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Economics of *Rabi* sorghum grain production and certified seed production in Satara district of Maharashtra

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Abstract
The present study entitled, 'Economics of *Rabi* Sorghum Certified Seed and Grain Production in Satara District of Maharashtra' is based on a sample of 90 Rabi Sorghum certified seed producer farmers and 30 grain producer farmers drawn from Satara and Karad tahsil of Satara district. The present study was undertaken with per hectare costs and returns of *Rabi* Sorghum certified seed production and grain production, problems faced by farmers in *Rabi* Sorghum certified seed and grain production. The data pertained to the agricultural year 2019-20. The study revealed that per hectare cost of cultivation was Rs.109940.62 and Rs. 78845.40 respectively for *Rabi* Sorghum certified seed production and grain production. The per hectare cost of cultivation was higher in *Rabi* Sorghum certified seed production than the *Rabi* Sorghum grain production but per quintal cost were Rs. 1131.36 and Rs. 1157.56 for *Rabi* Sorghum certified seed production and grain production respectively. The per hectare income received from *Rabi* sorghum certified seed production (Rs.289002.73) was higher showing more economic viability than that of grain production (Rs. 132562.36). The B:C ratio at cost C was 2.63 in case of *Rabi* sorghum certified seed production as compared to 1.68. in *Rabi* Sorghum grain production. The B:C ratio of more than unity indicated that the certified seed production in the study area is economically viable proposition. The findings of the investigation further showed that problems faced by *Rabi* Sorghum certified seed producer farmers in production were risk of rejection of sorghum seed at the time of grading, processing and testing, Higher wages rates, Maintenance of seed plot requires more labour, Higher cost of foundation seed etc. whereas, problems faced by *Rabi* Sorghum grain producer farmers were labour scarcity at peak season followed by Higher wages rates, Higher prices of pesticides, Lack of availability of good quality seed etc.

Keywords: costs, *Rabi* sorghum certified seed production, returns, problems faced by farmers

1. Introduction

Seed is the primary physical input in agricultural production, as well as the primary source of most foods, at least those of plant origin, and thus has the greatest socioeconomic benefit to human welfare. The development of seed production and the use of high-yielding seed varieties have played a major role in the success of the green revolution. Seed availability is crucial for increasing food production, developing farmer income, fighting poverty, and ensuring food security in both normal and disaster years.

Sorghum is one of the world's most popular and important crops. It is scientifically known as *Sorghum bicolar* L. and is commonly referred to as 'Jowar' in India. Among other millets, a large size is referred to as a 'Great millet'. Sorghum is a major and important food grain in our country.

Sorghum grain, which is grown by marginal and small groups of farmers in semi-arid parts of the country, ranks fifth in cereals for global production after crops like wheat, rice, maize, and pearl millet. It is regarded as the world's most important staple food crop for the poor and food-insecure people in Asian and African countries (Basavaraja, *et al.*, 2005) [5]. There has been drastic reduction in sorghum area especially in the rainy season, but the area under post-rainy sorghum has remained relatively stable and is grown predominantly in six districts of Maharashtra (Solapur, Ahmednagar, Pune, Beed, Osmanabad and Aurangabad) and three districts of Karnataka (Bijapur, Gulbarga and Raichur), apart from parts of Andhra Pradesh and Tamil Nadu (Reddy *et al*., 2012) [13].

In addition to being a source of staple food for humans, it is also an important source of fodder, animal feed, and raw material for agro industries. Sorghum has adaptable attributes in a variety of environments, allowing it to thrive in places where other cereal crops aren't.

(Haussmann *et al.*, 2000) [6]. It is grown for multipurpose uses as feed, food, fuel, and other industrial uses in both the post-rainy (*Rabi*) and rainy (*Kharif*) seasons. Sorghum grain is also known as nutrient-dense grain because it contains a variety of nutrients. As a result of its high carbohydrate and calcium content, it is a staple food for half of the world's population. Sorghum is an important component of the Indian diet. Half a cup of uncooked sorghum (96 grams) provides, Calories (316 Calories) Carbohydrate (69 grams), Proteins (10 grams), Fat (3 grams), Fiber (6 gram), Iron (18% of the DV), Thiamine (26% of DV), Pantothenic acid (7% of DV), Vitamin B6 (25% of DV) and Riboflavin (7% of DV) are all found in sorghum. (Source: Anonymous 2019).

