in Ramtek, Mauda, Umred, Kuhi, Parshivani and Kamtee tehsils of Nagpur district on 70 acre area by farmers group. This experiment was carried out only in Nagpur district of Maharashtra with the sponsorship of ATMA. We are well known about white rice, brown rice which we use in our daily diet. But black rice is completely new concept for us. The origin of history of black rice from Asia. In ancient china there is cultivation of black rice for royal families only. Consumption of black rice is banned for ordinary peoples of china and due to this black rice is known as "Forbidden rice" and after some time there is extension and spread of black rice in the America, china, Australia and Europe.

In India black rice is cultivated in north east state. There is many nutritious characteristics present in black rice. For the getting higher profit to farmers this experiment of black rice was carried out firstly in Nagpur district. One cup of black rice contains 160 cal, flavonoid phytonutrient, fiber, minerals, ferrous, copper and vegetable proteins. The bran of the black rice contains maximum amount of anthocyanin and antioxidants. 100 gms of black rice contains 351 kcal calorific value, 2.10 gm fat, 75.63 gms carbohydrates, 2.82 gm fibre, 7.47 gm proteins and 4 per cent DV iron and it also contains vit-B1 0.44 mg, vit-B2 0.14mg, niacin 4.60 mg, magnesium 140 mg, phosphorus 257 mg, & potassium 295 mg.

The bran of rice contain the antioxidants anthocyanin in large amount. The colour of black rice is due to antioxidant anthocyanin. Due to presence of anthocyanin the consumption of black rice keeps away from disease like cancer. Due to the consumption of black rice there is completely stops or delay the process of production of the harmful atherosclerotic plaque.

Which reduce the chance of heart attack and normal cholesterol level of body also maintained. Polluted air and adulterated food produces the poisonous substances in our body and researchers prove that consumption of black rice regularly destroys the poisonous liquid from the body. Phytonutrients which are important constituents of black rice help to remove the poisonous food/liquid from the body. In black rice there is presence of lots of fibers which have the ability to reduce constipation from our body and it also helps in reducing the weight and extra fat from our body. Gluten is absent in black rice, due to this food digestion takes place easily. There is presence of abundance of fiber in the outer layer i.e. bran. Due to this glucose absorption takes place very slowly and this will reduce diabetes. According to research type 2 diabetes is reduced due to black rice. Research proves that consumption of black rice will help to reduce the extra cholesterol from our body. The medicinal properties are the importance of black rice which are mentioned above. Therefore consumption of black rice is very valuable to health. There is availability of black rice in Wal-Mart and Super-Bazar which is produced through organic cultivation with a price of Rs 400 / kg. Extension and spreading of black rice will help to increase the income of farmers and it is proved that nutritious characteristics of

black rice keeps away the disease like cancer and it will help to maintain the health of ordinary people. The specific objectives of the study were ^[1] To study the socioeconomic characteristics of selected cultivators ^[2]. To estimate the cost and returns of black rice, and ^[3] To study the constraints faced by sample farmers in production of black rice

Methodology

Selection of area

The present study was undertaken in Nagpur district of Vidarbha region.

Nature & source of data

The present study was based on the primary data obtained from sample farmers of Nagpur district. The five tahsils were selected viz. Kamtee, Umred, Ramtek, Mouda and Kuhl. Thirteen villages were selected from five tahsil and thirty black rice growers were randomly chosen from thirteen villages for getting the required information on black rice cultivation. Thus the study was based on 30 randomly selected black rice growing farmers spread in Nagpur district for the year 2019-20.

Table 1: Selection of sample

Sr. No.	District	Tahsil	Village	No. of farmers N=30
1	Nagpur	Umred	Amgaon	11
			Sawaridawha	06
			Khedi	01
		Ramtek	Hamlapuri	01
			Musewadi	01
			Maharajpur	01
			Panchala	01
			Chichala	01
			Tomla	01
			Charbha	01
		Mouda	Kharda	01
			Gumthala	02
		Kampthee		02
Kuhl	Akoli	02		
Total				30

Analytical tools

For the purpose of achieving the objective of the study, the simple tabular analysis was carried out.

Cost of cultivation

The collected data were presented in tabular form to facilitate easy comparison. This technique of tabular presentation was employed the cost and return structure using standard cost concept. The data were summarized with aid of statistical tools like average, percentage etc. to obtain the meaningful results.

Method of analysis

Tabular analysis: The data was summarized in the form of appropriate tables. The budgeting technique was used to assess the cost, returns and profits from black paddy cultivation in the study area. The percentage and averages were computed and compared to draw meaningful inferences.

