

Millet Economy of Odisha: How Far It is Viable and Sustainable?

Deepak Shah*

ABSTRACT

In view of various inherent advantages of millets in the dietary pattern, the present study attempts to assess various important issues relating to finger millet production in Odisha, which accounts for about 85 per cent share in total millet production of the state. The issues investigated in the study encompass evaluating changes in cropping pattern of the state over time, the extent of changes in area allocation and production of finger millet vis-à-vis other crops grown in the state, and assessing the profitability involved in the cultivation of finger millet in Odisha vis-à-vis other major cultivating States of India. A critical evaluation of costs and return estimates shows highly uneconomic proposition of finger millet cultivation in Odisha. The state of Odisha not only shows negative returns over total cost of production but even negative family labour income (FLI) from finger millet cultivation. The study suggests various corrective measures, which include significant expansion of yield through application of high-yielding variety seeds, curbing of cost of production with major reduction in labour cost and an increase in minimum support price. In order to promote finger millet cultivation, there is a need to promote drought resistant high yielding varieties. Unless farmers are protected against the price risk faced by them and get better prices for their crop, the effort to promote millets will remain futile. Since the emphasis is now being placed on achieving nutritional security, a balanced approach is needed in terms of production promotion and subsequent absorption at consumer's end with greater emphasis on safeguarding the interest of producers of millet crops.

Keywords: finger millet cultivation, nutri-cereals, sustainability and viability, nutritional security

JEL: J21, Q11, Q15, Q16,

I

INTRODUCTION/MOTIVATION

The agricultural sector of India has undergone perceptible changes in the aftermath of green revolution initiated in the mid-sixties through the introduction of new technology, popularly known as seed-fertiliser and water technology. Although the technology revolution made India self-sufficient in foodgrain production with surplus production in course of time, the growth in production of course cereals, of late known as nutri-cereals, remained a cause of concern due to shift in area to rice and wheat. It is to be noted that while nutri-cereals acquired almost equal acreage as against rice and wheat prior to green revolution, the scenario changed dramatically after the post green revolution period and the overall decline in area under nutri-cereals was estimated at 41.65 per cent between 1950-51 and 2018-19 (Sreekala *et al.*, 2022). The major reasons for decline in area under nutri-cereals revolve around lack of profitability, input subsidies and price incentives for these crops, changes in consumer preference due to difficulty in processing, their low shelf life, greater importance being given to rice and wheat, their low social status and their lack of supply through public distribution system (PDS) (IIMR, 2015; Government of India,

* Professor, Gokhale Institute of Politics and Economics (Deemed to be University), Deccan Gymkhana, Pune 411004 (Maharashtra).

2014). This is despite the fact that nutri-cereals like millets, sorghum, etc. not only possess better nutritional profile but are capable of being grown in resource poor regions under arid and semi-arid conditions and can assure sustainable food supply to the stallholders since they adapt well in such climatic conditions (Dicko *et al.*, 2005). Millets show relatively high resistance to biotic stresses like pests and disease infestation and can withstand severe abiotic stresses such as insufficient rainfall, unpredictable climate and soil erosions (Sharma and Ortiz, 2000; Maqbool *et al.*, 2001). Since the cultivation period of millets is short, they fit well to multiple cropping system under both irrigated and dry land farming conditions. They also serve as nutritious green fodder to livestock and help in generating additional income to farmers (Kumar *et al.*, 2020).

Although millets possess numerous health benefits and can serve as an important source of feed and fodder supply to animals, the area under these cereal crops and their production have been steadily falling across India. Recognising the importance of millets in the dietary pattern of urban and rural people and in order to achieve nutritional security, the Government of India announced the year 2022-23 as the International Year of Millets and introduced policies to enhance production and consumption of millets. However, the efforts to promote millet production came much earlier in the state of Odisha, which tried to improve nutritional security and promote sustainable agricultural practices in 2017 when it launched the Odisha Millet Mission (OMM).

The spread of OMM intervention was initially limited to just 30 blocks across seven districts of Orissa in 2017-18, which expanded to 143 blocks covering 19 districts of the state in 2022-23. It has been reported that by 2023-24, the mission will expand to 177 blocks covering all the 30 districts of the state (Anonymous, 2022). The mission aims to encourage farmers to cultivate these highly nutritive crops, which traditionally constituted a substantial and important part of diet and cropping system in tribal areas. The promotion was chiefly on account of their inherent advantages like less requirement of farm inputs and water, their more resilience to climate vulnerability, richness in nutrients such as calcium, iron and protein. Although the major millets cultivated in Odisha encompass finger millet, sorghum, pearl millet and other small millets, finger millet among these still occupies a reasonable share in the cropping pattern of farmers, which is mainly cultivated in *kharif* season.