Sorghum comes from Ethopia, which is in East Central Africa. In the first millennium, sorghum was brought from East Africa to India. Sorghum (*Sorghum bicolor* L.) is belongs to family Poaceae. The height of the plants ranges from 0.6 to 4.0 meters. White, yellow, or brownish yellow seed. Glumes usually cover the inflorescence. Due to its high drought resistance, sorghum is also known as camel crop.

Maharashtra has first rank in sorghum area and production in India. Area under sorghum was 2.40 Million hectares with production of 1.19 metric tons and productivity of 491 kg/ha in 2018-2019. The major sorghum growing districts in Maharashtra are Solapur, Pune, Sangli and Satara. In Maharashtra Solapur district rank first in production (1.84 lakh MT) and also first in area (5.17 lakh hectare). Pune rank second in area (1.98 lakh hectares) and sixth in production (0.61 lakh MT), Sangli rank third in area (1.51 lakh ha.) as well as fourth in production (0.78 lakh MT). Satara rank fourth in area (1.49 lakh hectare) while rank second in production (1.24 lakh MT) during the year 2018-19. (Source: Directorate of Economics & Statistics, Ministry Of Agriculture and Farmers Welfare, Govt. Of India https://aps.dac.gov.in)

In recent years, the area of *Rabi* sorghum has decreased, and *Rabi* sorghum farmers have shifted their focus to more remunerative crops. Farmers are drawn to the cultivation of wards sorghum because of its suitability and profitability. Therefore, Satara district is purposively selected for the study. The aim of this study was to look into various aspects of *Rabi* sorghum seed and grain production, as well as the costs and returns structure of certified seed producer farmers in Satara district of Maharashtra. Present study involving economics of *Rabi* sorghum certified seed production in Satara district of Maharashtra was taken up with following specific objectives.

1.1. Objectives

1) To estimate the costs and returns of *Rabi* sorghum certified seed and grain production.
2) To study the problems faced in *Rabi* sorghum certified seed production and grain production.

2. Methodology

2.1. Data collection

The sampling design adopted for the investigation was two stage purposive and random sampling with sample tahsil as a primary unit of sampling and village as a secondary unit of sampling. Three villages from each Tehsil were selected purposively for study on the basis of higher area under *Rabi* sorghum cultivation. The list of *Rabi* sorghum certified seed producer farmers along with their operational area and area under Phule Revati cultivation for each of the selected villages were prepared on the basis of information obtained from village revenue office and MSSC office Satara. The *Rabi* sorghum certified seed producer farmers were arranged in descending order of their area under *Rabi* sorghum cultivation for each of the selected villages and famers from each village categorized by three predetermined size classes (i.e. area under *Rabi* Sorghum Phule Revati cultivation) *viz.*, Group I (below 0.20ha), Group II (0.21 to 0.40ha) and Group III (0.41 ha and above). Thereby making a total of 15 seed producer and 5 grain producer farmers for each village was selected randomly. Thus, the total sample size for the study consists of 90 *Rabi* sorghum certified seed producing farmers (comprising 30 small, 30 medium and 30 large) and 30 grain producing farmers with irrespective of area size were selected for present study.

2.2. Cost concepts

To fulfill the specific objectives of the study, based on the nature and extent of availability of data, analytical tools and techniques viz., tabular analysis was adopted to compile the general characteristics of the sample farmers, Standard cost concepts Cost-A, Cost-B, Cost-C, RPI technique used for study of problems faced by farmers.

Cost A = All the variable costs excluding family labour cost and including interest on working capital + Depreciation charges + Land revenue

Cost B1 = Cost A + Interest fixed capital + Rental value of owned land

Cost C = Cost B + Imputed value of family labour

Problems in Production

There was a disagreement over whether the emphasis should be placed on the number of responses to a specific priority or the highest number of responses to a constraint in the first priority in the quantification of problems expressed by farmers. However, they both lead to different conclusions. To address this, a Responses-Priority Index (RPI) was developed as a product of the Proportion of Responses (PR) and Priority Estimate (PE), where PR for the ith constraint gave the ratio of number of responses for a particular constraint to the total responses as per equation given below,

$$(RPI)_i = \frac{\sum_{j=1}^{k} f_{ij} \cdot X_{[(k+1)-j]}}{\sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}} \quad (0 \le RPI \le 5)$$

Where,

$(RPI)_i$ = Response Priority Index for i^{th} constraint,

f_{ij} = Number of responses for the jth priority of the ith constraints.

