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Economics of production and processing of Pigeon pea in Karnataka

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Abstract
Pigeon pea is an important legume crop of rainfed agriculture in the semiarid tropics. The present study was conducted to cost of processing of pigeon pea in Karnataka. The study has been carried out based on primary data and the data were collected from the processors of pigeon pea with the help of well-structured questionnaire. Tabular analysis was computed. The study revealed that the total cost of cultivation was ₹35,166.18 per hectare. The total variable cost formed the maximum share with 69.20 per cent. Among variable cost, the highest share contributed was the cost of human labour with 19.91 per cent which was due to involvement of household farmers and labours in major cultivation practices of pigeon pea. The total processing cost was recorded as ₹66,316.50 per ton. Among total processing cost, total variable cost contributes a share of 99.09 per cent with worth of ₹65,712.10 per ton and fixed cost contributes a share of 0.91 per cent with worth of ₹604.35 per ton. The total gross returns for the processing unit was ₹72,768.13 per ton and the net return for the processing unit was ₹6,451.63 per ton. The net present value of the unit was found to be ₹11.52 lakhs at the end of economic life of project. The economic life of the project was appraisal to be 15 years. The internal rate of return was computed at 12 per cent and it was found to be 35.85 per cent which was higher than the present bank rate.

Keywords: Economics, Pigeon pea, Karnataka

Introduction
Pigeon pea is an important legume crop of rainfed agriculture in the semiarid tropics. It is the primary accompaniment to rice or roti (flat bread) and has the status of staple diet throughout the length and breadth of India. Pigeon peas contain high levels of protein and the important amino acids methionine, lysine, and tryptophan. Pigeon peas are cultivated in more than 25 tropical and sub-tropical countries, either as a sole crop or intermixed with cereals, such as sorghum, pearl millet or maize or with other legumes, such as peanuts. Being a legume capable of symbiosis with Rhizobia, the bacteria associated with the pigeon pea enrich soils through symbiotic nitrogen fixation. Pigeon peas are very drought-resistant and can be grown in areas with less than 650 mm annual rainfall. Pigeon peas are both a food crop (dried peas, flour, or green vegetable peas) and a forage/cover crop. In combination with cereals, pigeon peas make a well-balanced meal and hence are favoured by nutritionists as an essential ingredient for balanced diets. The dried peas may be sprouted briefly, and then cooked, for a flavor different from the green or dried peas. Sprouting also enhances the digestibility of dried pigeon peas via the reduction of indigestible sugars that would otherwise remain in the cooked dried peas. The nutritional value of pigeon peas per 100 g is carbohydrates 23.88g, dietary fiber 5.1g, fat 1.64g, protein 7.2 g, thiamine (B_1) 0.4 mg, riboflavin (B_2), calcium 42 mg, iron 1.6 mg and potassium 552 mg.

World production of pigeon peas is 4.49 million tons (2017-18). About 63 per cent of this production comes from India. The total area under pigeon pea is 5.4 million hectares. India accounts for 72 per cent of area grown to pigeon pea *i.e.* 3.9 million hectares. In India, the total area under pigeon pea in 2018-19 was 4,549.54 thousand hectares, which provided about 3,315.44 thousand tonnes of pigeon pea with a productivity of 7,28.7 kg/ha (Anonymous, 2020) [1]. The total area under pigeon pea was mainly contributed by Karnataka with 1,482.95 thousand hectares, Maharashtra with 1,261.30 thousand hectares, Telangana with 296 thousand hectares. From this area, 3,315 thousand metric tonnes of pigeon pea was produced in 2018-19. During this period, productivity of pigeon pea was recorded as 728.7 kg/ha with highest in Bihar (1,852 kg/ha), Kerala (1,674 kg/ha) and West Bengal (1,543 kg/ha).

The total area under pigeon pea in Karnataka was mainly contributed by Kalaburagi with 6.13 thousand hectares followed by Vijayapura with 5.21 thousand hectares.

From this area, 947.61 thousand metric tonnes of pigeon pea was produced in 2018-19. During this period, productivity of pigeon pea was recorded as 639 kg/ha with highest in Davangere (1,040 kg/ha). In this paper, an attempt is made to study the cost of cultivation and processing of pigeon pea in Karnataka.

Objective of the study

The specific objective of the study is to estimate the cost of cultivation and cost processing of pigeon pea in Karnataka.

Data base and Research Methodology

Based on the highest area under pigeon pea in Karnataka, the districts like Kalaburagi and Vijayapur were selected for the study. 90 farmers and 3 processing units were selected randomly from the study area. Primary data were collected through personal interviews from the farmers, processors with the help of a pre-tested and well-structured schedule. Samples were selected by random sampling method in the agricultural year 2020-21. Secondary data related to procurement details for the period from 2007-08 to 2019-20 was selected from the processing units.

Tabular presentation technique

Tabular analysis was adopted to study the economics of pigeon pea cultivation and processing. For this analysis, the data pertaining to cost of cultivation, cost of processing, procurement of raw materials details was selected and arranged in a systematic manner to describe the economics of pigeon pea cultivation and processing.