The major characteristic of finger millet is its adaptability to diverse agro-ecological conditions. It also shows much higher productivity as against other millets (Seetharam, 1997). The other characteristics of finger millet include its suitability to diverse soil situations, all weather conditions, varying rainfall situations, draught resistance, etc. In view of the importance accorded to millet production in the country in more recent times, the present study tries to evaluate various important issues relating to finger millet production in Odisha.

II

OBJECTIVES

The study is carried out with the following specific objectives: (i) To evaluate changes in cropping pattern of the state over time. (ii) To examine the extent of changes in area allocation and production of finger millet vis-à-vis other crops grown in the state. and (iii) To perform a comparative analysis of cost structure and profitability involved in the cultivation of finger millet in Odisha as against other major finger millet cultivating States of India.

In brief, the study assesses economic viability and sustainability of finger millet production in Odisha to understand long term implications of achieving nutritional security.

III

DATA AND METHODS

The study is mainly based on secondary data collected from various sources. The study makes use of various reports of Commission for Agricultural Costs and Prices (CACP), Ministry of Agriculture and Farmers' Welfare, Government of India to examine variations in cost of cultivation and profitability for finger millet in Odisha vis-à-vis other major States cultivating the crop. The cost and return estimates for finger millet for Odisha are furnished in CACP reports only for the last four years encompassing the period from 2017-18 to 2020-21, which are made use of to compare economics involved in the cultivation of finger millet in Odisha as against other States. The cost concepts used by CACP form the basis for evaluating cost of cultivation of finger millet in Odisha and its comparison with other States. Apart from cost estimates, the CACP reports provide estimates relating to value of main and by product, yield, prices, etc., which are made use of to ascertain the extent of net return generation in the cultivation of finger millet produced in Odisha. Further, returns for finger millet are estimated both over total and variable costs. In additions, estimations were done with respect to farm business income (FBI), family labour income (FLI), return per rupee (RPR) of investment and cost of production per quintal. These estimates provided us with fair amount of logical interpretations with respect to variations in various components of cost as well as returns and their implications on income generations from finger millet production in Odisha vis-à-vis other States of India.

IV

RESULTS AND DISCUSSION

The immense potential in the agricultural sector of Odisha has shown promising growth pattern in crop production in due course of time. Although the major crops cultivated in Orissa encompass rice, pulses and a host of other fruits vegetables, fibre and cash crops, the state also boosts to have a reasonable acreage under millets. The ten agro-climatic zones of Odisha support its soil and cropping pattern. It has been

reported that out of 30 districts of Odisha, 15 districts cultivate millets and maize, and among millets, about 95 percent of total production comes from finger (Ragi) millet (Government of India, 2023). However, there are also some major changes witnessed in the cropping pattern of Odisha during the last five decades. While the area under rice as proportion to gross cropped area (GCA) in Odisha has declined steadily from 66 percent in 1970-71 to 48 per cent in 2019-20, this share is seen to have increased for pulses, oilseeds, fiber and other crops during the same period (Table 1).

TABLE 1: CROPPING PATTERN CHANGES IN ODISHA: 1970/71 – 2019/20

Area/Crop (1)	<i>(per cent share in GCA)</i>					
	1970-71 (2)	1980-81 (3)	1990-91 (4)	2000-01 (5)	2010-11 (6)	2019-20 (7)
Rice	66.13	47.92	45.89	56.28	46.54	47.76
Wheat	0.19	0.77	0.35	0.2	0.19	0.03
Maize	1.06	2.07	1.74	2.23	2.78	3.09
Ragi	2.31	3.84	2.58	2.40	1.98	1.42
Jowar	0.25	0.42	0.28	0.17	0.10	0.07
Bajra	0.06	0.10	0.07	0.05	0.04	0.02
Small millets	2.40	4.13	0.74	0.51	0.17	0.40
All Cereals	72.4	59.25	51.67	61.85	51.8	52.80
Mung (Green gram)	4.78	7.88	7.66	5.96	9.21	10.04
Biri (black gram)	2.99	4.69	5.97	5.42	6.80	5.29
Kulthi (horse gram)	2.59	3.92	4.23	3.44	2.69	2.86
Gram (Bengal)	0.31	0.57	0.48	0.26	0.46	0.34
Arhar (Red gram)	0.75	0.94	1.72	1.89	1.49	1.56
Other pulses	1.08	1.73	2.15	0.66	2.26	3.28
All pulses	12.5	19.73	22.21	17.64	22.9	23.37
All foodgrains	84.9	78.98	73.89	79.49	74.7	76.17
All oilseeds	4.88	8.42	12.06	8.94	8.49	7.32
All fibre crops	1.15	1.14	0.94	1.12	1.19	2.22
Other crops	9.07	11.46	13.11	10.45	15.62	14.29
GCA (in '000' hectares)	6761 (100.00)	8746 (100.00)	9594 (100.00)	7878 (100.00)	9080 (100.00)	8224 (100.00)

Source: Computations are based on figures obtained from 'Five Decades of Odisha Agriculture Statistics', 2020, Directorate of Agriculture and Food Production, Government of Odisha, Odisha

Note: Other crops include potato, sugarcane, tobacco, fruits, vegetables, etc.