(i=1, 2……, 1; j= 1,2,3,…..k),

$\sum_{j=1}^{k} fij$ = Total number of responses for the ith constraint.

$X_{[(k+1)-j]}$ = Scores for the jth priority,

k = Number of priorities, i.e. 5,

$\sum_{i=1}^{1} \sum_{j=1}^{k} fij$ = Total number of responses to all constraints, and

$\sum_{i=1}^{1} (RPI)_i$= Summation of RPI indices for all constraints.

3. Results and Discussion

3.1. Input Used in *Rabi* Sorghum Certified Seed Production.

Table 1 show that the overall per hectare human labour use in certified seed production was 74.60 mandays, which was higher than the 71.30 mandays in grain production. The higher human labour demand in seed production was primarily due to activities such as gap filling, rouging, and other similar tasks. Certified Seed production comprising of 39.93 male labour and female 34.67 labour mandays while in case of grain production, the per hectare human use of total human labour was 71.30 labour mandays comprising of 36.55 male labour and 34.74 female labour mandays.

The bullock power use was found to be lower in case of *Rabi* sorghum certified seed production (5.08 pair days) as compare to *Rabi* sorghum grain production (7.66 pair days). The per hectare machine labour utilization was observed slightly more in case of seed production than grain production which was 11.10 hours. The machine power i.e. use of tractors was mostly for the operation of carrying of FYM, ploughing, harrowing and threshing etc. The use of manure per hectare at overall level for seed production was 78.38 qtl/ha and for grain production was 59.05 qtl /ha. The per hectare fertilizer use for rabi sorghum certified seed production were 144.34 kg N, 244.91 kg P and 49.78 kg of K. however for *Rabi* sorghum grain production per hectare fertilizer use were 155.03 kg N, 217.69 kg P and 41.27 kg K. The seed rate per hectare at overall was found to be 11.44 kg and 11.22 kg for *Rabi* sorghum certified seed and grain production respectively. *Rabi* sorghum certified seed producer farmers used more seed rate as compared to grain producer farmers because certified seed producer farmers follows roughing practices for maintaining plant to plant distance. The per hectare use of plant protection charges in certified seed production and grain production was Rs. 927.10 and Rs 821.47 respectively.

The certified seed producer farmer has to strictly adhere to the recommended cultural practices for maintaining the genetic and physical purity as laid down by the seed certification agency, hence the use of inputs were higher in certified seed production programme. For seed production it is essential to protect the plant form the pests and diseases, so the farmers use more amount of plant protection measures to protect the plant form the pests and diseases. Kiran Kumar (2011) [8], Pal *et al*. (2016) [10, 11], Ade (2021) [1] in their study also observed that there is total cost of production for seed production was more than grain production.

Table 1: Per hectare Utilization of Physical Inputs for *Rabi* sorghum Certified Seed and production.

Sr. No.	Particulars	Seed Production-Size Group				Grain Producers
		Small	Medium	Large	Overall	
1	Human labour	80.11	70.93	72.75	74.60	71.30
	(Days)					
	Male	39.91	38.35	41.53	39.93	36.55
	Female	40.20	32.58	31.22	34.67	34.74
2	Bullock Labour (pair)	6.39	4.05	4.79	5.08	7.66
3	Machine labour (hours)	19.61	19.63	18.82	19.35	11.10
4	Manures (Qtl)	92.56	77.19	65.39	78.38	59.05
5	Fertilizers (kg)					
	N	130.26	152.07	150.71	144.34	155.03
	P	256.54	245.50	232.70	244.91	217.69
	K	37.06	56.47	55.82	49.78	41.27
6	Seed (Kg)	11.72	11.41	11.20	11.44	11.22
7	Plant protection (Rs.)	963.89	927.64	889.78	927.10	821.47

3.2 Cost of Cultivation of *Rabi* sorghum Certified Seed production

The Table 2 reveals that at overall level in certified seed production, human labour accounted for the majority (14.40 percent) of the total cost of Rs 15719.34 per hectare, and in grain production, human labour accounted for 16.52 percent of the total cost of Rs 13023.61 per hectare. The higher human labour costs in certified seed production was primarily due to activities such as rouging and gap filling. In the seed production rental value of land accounted major contribution i.e. Rs 47985.93 (43.71%) followed by Human labour (14.40%) machine power (10.59%), manure (7.10%), cost of fertilizer (3.71%) and irrigation (1.92%). In grain production the rental value of land reported major share of Rs 21912.98 (27.79%) followed by human labour 13023.61 (16.52%), machine power (8.45%), manure (7.49%), bullock power (4.86%), fertilizer (4.75%) and irrigation charges (2.65%).