Result and Discussion

Cost and Returns of pigeon pea cultivation

The cost and returns structure of pigeon pea cultivation was discussed in table 1. The study revealed that the total cost of cultivation was ₹35,166.18 per hectare. The total variable cost formed the maximum share with 69.20 per cent. Among variable cost, major cost was towards wages for human labour with ₹7,000.00 (19.91%) followed by plant protection chemicals with ₹3,962.50 (11.27 %). The other variables shared its contribution towards variable cost like seeds was ₹1,545.00 per hectare (4.39 %), farm yard manure was ₹1,800.00 (5.12 %), the cost of chemical fertilizers was ₹2,625.00 (7.46 %), wages for bullock labour ₹3,000 (8.53 %), wages for machine labour ₹2,500 (7.11 %) and other miscellaneous cost was ₹310.00 (0.88 %).

The fixed cost constituted almost per cent of total costs, with the majority of the share by means of rental value of land with the amount ₹9,000.00 (25.59 %) followed by depreciation cost was ₹797.00 (2.19 %) and the land revenue was ₹50.00 (0.14 %). The total yield of pigeon pea obtained was 12.20 quintals with the farm harvest price of the main product was ₹5,700 per quintal. Total returns obtained from the sale of the main product were ₹69,540.00 and the net return obtained in pigeon pea cultivation was ₹34,373.82 per hectare.

In the cost of cultivation, the highest share contributed was the cost of human labour with 19.91 per cent which was due to involvement of household farmers and labours in major cultivation practices of pigeon pea followed by the cost of chemical fertilizers with 7.46 per cent which is due to the impact of green revolution to increase the yield of the crop to meet the demand of the population and machine labour charges with 7.11 per cent respectively which is due to the increased mechanized operation in agricultural package of practices. The findings were similar to Uma and Praveena (2019) [18] which concluded that the highest benefit cost ratio for the integrated pest management adopted farmers when compared to the non-adopted farmers. Similar results were observed by Surya and Saravana Kumar (2019) which concluded that compare to the conventional technology, the other improved method found more benefitted.

Procurement of pigeon pea processing units

Procurement management of pigeon pea describes about the quantity of raw materials procured from the markets and its value for the period from 2007-08 to 2019-20 has been tabulated and analysed to estimate the growth rate. Table 2 shows the procurement management of pigeon pea raw material by the selected processing units. The quantity of raw materials has been increased at the growth rate of 3.84 per cent over the years from 1,690 MT to 2,938 MT. The value of raw materials has been increased at the growth rate of 5.48 per cent over the years from ₹28,318 per MT to ₹57,493 per MT. The procurement of raw materials was increased gradually because of increased demand of tur dal for consumption purpose and the price of the product was increased in market which proves the good performance of the processing units over the years. Similar results were observed by Israel *et al.* (2019) [7] concluded that the increased demand for the processed tamarind by the traders was the major reason for the impressive growth of procurement of raw materials and similar observations has been found in Mula *et al.* (2015).

Capacity utilization pattern of pigeon pea processing units

Table 3 represents the capacity utilization in selected pigeon pea processing units which describes about the processing unit in brief manner. The initial installed capacity was 19.21 MT per day, having the number of working days 260 days per annum, number of shifts were 1 per day, duration of shift was 8 hours, total annual installed capacity was 4,994.60 MT, quantity processed per day 11.26 MT. But actual annual quantity processed was 2,927.60 MT and the capacity utilization was 58.62 per cent. In this result, the capacity utilization is approximately 60 per cent which is due to unavailability of raw materials throughout the year in the required quantity, high cost of raw material during off season period in the market and sale of the processing product is confined to limited regions. This observation was concurrent to the findings of Israel *et al.* (2019) [8] and Malhotra and Vashishtha (2007).

Cost and returns of pigeon pea processing units

Cost of pigeon pea in the processing units were estimated and represented in the table 4. The total processing cost was recorded as ₹66,316.50 per ton. Among total processing cost, total variable cost contributes a share of 99.09 per cent with worth of ₹65,712.10 per ton and fixed cost contributes a share of 0.91 per cent with worth of ₹604.35 per ton. Among total variable cost, the highest contribution was raw material cost with the amount of ₹57,000.00 (85.95%), followed by commission charges with the amount of ₹1,742.33 (2.63 %), transportation charges with ₹555.74 (0.84 %). The other charges in the variable cost includes cost of gunny bags with ₹670.45 per ton, electricity and water charges with ₹365.91, the loading and unloading charges with ₹100 per ton, wages for labour with ₹250.34, repairs and maintenance with ₹186.36 and miscellaneous cost with ₹538.70. The following cost constitutes the contribution towards fixed cost *i.e.* depreciation on building with ₹17.89, depreciation on machinery with ₹39.27, insurance and license fee with ₹169.32 and salary to permanent employees with ₹437.73. The similar findings were recognized from Israel *et al.* (2019) [9] which revealed that the variable cost was high in their

study, it is because of the laborious work involved in processing the product and suggested to upgrade the machinery in the unit.