The maize acreage also showed an increasing trend in GCA over time. On the other hand, the share of millets in GCA declined from 5 per cent in 1970-71 to less than 2 per cent of 2019-20. Evidentially, the area allocation under finger millet as proportion of GCA has come down from 2.31 per cent to 1.42 per cent during the last five decades. The estimates further showed that the declining share of rice area in GCA over the last five decades did not result in fall in production of rice in Odisha, which increased from 5.59 million tonnes in TE 1999-00 to 7.97 million tonnes in TE 2019-20. A significant yield expansion of rice during the last two decades led to rise in rice production in the state (Table 2). A significant yield expansion and moderate rise in area also led to sharp increase in production of maize in the state. However, all the millet crops put together showed a continuous fall in area during the last two decades, though their production increased between TE 1999-00 and TE 2009-10, and fallen between TE 2009-10 and TE 2019-20. Millets hardly showed any increase in their yield during the last one decade. Among millets, the yield of finger millet

increased sharply between TE 1999-00 and TE 2009-10 and marginally between TE 2009-10 and TE 2019-20. Finger millet in Odisha showed 43 percent decline in area and 21 per cent decline in production during the last two decades. In general, the last two decades witnessed an increase in production of cereals due to yield expansion during this period. Pulses also showed an increase in production due to rise in yield.

TABLE 2: STRUCTURAL CHANGES IN AREA, PRODUCTION AND YIELD OF CEREALS AND PULSES IN ODISHA

(Area in '000' ha; Production in '000' tonnes; Yield in kg/ha)

Crops/ Period	Area			Production			Yield		
	TE 1999-00 (2)	TE 2009-10 (3)	TE 2019-20 (4)	TE 1999-00 (5)	TE 2009-10 (6)	TE 2019-20 (7)	TE 1999-00 (8)	TE 2009-10 (9)	TE 2019-20 (10)
Rice	4515.33	4424.00	3851.00	5594.00	7197.67	7974.00	1238.89	1626.96	2070.63
Wheat	17.41	19.69	2.50	22.97	29.97	4.53	1319.55	1522.18	1812.00
Maize	169.07	222.22	251.06	205.33	498.23	738.65	1214.47	2242.01	2942.11
Ragi	201.53	185.10	116.36	141.91	167.49	111.41	704.15	904.86	957.46
Jowar	14.21	9.03	6.21	7.83	5.72	3.93	551.13	630.19	633.19
Bajra	3.66	2.83	1.93	2.02	1.70	1.20	552.42	601.18	620.03
Small millets	43.71	18.17	31.61	19.41	9.22	16.30	444.10	507.25	515.77
All millets	263.11	215.13	156.11	171.17	184.13	132.84	650.56	855.90	850.94
All cereals	4964.81	4880.91	4260.98	5993.51	7910.07	8850.18	1207.20	1620.61	2077.03
Mung	578.18	779.12	852.28	223.62	329.84	418.12	386.76	423.35	490.60
Biri	477.01	614.51	481.17	185.40	265.57	232.70	388.67	432.17	483.62
Kulthi	316.21	252.17	213.64	110.70	99.03	96.15	350.07	392.71	450.06
Gram (Bengal)	32.59	40.52	30.44	17.88	28.10	23.71	548.79	693.40	778.93
Arhar	140.86	136.26	136.86	82.66	114.73	138.50	586.85	841.99	1011.98
All pulses	1620.45	2024.72	1973.68	658.25	954.96	1058.19	406.21	471.65	536.15
All foodgrains	6585.25	6905.63	6234.66	6651.75	8865.03	9908.38	1010.10	1283.74	1589.24
Cereal- foodgrains share (per cent)	75.39	70.68	68.34	90.10	89.23	89.32	-	-	-
Pulses- foodgrains share (per cent)	24.61	29.32	31.66	9.90	10.77	10.68	-	-	-
Millets- cereals Share (per cent)	5.30	4.41	3.66	2.86	2.33	1.50	-	-	-

Source: Computations are based on figures obtained from 'Five Decades of Odisha Agriculture Statistics', 2020, Directorate of Agriculture and Food Production, Government of Odisha, Odisha

Although area under cereals as proportion of total foodgrain area declined steadily during the last two decades, the cereal crops by and large showed constant share in foodgrains production of the state due to expansion in their yield during this period. On the other hand, pulses showed an increasing trend in terms of their share in area and production of foodgrains in the state over the last two decades (Table 2). However, it is disquieting to note that millets have been showing a continuous decline in their share not only in terms of area but also production of cereal crops in Odisha, which could be considered as a cause of concern.