Cost "A" (Total Variable Cost)

It is actual cost paid by owner cultivator both in cash and kind. The cost "A" include expenses on all variable items is analogous to cost of cultivation. Following variables have been considered to estimate the cost of cultivation i.e. cost

"A" incurred in the cultivation of black rice accordingly.

1. Hired human labour
 - a) Male
 - b) Female
2. Bullock pairs
 - a) Owned
 - b) Hired
4. Machinery hrs
5. Seed
6. Manures
7. Fertilizers
8. Plant protection
9. Irrigation charges
10. Land revenue
11. Depreciation
12. Interest on working capital.
13. Other expenses.

Cost "B"

Cost B = Cost "A" + Rental value of land + Interest on fixed capitals.

Cost "C"

Cost C = Cost "B" + Imputed value of family labour.

Net returns per hectare

Net Return = Gross Return – Cost "C"

Simple tabular analysis is carried out to workout per hectare cost of production, Gross returns, Net returns.

Results and Discussion:

Keeping in view the objectives of the study, the data were analyzed using suitable techniques. The results obtained from this study have been presented and discuss critically.

A) Distribution of the farmers:

The average family size of selected black rice growers are presented in the Table 2. Average family size of holding are more important to cultivate black rice to get more income. Family size is a major factor in determining the economic wellbeing of the farmers.

Table 2: Average family size of selected black rice growers.

Sr. No.	Particulars	No. of farmer(N=30)
1	Male	2 (40.00)
2	Female	2 (40.00)
3	Children	1 (20.00)
Total		5 (100.00)

(Figures in parentheses are the percentage to the total family members)

The table 3 revealed that, the total average family size was 5 members, out of which 2 male, 2 female and 1 children

B) Profile of Sample Farm:

A total of thirty farmers (30) spread across thirteen villages from five tahasils of the Nagpur district was surveyed for the study.

Education play vital role in farmer's disposition towards technology and their comprehension and adoption. Education is important variable in determination the educational status of selected growers which influences the standard of living. The educational status of the selected black rice growers are presented in Table 3

It is observed from the Table 3 that, the Illiteracy per cent was 6.67. However, Primary level educated farmers was 40 per cent and High School education 43.33 per cent. About 10 per cent farmers were completed Graduation.

Table 3: Educational status of the selected black rice growers

Sr. No.	Educational Status	No. of farmer N=30
1	Illiterate	2.00 (6.67)
2	Primary	12.00 (40.00)
3	High school	13.00 (43.33)
4	Graduation	3.00 (10.00)
Total		30.00 (100.00)

(Figures in parentheses are the percentage to the total family members)

It is observed from the Table 4 that, the highest percentage of educational level of black rice growers was highest in High School level 43.33 per cent. It is followed by Primary School level was 40.00 per cent, Graduation level was 10.00 per cent. The Illiterate grower was 6.67 per cent.

C) Land use pattern: Land utilization indicates that the area

of land actually utilized for different purposes, like crop production, fallow land and net cultivated land etc. The land use pattern and cropping intensity of selected black rice growers in Nagpur district are presented in Table 4.

Table 4: Land use pattern of selected black rice growers (ha)

Sr. No.	Particulars	Overall
1	Total Land Holding	5.51 (100.00)
2	Fallow land	0.40 (7.26)
3	Net Cultivated area	5.11 (92.74)
4	Area sown more than once	3.13 (56.81)
5	Irrigated area	2.90 (52.63)
6	Unirrigated Area	23.05 (34.96)
7	Gross cropped area Cropping Intensity (%)	8.24 161.25

(Figures in parentheses are the percentage to the total land holding area)

From the above table it can be revealed that, the total land holding of black rice growers was 5.51 ha (100%). The fallow land was 0.40 ha (7.26%), net cultivated area 5.11 ha (92.74%), area sown more than once 3.13 ha (56.63%) and irrigated area was 2.90 ha (52.63%). The gross cropped area was 8.24 ha and the cropping intensity was 161.25 per cent.

D) Cropping Pattern

Cropping pattern of the region is influenced by the agro climatic condition and market condition in the locality, the farmers has to plan his cropping pattern every year. Besides the agro climatic condition while exercise limitation in respect of choice of crops to be grown, demand for agriculture produce and traditions in vogue in the locality act as guiding factor in allocation of the area under cash crops and food grains and subsistence crops. The cropping pattern of selected farmers is presented in Table 5.

Table 5: Cropping pattern of selected black rice growers (Area in ha.)