At overall level the per hectare cost of cultivation for *Rabi* sorghum certified seed production was worked out to Rs 109940.62 in which the contribution of Cost 'A' (Rs 53737.86) accounted for 48.92 per cent to the total cost. The contribution of Cost 'B' (Rs 106747.07) to the total cost was 97.17 per cent. In grain production, per hectare cost of production was worked out to Rs 78845.40 in which the contribution of Cost 'A' (Rs 46920.26) accounted for 59.51 per cent to the total cost. The contribution of Cost 'B' (Rs 73954.29) to the total cost was 93.80 per cent. It was observed that the cost of cultivation was higher in certified seed production as compared to grain production of *Rabi* sorghum. The higher cost is due to the additional activities involved in seed production, as well as farmers' strict adherence to cultivation practices in order to maintain product quality. The per quintal cost of rabi sorghum was calculated on net Cost 'C' of by-produce by dividing it value of main produce, at overall level per qtl. cost of rabi sorghum seed and grain production was Rs 1131.36 and Rs 1157.56, respectively. These results are in conformity with the findings of Ranganath and Reddy (2005), Kiran Kumar (2011) [8], Pal *et al*. (2016) [10, 11], Ade (2021) [1].

Table 2: Per Hectare Cost of Cultivation for *Rabi* sorghum Certified Seed and Grain production

Sr. No.	Particulars	Seed Production-Size Group				Grain Producers
		Small	Medium	Large	Overall	
1	Hired male labour	8622.22	9832.86	11725.00	10060.03	7600.83
		(7.26)	(9.10)	(11.38)	(9.25)	(9.64)
	Hired female labour	6166.67	5051.27	5760.00	5659.31	5422.78
		(5.19)	(4.68)	(5.59)	(5.15)	(6.88)
	Total	14788.89	14884.13	17485.00	15719.34	13023.61
		(12.45)	(13.78)	(16.97)	(14.40)	(16.52)
2	Bullock power	3194.44	2025.40	2394.44	2538.10	3830.56
		(2.69)	(1.87)	(2.32)	(2.30)	(4.86)
3	Machine power	11766.67	11780.95	11290.00	11612.54	6661.67
		(9.91)	(10.90)	(10.96)	(10.59)	(8.45)
4	Seed	703.44	684.78	671.70	686.64	392.78
		(0.59)	(0.63)	(0.65)	(0.63)	(0.50)
5	Manure	9255.56	7718.57	6539.44	7837.86	5904.72
		(7.79)	(7.14)	(6.35)	(7.10)	(7.49)
6	Fertilizer cost	3832.26	4233.96	4098.14	4054.79	3746.02
		(3.23)	(3.92)	(3.98)	(3.71)	(4.75)
7	Irrigation	2381.48	1991.51	1953.81	2108.93	2093.11
		(2.01)	(1.84)	(1.90)	(1.92)	(2.65)
8	Plant PC	963.89	927.64	889.78	927.10	821.47
		(0.81)	(0.86)	(0.86)	(0.84)	(1.04)
9	registration charges	50.00	50.00	50.00	50.00	0.00
		(0.04)	(0.05)	(0.05)	(0.05)	(0.00)
10	Incidental C	1036.48	739.08	287.47	687.68	596.86
		(0.87)	(0.68)	(0.28)	(0.61)	(0.76)
11	Repairs	1385.19	930.77	389.39	901.78	1345.19
		(1.17)	(0.86)	(0.38)	(0.80)	(1.71)
12	Working Capital (1 - 12)	49358.30	45966.79	46049.18	47124.75	38415.99
		(41.56)	(42.55)	(44.70)	(42.94)	(48.72)
13	Interest on W.C.	2961.50	2758.01	2762.95	2827.49	2304.96
		(2.49)	(2.55)	(2.68)	(2.58)	(2.92)
14	Depreciation charge	4308.13	4551.80	1953.35	3604.43	6018.55
		(3.63)	(4.21)	(1.90)	(3.25)	(7.63)
15	Land revenue	181.17	180.83	181.58	181.19	180.75
		(0.15)	(0.17)	(0.18)	(0.17)	(0.23)
16	Cost A (12 -15)	56809.09	53457.43	50947.06	53737.86	46920.26
		(47.83)	(49.48)	(49.45)	(48.92)	(59.51)
17	Rental value of land	50572.04	46295.89	47089.85	47985.93	21912.98
		(42.58)	(42.85)	(45.71)	(43.71)	(27.79)
18	Interest on fixed capital	6165.42	5141.62	3762.79	5023.28	5121.06
		(5.19)	(4.76)	(3.65)	(4.53)	(6.50)
19	Cost B (16-18)	113546.55	104894.94	101799.70	106747.07	73954.29
		(95.60)	(97.10)	(98.82)	(97.17)	(93.80)
20	Family male labour	3350.00	1673.10	735.00	1919.37	3365.00
		(2.82)	(1.55)	(0.71)	(1.69)	(4.27)
21	Family female labour	1874.07	1464.60	483.89	1274.19	1526.11
		(1.58)	(1.36)	(0.47)	(1.13)	(1.94)
22	Total	5224.07	3137.70	1218.89	3193.55	4891.11
		(4.40)	(2.90)	(1.18)	(2.83)	(6.20)
23	Cost C (19+22)	118770.63	108032.64	103018.59	109940.62	78845.40
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
	Gross Income	304519.26	278860.33	283628.58	289002.73	132562.36
	A) Main produce	231488.89	207179.76	215890.56	218186.40	85228.33
	B) By-produce	73030.37	71680.57	67738.03	70816.32	47334.03
	Cost C net of by-produce	45740.26	36352.07	35280.56	39124.30	31511.38
	B:C ratio	2.56	2.58	2.75	2.63	1.68
	Per quintal Cost	1253.16	1106.58	1025.76	1131.36	1157.56