Although the revival of millet production was launched in 2017 by the Government of Odisha under its flagship ‘Special Programme for Promotion of Millets in Tribal Areas’, its spread is limited and yet to bear fruits. The Odisha Millet Mission (OMM) aimed at tackling malnutrition by introducing millets in the PDS. It also included other state nutrition schemes. The OMM mainly focuses upon promoting household level consumption, setting up of decentralised processing unit, improving productivity of millet crops, promoting farmer producer organisations (FPOs) in marketing, and inclusion of millets in Integrated Child Development Services (ICDS), Mid-Day Meal (MDM) and PDS (Government of India, 2023).

Cost of Cultivation of Finger Millet

The cost of cultivation of finger millet is evaluated for Odisha and other major States using various cost concepts furnished in the reports of CACP, and these estimates for the period between 2017-18 and 2020-21 are furnished in Table 3. The

TABLE 3: COMPARISON OF COST OF CULTIVATION OF FINGER MILLET BASED ON VARIOUS COST CONCEPTS

Year (1)	Share in Cost C ₂ (per cent)					C ₂ (Rs./ha) (8)	
	A1 (2)	A2 (3)	A2 + FL (4)	B1 (5)	B2 (6)		C1 (7)
Odisha							
2017-18	43.84	43.84	79.29	51.87	64.54	87.33	25515.53
2018-19	41.79	41.79	82.97	46.50	58.82	87.68	25876.36
2019-20	44.10	44.10	82.50	47.64	61.60	86.04	31067.60
2020-21	34.00	34.00	80.67	35.27	53.33	81.94	39626.48
Karnataka							
2017-18	65.47	65.47	80.13	67.31	85.34	81.97	60198.73
2018-19	57.18	57.18	75.46	58.53	81.72	76.81	57254.47
2019-20	54.25	54.25	77.78	55.40	76.47	78.93	68346.30
2020-21	59.58	59.58	79.92	60.48	79.66	80.82	79025.14
Maharashtra							
2017-18	60.94	60.94	84.02	66.18	76.92	89.27	70516.15
2018-19	57.00	57.00	84.91	60.01	72.10	87.91	72230.16
2019-20	62.83	62.83	89.10	65.72	73.72	92.00	67389.45
2020-21	-	-	-	-	-	-	-
Tamil Nadu							
2017-18	65.24	65.24	77.57	69.18	87.67	81.51	58314.09
2018-19	52.06	52.06	68.94	57.87	83.12	74.74	43789.17
2019-20	52.72	52.72	65.46	57.69	87.26	70.43	63718.97
2020-21	-	-	-	-	-	-	-
Uttarakhand							
2017-18	27.58	27.58	82.09	31.50	45.49	86.01	47650.09
2018-19	31.61	31.61	80.45	35.38	51.16	84.22	44958.56
2019-20	31.44	31.44	81.61	34.72	49.83	84.88	47799.52
2020-21	-	-	-	-	-	-	-

Source: Computations are based on figures obtained from various CACP Reports, Ministry of Agriculture and Farmers' Welfare, Government of India

Notes: (i) Cost estimates for Finger Millet for Odisha are not reported in CACP reports prior to 2017-18; (ii) In 2020-21, CACP reports cost of cultivation estimates of finger millet for Odisha and Karnataka; (iii) Cost A₁ = All actual expenses in cash and kind incurred in production by owner, Cost A₂ = Cost A₁ + rent paid for leased in land; Cost A₂ + FL = Cost A₂ + imputed value of family labour; Cost B₁ = Cost A₁ + interest on value of owned capital assets (excluding land);

Cost B₂ = Cost B₁ + rental value of owned land (net of land revenue) and rent paid for leased in land

Cost C₁ = Cost B₁ + imputed value of family labour

Cost C₂ = Cost B₂ + imputed value of family labour.

major finger millet producing states for which CACP provides estimates are Karnataka, Maharashtra, Tamil Nadu, Uttarakhand and Odisha. The estimates clearly show the lowest total cost of cultivation (C_2) for finger millet in Odisha and the highest in Maharashtra and Karnataka.

Although the cost of cultivation (C_2) for finger millet in Odisha is the lowest as against other States, there has been rising trend in the same during the last couple of years. Similarly, the state of Karnataka also shows an increase in cost of cultivation of finger millet. In general, the cost of cultivation of finger millet is seen to have varied from Rs. 25,515/ha in Odisha in 2017-18 to as much as Rs. 79,025/ha in Karnataka in 2020-21. Majority of the states are seen to show the share of cost $A_2 + FL$ in cost C_2 to the tune of 80-85 per cent with the exception of Tamil Nadu which shows a lower share of cost $A_2 + FL$ in cost C_2 . The estimates reported in Table 3 also show much wider gap between share of cost A_2 and cost $A_2 + FL$ in cost C_2 of finger millet for Odisha and Uttarakhand, which is an indication of higher family labour cost involved in finger millet cultivation in these two states. The state of Tamil Nadu shows the lowest gap between share of cost A_2 and cost $A_2 + FL$ in cost C_2 for finger millet. Incidentally, the state of Uttarakhand hardly show any change in cost of cultivation of finger millet during the given period of time.