Sr. No.	Particulars	No. of farmer N=30
I Kharif		
1	Cotton	0.27 (3.28)
2	Tur	0.13 (1.58)
3	Paddy	3.52 (42.72)
4	Black Rice	0.34 (4.13)
5	Vegetables	0.23 (2.79)
3	Soybean	0.62 (7.52)
Total		5.11 (62.01)
II Rabi		
1	Wheat	1.58 (19.17)
2	Gram	1.13 (13.71)
3	Paddy	0.09 (1.09)
4	Vegetable	0.33 (4.00)
Total		3.13 (37.99)
III	Gross cropped Area	8.24 (100.00)

(Figures in parentheses are the percentage to the gross cropped area)

The Table 5 revealed that, the percent share of area under kharif crop was higher 62.01 per cent fallowed by the rabi crop 37.99 per cent. In kharif crops the higher percentage observed in paddy 42.72 per cent fallowed by soybean 7.52 per cent, black rice 4.13 per cent, cotton 3,28 per cent, vegetable 2.79 per cent and tur 1.58 per cent respectively.

In rabi highest percentage observed in wheat 19.17 per cent fallowed by in gram 13.71 per cent, in vegetable 4.00 per cent and in paddy 1.09 per cent respectively.

E) Input utilization

Input utilization indicates that, the farmers use the inputs in different forms like, seeds, manures, fertilizer, hired and family labours (male/female), machine hrs, plant protection and irrigation etc. the result revealed that in the Table 6 indicates the input use pattern of selected black rice grower in Nagpur district.

Table 6: Input use pattern of black rice growers (ha)

Sr. No.	Particulars	Units	Physical Term	Monetary Term
1	Seed (Owned + Purchased)	Kg	70.97	8141.94 (15.68)
2	Manures	Qtl	69.35	7225.81 (13.91)
Fertilisers				
3	N	Kg	82.26	2040.48 (3.93)
	P	Kg	69.35	2623.52 (5.05)
	K	Kg	9.68	210.19 (0.40)
4	Labour (M+F)	Mandays	83.13	20009.68 (38.53)
5	Machinery Hours	Hrs	11.29	10629.03 (20.47)
6	Plant Protection	Rs		995.48 (1.92)
7	Irrigation	Rs		57.42 (0.11)
Total			51933.55	(100.00)

(Figures in parentheses are the percentage to the total)

It can be revealed from Table 7 that, the labour was the major input for black rice cultivation i.e. 38.53 per cent. The total

83.13 man days per hectare were required for black rice cultivation.

However, N:P:K dose used by farmers was 82.26:69.35:9.68 per hectare with monetary expenditure Rs.4874.19. On an average 70.97 Kg. seed was used during cultivation of black rice.

F) Cost of cultivation

The profitability aspect of black rice cultivation in the study area has been analysed by computing per hectare cost and returns. The pattern of inputs used in black rice cultivation for sample farmers is depicted in Table 7. At a glance in the table indicated that farmers of black rice was worked out and discuss as below.

The estimation of cost helps to know the profitability of crop enterprises. The per hectare cost of cultivation of black rice was worked out by standard cost concept. Cost C for the black rice was observed Rs. 91541.24 per hectare. The major item was rental value of land 33.43 per cent followed by hired human labour 21.86 per cent, machine hours 11.61 per cent and seed 8.89 per cent, respectively.

The percent share of cost A was 62.59 per cent, at cost of cultivation The cost A and cost B incurred by the farmers during the cultivation of black rice were Rs. 57295.48 and Rs. 90554.15 respectively. The per quintal cost of production of black rice was observed Rs. 3493.09.

Table 7: Per hectare cost of cultivation of Black Rice

Sr. No.	Items	Units		Units Required	Price / Unit	Cost in Rs.	% to total
		Male	Days				
1	Hired Human Labour	Female	Days	18.39	278.90	5129.03	5.60
		Total	Days	64.74	229.85	14880.65	16.26
		Total	Days	83.13	240.70	20009.68	21.86
2	Bullock Labour	Hired	Days	0.00	0.00	0.00	0.00
		Owned	Days	0.00	0.00	0.00	0.00
		Total	Days	0.00	0.00	0.00	0.00
3	Machine	Hired	Days	11.29	941.46	10629.03	11.61
		Owned	Days	0.00	0.00	0.00	0.00
		Total	Days	11.29	941.46	10629.03	11.61
4	Seed		KGS.	70.97	114.72	8141.94	8.89
5	Manure		QTLs.	69.35	104.19	7225.81	7.89
6	Fertilizer	N	KGS.	82.26	24.81	2040.48	2.23
		P	KGS.	69.35	37.83	2623.52	2.87
		K	KGS.	9.68	21.71	210.19	0.23
		Total				4874.19	5.32
7	Irrigation	Cost	RS.			57.42	0.06
8	Incidental	Cost	RS.			570.00	0.62
9	Insecticide	Cost	RS.			995.48	1.09
10	Repairs	Cost	RS.			314.19	0.34
11	Working Capital	Cost	RS.			52817.74	57.70
12	Depreciation	Cost	RS.			2866.81	3.13
13	Land Revenue	Cost	RS.			26.40	0.03
14	Int. On Wor. Capital	Cost	RS.			1584.53	1.73
15	COST "A"		RS.			57295.48	62.59
16	Rental Value Of Land		RS.			30603.98	33.43
17	Int. On Fixed Capital		RS.			2654.69	2.90
18	COST "B"		RS.			90554.15	98.92
19	Family Human Labour	Male	DAYS	2.90	261.40	758.06	
		Female	DAYS	1.61	142.25	229.03	
		Total	DAYS	4.51	218.87	987.09	1.08
20	COST "C"		RS.			91541.24	100.00
21	Yield	Main	QTLs.	25.62	7093.44	181733.87	
		Bye	QTLs.	25.16	81.41	2048.39	
22	Value Of Total Produce		RS.			183782.26	
23	Per Qtl. Cost Of Prod.					3493.09	