(Figure in parenthesis indicates percentages to the Cost C)

3.3 Costs, Returns and Profitability of *Rabi* sorghum Certified Seed and grain production

The net returns and benefit cost ratio for *Rabi* sorghum certified seed and grain production have been compared to the per hectare gross income, different costs, and profit at different costs; the details are given in table 3

It clearly shows that the costs of certified seed production were higher than the costs of grain production in *Rabi* sorghum. To ensure genetic purity, the seed producer must adhere strictly to the recommended cultural practices as set out by the seed certification agency. To maintain genetic purity, the seed production plot must be weed-free, and off-

type plants must be manually removed. Drying the proper way a further unique operation in seed production is seed cleaning and preliminary processing. All of these are Additional labour was required for the activities. As a result, the cost of certified seed production was higher as a result of the higher cost of cultivation, when compared to grain production. In comparison to grain production, cost A, B, and C were all higher in *Rabi* sorghum certified seed production.

Overall, the per hectare gross return received by *Rabi* sorghum certified seed producers was observed to be Rs. 289002.73, whereas the per hectare gross return received by grain producers was Rs 132562.36. The profit at cost "C" was Rs 179062.11 and Rs 53716.96 for seed and grain production respectively. As a result, certified seed producers earn more gross income than grain producers. Higher gross income was primarily due to higher seed market prices and productivity (34.77 q/ha) compared to grain production (27.22 q/ha). When compared to grain production, seed production gives higher returns with a higher B:C ratio. In the case of *Rabi* sorghum certified seed production, the B:C ratio at cost "C", was 2.63 whereas in grain production, it was 1.68. The B:C ratio was greater than unity, indicating that seed production in the survey area is economically viable. As a result, the hypothesis has been accepted that *Rabi* sorghum certified seed production is more profitable than grain production.

Table 3: Per hectare Profitability of *Rabi* sorghum Certified Seed and grain production

Sr. No.	Particulars	Seed Production-Size Group				Grain Producers
		Small	Medium	Large	Overall	
1	Gross returns	304519.26	278860.33	283628.58	289002.73	132562.36
2	Costs (Rs.)					
	i) Cost "A"	56809.09	53457.43	50947.06	53737.86	46920.26
	ii) Cost "B"	113546.55	104894.94	101799.70	106747.07	73954.29
	iii) Cost "C"	118770.63	108032.64	103018.59	109940.62	78845.40
3	Profit (Rs.)					
	i) Cost "A"	247710.17	225402.90	232681.52	235264.86	85642.10
	ii) Cost "B"	190972.71	173965.39	181828.88	182255.66	58608.07
	iii) Cost "C"	185748.63	170827.69	180609.99	179062.11	53716.96
4	Production (qtl)					
	A. Main Produce	36.50	32.85	34.39	34.58	27.22
	B. By produce	119.19	121.62	112.44	117.75	90.36
5	Per Qtl cost of production	1253.16	1106.58	1025.76	1131.36	1157.56
6	Output-input ratio					
	i) Cost 'A'	5.36	5.22	5.57	5.38	2.83
	ii) Cost 'B'	2.68	2.66	2.79	2.71	1.79
	iii) Cost 'C'	2.56	2.58	2.75	2.63	1.68