A break-up relating to expenses incurred towards labour, seed, fertilizer and manure, insecticides, irrigation, interest on working capital, etc. for finger millet encompassing the period from 2017-18 and 2020-21 is shown in Table 4. It could be noted that the labour cost accounted for the bulk of the variable cost of finger millet cultivation.

The variable cost accounted for about 80 per cent share in cost of cultivation of finger millet in the states of Odisha, Karnataka and Uttarakhand. The bulk of the variable cost was incurred on account of human, bullock and machine labour (Table 4). It was only in case of Tamil Nadu that labour cost accounted for relatively lower share in cost of cultivation of finger millet as against other states. In the state of Uttarakhand, almost the entire variable cost of finger millet cultivation was accounted for by human and bullock labour. This state also did not show any expense incurred towards fertilizer and manure use. In general, the highest share in cost of cultivation of finger millet was found to be accounted for by human labour, followed by bullock labour in case of Odisha, Maharashtra and Uttarakhand, and human labour, followed by machine labour for Karnataka and Tamil Nadu. The seed cost and interest on working capital were found to account for less than two percent share in cost of cultivation of finger millet.

The estimates further revealed that the cost of fertilizer and manure application varied from 10-15 per cent of the total cost of cultivation of finger millet across various states with the exception of Uttarakhand. Incidentally, the expenses towards irrigation and insecticide use were almost negligible in most of the states with the exception of Tamil Nadu and to certain extent the state of Karnataka.

TABLE 4: BREAK UP OF COST OF CULTIVATION (C₂) OF FINGER MILLET FOR VARIOUS STATES

Year (1)	Labour			Seed (5)	Fert. and Insecticide (6) (7) (8)			Int. on working capital (9)	Misc (10)	Variable Cost (11)	Fixed Cost (12)	Total cost (C ₂) (Rs./ha) (13)
	Human (2)	Bullock (3)	Machine (4)									
Share in Cost C ₂ (per cent)												
Odisha												
2017-18	48.20	8.73	8.02	0.92	9.29	-	-	1.24	0.04	76.45	23.55	25515.53
2018-19	53.48	12.72	3.36	0.99	9.43	-	0.05	1.22	0.06	81.31	18.69	25876.36
2019-20	52.62	10.27	7.22	0.89	8.59	-	-	1.29	0.05	80.94	19.06	31067.60
2020-21	55.08	7.64	8.18	0.89	7.15	-	0.08	1.01	0.05	80.09	19.91	39626.48
Karnataka												
2017-18	42.94	9.85	13.54	1.33	8.96	-	1.03	1.98	0.21	79.84	20.16	60198.73
2018-19	39.69	9.43	12.78	2.78	7.57	0.07	0.63	1.72	0.30	74.97	25.03	57254.47
2019-20	44.40	8.80	13.70	1.40	6.89	-	0.21	1.63	0.32	77.35	22.65	68346.30
2020-21	50.06	5.57	11.92	1.23	8.09	-	0.61	1.80	0.42	79.69	20.31	79025.14
Maharashtra												
2017-18	41.93	13.63	3.88	0.31	15.22	-	0.14	1.82	6.20	83.12	16.88	70516.15
2018-19	45.09	12.53	3.68	0.37	12.66	-	-	1.70	7.94	83.98	16.02	72230.16
2019-20	44.90	15.22	5.16	0.22	15.23	-	-	1.88	5.63	88.24	11.76	67389.45
2020-21	-	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu												
2017-18	42.57	-	13.12	2.20	13.61	1.02	1.42	1.93	0.07	75.94	24.06	58314.09
2018-19	37.20	-	14.35	0.92	10.05	1.22	1.17	1.50	0.01	66.42	33.58	43789.17
2019-20	35.58	0.01	10.35	0.71	13.51	0.74	1.01	1.54	0.01	63.45	36.55	63718.97
2020-21	-	-	-	-	-	-	-	-	-	-	-	-
Uttarakhand												
2017-18	56.79	19.83	-	1.62	0.05	-	-	0.74	-	79.03	20.97	47650.09
2018-19	51.49	22.86	-	2.16	0.03	-	-	0.87	-	77.40	22.60	44958.56
2019-20	55.04	20.68	-	1.99	0.02	-	-	0.86	-	78.61	21.39	47799.52
2020-21	-	-	-	-	-	-	-	-	-	-	-	-