G) Cost and returned from black rice cultivation:

The cost and return structure per hectare of agricultural production helps the farmer in mapping adjustment in the organization and thereby secure the optimum level of production and income. The per hectare cost and returns from black rice cultivation is presented in Table 9. It is revealed that, the gross return from the black rice and presented in Table 8.

Table 8: Per hectare cost and returns from Black Rice (Rs/Ha)

Sr. No.	Particulars	Amount
1	Value of main produce	181733.87
2	Value of by-produce	2048.39
3	Total produce	183782.26
Total Cost		
4	Cost "A"	57295.48
	Cost "B"	90554.15
	Cost "C"	91541.24
Net Return Over		
5	Cost "A"	126486.68
	Cost "B"	93228.11
	Cost "C"	92241.02
Input-Output ratio at		
6	Cost "A"	3.21
	Cost "B"	2.03
	Cost "C"	2.01

The input – output ratio which is an indicator of economic efficiency in crop production for the crop and other discussion indicated that, the per hectare production of black rice was Rs. 183782.26 in value term.

The per hectare net returns received by the farmers was Rs. 126486.68, Rs. 93228.11 and Rs. 92241.02 at cost "A", "B" and "C" respectively. The input-output ratio at cost "A" was 3.21, and at cost "C" 2.01. It indicates that the black rice cultivation was profitable.

Constraints faced by farmers in Production of black rice are presented in Table 9

Table 9: Constraints face by farmers in cultivation of black rice

Sr. No.	Constraints at production level	No of farmers (n=30)	Percentage of total farmers	Rank
1	Less availability of human labour	10	33.33	V
2	High cost of human labour	20	66.66	II
3	Lack of financial facility	16	53.33	III
4	Attack of wild animal on crop	25	83.33	I
5	Attack of insects and pests	16	53.33	IV

It is revealed from Table 9, attack of wild animal on crop was major problem which was expressed by 25 (83.33 per cent) farmers followed by high cost of human labour was 20 farmers expressed by (66.66 per cent). Attack of insects and pests 16 farmers expressed by (53.33 per cent) etc.

Conclusions

The total average family size was 5 members. Only 6.67 per cent black rice growers are illiterate and rest of them have educated. The total land holding of black rice growers was 5.51 ha The gross cropped area was 8.24 ha and the cropping intensity was 161.25 per cent. The percent share of area under kharif crop was higher 62.01 per cent followed by the rabi crop 37.99 per cent. The labour was the major input for black rice cultivation, i.e. 38.53 per cent. The total human labour required was 83.13 mandays per hectare in monitory term it was Rs. 20009.68/ ha. The percentage share of cost A and

cost B were 62.59 per cent, whereas 98.92 per cent in total cost. The cost A and cost B incurred by the farmers in the cultivation of black rice was Rs. 57295.48 and Rs. 90554.15 per hectare respectively. The per quintal cost of production of black rice was observed Rs. 3493.09. The per hectare net returns received by the farmers was Rs. 126486.78, Rs. 93228.11 and Rs. 92241.02 at cost "A", "B" and "C" respectively. The input-output ratio at cost A was 3.21. However, at cost "C" input-output ratio was 2.01. It indicates that the black rice cultivation was profitable. 100 per cent farmer express the unavailability of high yielding seed was the major constraint in the district. It is also observed that the production technology is lacking in the area which stated by the farmer. The attack of wild animal on crop was major problem which was expressed by 25 (83.33 per cent) farmers followed by high cost of human labour expressed by (66.66 per cent). Attack of insects and pests was major constraints in production of black rice express by 16 farmers (53.33 per cent).

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