3.3.1 Problems Faced in *Rabi* Sorghum Certified Seed Production

One of the most important aspects of the research is the examination of the constraints or problems that farmers face. Farmers were asked to make a list of their issues. The problems were ranked by the farmer's priority. All of these were organized and screened, and major constraints were ultimately found. As shown in Table 4, ranks are based on RPI value. The high RPI value has given first rank.

The major problem faced by the certified seed producer farmer was labour scarcity at peak season with RPI value 0.98 having rank I followed by Risk of rejection of sorghum seed at the time of grading, processing and testing with RPI value 0.87 (rank II) and Higher wages rates with RPI value 0.29 (rank III), Maintenance of seed plot required more labour, Higher cost of foundation seed, Lack of clear seed strategy programme, Insufficient institutional credit.

Table 4: Problems Faced in *Rabi* Sorghum Certified Seed Production

Sr. No	Problems	Numbers in respective priorities					Total Record responses	RPI	Rank
	Seed Production issues	I	II	III	IV	v			
1	Risk of rejection of sorghum seed at the time of grading, processing and testing	25	28	24	29	23	129	0.87	II
2	Maintenance of seed plot required more labour	10	7	8	7	7	39	0.27	IV
3	Lack of clear seed strategy programme	5	4	6	5	7	27	0.17	VI
4	Higher wages rates	8	10	7	9	11	45	0.29	III
5	Higher cost of foundation seed	6	5	7	6	4	28	0.19	V
6	labour scarcity at peak season	30	28	32	26	31	147	0.98	I
7	Insufficient institutional credit	4	5	3	2	5	19	0.13	VII
8	Lack of technical knowledge	2	3	3	6	2	16	0.10	VIII
	Total	90	90	90	90	90	450		

3.3.2 Problems Faced in *Rabi* Sorghum Grain Production

The major problem faced by the grain producer farmer was labour scarcity at peak season with RPI value 0.66 having rank I followed by Higher wages rates with RPI value 0.63 (rank II) and Higher prices of pesticides with RPI value 0.51 (rank III), Lack of availability of good quality seed, Insufficient institutional credit, Higher cost of fertilizer, Lack of technical knowledge, Non availability of inputs in time.

Table 5: Problems Faced in *Rabi* Sorghum Grain Production

Sr. No	Problems	Numbers in respective priorities					Total Record responses	RPI	Rank
	Grain Production issues	I	II	III	IV	v			
1	Higher wages rates	6	7	6	6	6	31	0.63	II
2	Higher prices of pesticides	5	6	5	4	5	25	0.51	III
3	Lack of availability of good quality seed	4	5	4	3	4	20	0.41	IV
4	Higher cost of fertilizer	2	3	2	1	2	10	0.21	VI
5	Lack of technical knowledge	1	2	1	6	1	11	0.19	VII
6	labour scarcity at peak season	8	4	7	7	8	35	0.66	I
7	Insufficient institutional credit	3	2	3	2	3	13	0.26	V
8	Non availability of inputs in time	1	1	2	1	1	5	0.12	VIII
	Total	30	30	30	30	30	150		

4. Conclusion

As per the above estimated results of *Rabi* sorghum the per hectare cost of cultivation, net returns, gross returns and benefit cost ratio of certified seed production were higher than the grain production. Therefore, it concluded that the economics of certified seed production is profitable than the grain production.

5. Policy implication

1. Certified Seed production of rabi sorghum is more profitable compared to grain production. Therefore, to increase their income, more and more number of farmers should take up seed production in areas where sorghum is grown predominantly, provided with the procedures and other formalities in registering the seed farms.
2. Problem analysis indicated that labour scarcity at peak season was the major constraint as certified seed and grain production is labour intensive. Hence, there is need for farm mechanization which is encourages, particularly during the peak seasons.

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