Source: Computations are based on figures obtained from various CACP Reports, Ministry of Agriculture and Farmers Welfare, Government of India

Notes: (i) Cost estimates for Finger Millet for Odisha are not reported in CACP reports prior to 2017-18

(ii) In 2020-21, CACP reports cost of cultivation estimates of finger millet for Odisha and Karnataka

Profitability of Finger Millet

The ultimate goal of a producer is maximization of net return, which largely depends on the cost structure in crop cultivation. Maximization of profit requires a balance between the increase in production and various components of costs. In fact, it is the structure of cost and returns that is most crucial not only for the producers but also for the consumers and policy makers since these two key elements provide an effective linkage between the producer and consumers for rational fixation of prices of the produce. It is, therefore, essential to evaluate the element of profit involved in finger millet cultivation. The estimates relating to yield level, prices, value of main and by product, variable and total cost, and gross and net returns for finger millet cultivation in the states of Odisha, Karnataka, Maharashtra, Tamil Nadu and Uttarakhand for the period between 2017-18 and 2020-21 are presented in Table 5.

TABLE 5: PROFITABILITY INDICATORS OF FINGER MILLET FOR VARIOUS STATES

Year	Yield (q/ ha)	Implicit price/rate (Rs/qrtl)	Price (Rs/QtI) MSP	Value Main product	Value By Product	Gross returns	Variable Cost	Total Cost	Returns over variable cost	(Rs./ha)
										Net Returns
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Odisha										
2017-18	6.71	1862.79	1900	12936.11	-	2936.11	19506.41	25515.53	-6570.30	12579.42
2018-19	5.81	2017.27	2897	12690.43	60.98	2751.41	21039.96	25876.36	-8288.55	13124.95
2019-20	7.55	2227.42	3150	17278.58	66.17	7344.75	25144.65	31067.60	-7799.90	13722.85
2020-21	10.03	2952.51	3295	28557.43	74.78	28632.21	31737.15	39626.48	-3104.94	10994.27
Karnataka										
2017-18	17.48	2180.14	1900	37260.00	10210.12	7470.12	48060.48	60198.73	-590.36	12728.61
2018-19	11.97	2683.41	2897	46031.40	9664.21	5695.61	42922.50	57254.47	12773.11	1558.86
2019-20	18.52	2679.08	3150	50647.54	9511.03	60158.57	52863.83	68346.30	7294.74	-8187.73
2020-21	23.51	2962.57	3295	64605.49	8408.24	73013.73	62975.87	79025.14	10037.86	-6011.41
Maharashtra										
2017-18	16.69	2016.36	1900	43044.25	2365.90	45410.15	58614.27	70516.15	3204.12	-25106.00
2018-19	13.69	2173.75	2897	49791.99	2593.05	52385.04	60656.13	72230.16	-8271.09	-19845.12
2019-20	10.45	1939.39	3150	30294.62	2057.59	32352.21	59464.80	67389.45	-27112.59	-35037.24
2020-21	-	-	-	-	-	-	-	-	-	-
Tamil Nadu										
2017-18	10.65	2760.37	1900	30875.14	4657.70	35532.84	44282.59	58314.09	-8749.75	-22781.25
2018-19	11.74	2799.37	2897	30023.15	1694.78	31717.93	29083.89	43789.17	2634.04	-12071.24
2019-20	16.60	2271.84	3150	45062.95	2174.67	47237.62	40428.33	63718.97	6809.29	-16481.35
2020-21	-	-	-	-	-	-	-	-	-	-
Uttarakhand										
2017-18	10.54	2941.97	1900	31380.52	3318.39	34698.91	37657.80	47650.09	-2958.89	-12951.18
2018-19	10.74	2996.97	2897	32144.29	2083.07	34227.36	34796.84	44958.56	-569.48	-10731.20
2019-20	14.40	3001.85	3150	43217.96	3939.48	47157.44	37573.44	47799.52	9584.00	-642.08
2020-21	-	-	-	-	-	-	-	-	-	-

Source: Computations are based on figures obtained from various CACP Reports, Ministry of Agriculture and Farmers Welfare, Government of India

Notes: (i) Cost estimates for Finger Millet for Odisha are not reported in CACP reports prior to 2017-18

(ii) In 2020-21, CACP reports cost of cultivation estimates of finger millet for Odisha and Karnataka

(iii) Implicit price is the ratio of value of the output of main product per hectare to the yield per hectare

Although finger millet and other millet crops are now being promoted to achieve nutritional security in India, the economics involved in their cultivation is not very encouraging. The finger millet cultivation is found to be highly uneconomic proposition across all the states of India. The total cost of production in finger millet cultivation is much higher as against returns generated from it. However, there are also significant variations in cost and return estimates for finger millet across various States. For instance, during the period between 2017-18 and 2020-21, the finger millet cultivation is seen to generate 30-50 percent lower gross returns as against total cost in the states of Odisha and Maharashtra, and 25-40 per cent lower returns than cost in Tamil Nadu. It is only in case of Karnataka that the total cost exceeded gross returns in finger millet cultivation by 3-20 per cent during the last four years. In

general, all the states show significant negative net returns from finger millet cultivation due to higher element of cost involved. The states of Odisha and Maharashtra not only show negative returns over total cost but also variable cost of production of finger millet. It is only in case of Karnataka that returns over variable cost exceed with a comfortable margin in finger millet cultivation, which also holds true in the case of Tamil Nadu and Uttarakhand in recent years.

The finger millet cultivation is also noticed to be marked with significant yield variation across states of India. The yield of finger millet is noticed to be the lowest in Odisha, though there has been an improvement in more recent year. In general, finger millet yield is noticed to have varied from 6 quintals per hectare in 2018-19 in Odisha to 24 quintals per hectare in Karnataka in 2020-21. Despite the fact that the state of Karnataka shows the highest yield of finger millet, it is still not able to generate positive net returns over total cost of production.

Income Measures for Finger Millet

The estimates relating to farm business income (FBI), family labour income (FLI) net income, return per rupee of investment, per quintal cost of production and minimum support price (MSP) for finger millet for major states encompassing the period from 2017-18 to 2020-21 are brought out in Table 6.

TABLE 6: INCOME MEASURE ESTIMATES FOR FINGER MILLET FOR VARIOUS STATES

Period	Farm Business Income (Rs/ha) (2)	Family Labour Income (Rs/ha) (3)	Net Income (Rs/ha) (4)	Return Per Rupee (5)	Cost of Production (Rs/Q) (6)	Price (Rs/Q) MSP (7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Odisha						
2017-18	1751.16	-3532.17	-12579.42	0.50699	3802.61	1900
2018-19	1937.31	-2470.22	-13124.95	0.492782	4453.76	2897
2019-20	3644.51	-1792.02	-13722.85	0.558291	4114.60	3150
2020-21	15157.90	7499.36	-10994.27	0.722552	3950.85	3295
Karnataka						
2017-18	8056.58	-3906.33	-12728.61	0.788557	3443.86	1900
2018-19	22956.14	8907.69	-1558.86	0.972773	4781.23	2897
2019-20	23079.26	7894.30	-8187.73	0.880202	3689.69	3150
2020-21	25929.78	10064.49	-6011.41	0.92393	3361.48	3295
Maharashtra						
2017-18	2437.68	-8830.15	-25106.00	0.643968	4225.05	1900
2018-19	11213.02	310.25	-19845.12	0.725252	5276.13	2897
2019-20	-9987.23	-17329.41	-35037.24	0.480078	6447.17	3150
2020-21	-	-	-	-	-	-
Tamil Nadu						
2017-18	-2510.98	-15589.18	-22781.25	0.609335	5475.50	1900
2018-19	8921.51	-4681.09	-12071.24	0.724333	3729.91	2897
2019-20	13642.70	-8363.90	-16481.35	0.741343	3839.50	3150
2020-21	-	-	-	-	-	-
Uttarakhand						
2017-18	21558.35	13022.58	-12951.18	0.728202	4520.88	1900
2018-19	20014.35	11225.71	-10731.20	0.761309	4186.09	2897
2019-20	32128.99	23337.84	-642.08	0.986567	3319.52	3150
2020-21	-	-	-	-	-	-

Source: Same as in Table 6. Notes: Farm Business Income = Gross Income – Cost A₂; Family Labour Income = Gross Income – Cost B₂; Net Income = Gross Income – Cost C₂; Return per Rupee = (Gross Income/ha) / (Cost C₂/ha); Cost of Production/qlt. = Cost C₂/ha / Yield/ha.

The estimates clearly show significant farm business income from finger millet cultivation across all the states of India, which varied from as low as Rs. 1,751/ha in Odisha in 2017-18 to as much as Rs. 32,129/ha in Uttarakhand. In general, all the states show a steady rise in FBI from finger millet cultivation. However, the family labour income (FLI) from finger millet cultivation turns out to be positive during the entire given period in Uttarakhand and during the last three years in Karnataka, whereas Odisha shows positive FLI only in the recent years.

The state of Tamil Nadu is noticed to be marked with negative FLI in the cultivation of finger millet during the entire period. Since total cost is seen to have exceeded gross returns from finger millet with a significant margin, the return per rupee of investment turns out to be very low ranging from Rs.0.50 in Odisha in 2017-18 to Rs.0.99 in Uttarakhand in 2019-20 (Table 6). The estimates also show much higher cost of production of finger millet as against MSP for all the states of India. During the period between 2017-18 and 2020-21, the per quintal cost of production of finger millet remained higher than its MSP across all the states. The highest per quintal cost production of finger millet was noticed in Maharashtra, which stood at more than two times than MSP. Since the estimates show uneconomic proposition of finger millet cultivation in majority of the States, there is a need to exercise corrective measures, which not only require significant expansion of yield through application of HYV seeds but also curbing of cost of production with major reduction in labour cost. These measures coupled with an increase in MSP will surely pay rich dividends in finger millet cultivation not only in Odisha but also other states.

IV

CONCLUSION

The scenario obtaining in terms of cultivation of finger millet across States is not so encouraging since this calcium, iron and protein rich crop not only shows decline in area under its cultivation but also lower yield and higher cost as against returns emanating from the crop. A critical evaluation of costs and return estimates show 25-50 per cent lower gross returns than total cost in the cultivation of finger millet in the states of Odisha, Maharashtra and Tamil Nadu. It is only in case of Karnataka that the total cost exceeded gross returns in finger millet cultivation by 3-20 per cent during the last four years. The higher element of cost as against returns has been making finger millet cultivation highly unprofitable, which is also causing depletion of area under its cultivation. The estimates also show that while majority of states cultivating finger millet are able to generate positive farm business income (FBI), there has again been negative family labour income (FLI) from its cultivation, especially in the states of Odisha and Tamil Nadu. The estimates further show much higher per quintal cost of production of finger millet as against MSP across all the states. The return per rupee of investment in the cultivation of finger millet is seen to vary from Rs.0.50 in Odisha to Rs.0.99 in Uttarakhand during the last four years.

The uneconomic proposition of finger millet cultivation in majority of the states makes it necessary to exercise corrective measures, which require significant expansion of yield through application of HYV seeds, curbing of cost of production with major reduction in labour cost and an increase in MSP. There are varied reasons for inadequate motivation towards finger millet cultivation, which chiefly encompass low productivity, high labour requirement, seed supply chain constraints, social taboos, lack of technological up-gradation in processing, inadequate knowledge about nutritional profile of crop, etc. Therefore, in order to promote finger millet cultivation, there is a need to promote not only drought resistant high yielding varieties but also addressing the value chain of this important nutri-cereal so that farmers are protected against price risk faced by them and get better prices for their crop. Since the emphasis is now being placed on achieving nutritional security, a balanced approach is needed in terms of production promotion and subsequent absorption at consumers' end with greater emphasis on safeguarding the interest of producers of millet crops.

REFERENCES

- Anonymous (2022), 'Odisha's Tryst with Millets and Integrated Farming: Inclusive, Sustainable and Going Global', *Indian Journal of Agricultural Economics*, 77 (4): 680-683.
- Dicko, H., Gruppen, H., Traore, A., Voragen, J. and Berker, J. (2005), 'Sorghum Grain as Human Food in Africa. Relevance of Content of Starch and Amylase Activities', *African Journal of Biotechnology*, 5 (5): 384-395.
- Government of India (2014), 'Status Paper on Coarse Cereals (Sorghum, Pearl Millet, Finger Millet, Small Millets, Maize and Barley)', Directorate of millets development, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. <https://www.nfsm.gov.in/StatusPaper/StatusMillet2016.pdf>.
- Government of India (2023), 'E-Catalogue for Export of Millets and Value Added Products Odisha', International Year of Millets 2023, Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, New Delhi
- IIMR (2015) Vision 2050, ICAR- Indian Institute of Millets Research, Rajendranagar, Hyderabad-30. <https://www.millet.res.in/vision/vision2050.pdf>.
- Kumar, Ganesh B., N. Sivaramane and Ch. Srinivasa Rao (2020), 'Economic Analysis of Production and Consumption of Finger Millet in India', *Multilogic in Science*, Vol. 5, Issue 34, July, pp. 1006-1011
- Maqbool, S.B., Devi, P. and Sticklen, M. (2001), 'Biotechnology: Genetic Improvement of Sorghum (Sorghum bicolor)', *In vitro Cell Developmental Biology-Plant*, 37: 504-515.
- Sharma, K.K. and Ortiz, R. (2000), 'Program for the Application of Genetic Transformation for Crop Improvement in the Semi-arid Tropics', *In vitro Cell Developmental Biology-Plant*, 36: 83-92.
- Seetharam, A. (1997), 'Finger millet – Its Importance in Indian Agriculture', In *Proceedings of National Seminar on Small Millets*, 23-24, April 1997, Tamil Nadu Agricultural University, Coimbatore, pp. 1-2.
- Sreekala, Asha Devi Sukumaran, P. Anbukkani, Alka Sing, B. Dayakar Rao and Girish K. Jha (2022), 'Millet Production and Consumption in India: Where Do We Stand and Where Do We Go?', *National Academy Science Letters-Springer*, 07 September, <https://doi.org/10.1007/s40009-022-01164-0>.