Returns of pigeon pea in the selected processing units were tabulated and represented in the table 5. The final processed product was categorized into different grades and made available for the sale. Based on the different grade the price of the product has been finalized *i.e.* out of 100 kg of pigeon pea raw material, 83.34 kg of tur dal and 16.66 kg of chunni and bhusa was obtained. Out of 83.34 kg of tur dal, the grade 1 tur dal contribute about 60.67 kg with the price of ₹88.43 per kg, followed by grade 2 tur dal contributes 12.00 kg with the price of ₹80.58 per kg and grade 3 tur dal contributes 10.67 kg with the price of ₹64.19 per kg. The price of the by-product chunni and bhusa was ₹15.60 per kg. The total returns obtained by the main product was ₹70,169.17 per ton and from the by product was ₹2,598.96 per ton. The total gross returns for the processing unit was ₹72,768.13 per ton and the net return for the processing unit was ₹6,451.63 per ton. Due to improved mechanisation, it is noted that the income of the units is gradually increasing. A similar finding has been observed in Israel *et al.* (2019) [10], described cost and returns of tamarind juice processing units.

Financial feasibility of processing units in the study area

The evaluation of the financial feasibility of pigeon pea and ragi processing units were worked out and the following details were represented in the table such as net present value, benefit cost ratio, internal rate of return and payback period which was calculated by using cash out flow, cash inflow and net discounted cash flow and discount factor of 12 per cent was considered for the evaluation.

Table 6 describes about the financial feasibility status of the pigeon pea processing unit. The results revealed that the net present value of the unit was found to be ₹11.52 lakhs at the end of economic life of project. The economic life of the project was appraisal to be 15 years. The internal rate of return was computed at 12 per cent and it was found to be 35.85 per cent which was higher than the present bank rate. The benefit cost ratio was assessed to be 1.10, which means that for investing a rupee, the investor would get profit of ₹1.10. It also infers that benefit cost ratio of the processing unit was more than one and the payback period was found to be 4.2 years which shows that the unit was economically feasible. Thus, the results of the study justify the decision of a farmer to take up of processing units was a worthy and profitable investment. A similar finding has been observed in Israel *et al.* (2019) [11], described financial feasibility of tamarind juice processing units in Karnataka.

Table 1: Cost and returns of pigeon pea cultivation (₹ per hectare)

Sl. No.	Particulars	Quantity	Per Unit Cost	Total Cost	Per cent to Total Cost
I	Variable cost				
1	Human labour (man days)	35.00	200	7,000.00	19.91
2	Bullock labour (pair days)	2.50	1,200	3,000.00	8.53
3	Machine labour (hours)	2.50	1,000	2,500.00	7.11
4	Seeds (kg)	15.00	103	1,545.00	4.39
5	FYM (tractor)	1.50	1,200	1,800.00	5.12
6	Chemical fertilizers	-	-	2,625.00	7.46
7	Plant protection chemicals	-	-	3,962.50	11.27
8	Miscellaneous cost	-	-	310.00	0.88
9	Interest on working capital @ 7 per cent per annum	-	-	1,591.98	4.53
	Total Variable Cost		-	24,334.48	69.20
II	Fixed Cost				
1	Depreciation cost	-	-	797.00	2.27
2	Land Revenue	-	-	50.00	0.14
3	Interest on fixed capital @ 10 per cent per annum	-	-	984.70	2.80
4	Rental value of owned land	-	-	9,000.00	25.59
	Total Fixed Cost			10,831.70	30.80
IV	Total cost of cultivation	-	-	35,166.18	100.00
V	Yield: (qtl/ha)	12.20	-	-	-
	A: Farm harvest price of the main product(₹ /qtl)	-	5,700	69,540.00	-
VI	Gross income	-	-	69,540.00	-
VII	Net Income(VI-IV)	-	-	34,373.82	-

Table 2: Procurement management of pigeon pea processing unit

Sl. No.	Years	Quantity of raw material (MT)	Value of raw material cost (₹/MT)
1	2007-08	1,690	28,318
2	2008-09	1,560	46,949
3	2009-10	1,924	33,611
4	2010-11	2,132	35,156
5	2011-12	2,210	38,728
6	2012-13	2,080	42,009
7	2013-14	2,106	46,825
8	2014-15	1,872	89,951
9	2015-16	1,950	62,577
10	2016-17	2,314	40,634
11	2017-18	2,470	43,632
12	2018-19	2,652	73,858
13	2019-20	2,938	57,493
	Average	2,146	49,211
	CAGR (%)	3.84	5.48

Table 3: Capacity utilization pattern of pigeon pea processing unit

Sl. No.	Particulars	Units	Utilization
1	Installed capacity	MT/ days	19.21
2	Quantity processed	Per day (MT)	11.26
3	Number of working days	Days per annum	260
4	Number of shifts	Per day	1
5	Duration of shift	Hours	8.33
6	Annual installed capacity	MT	4,994.60
7	Annual quantity processed	MT	2,927.60
8	Capacity utilization	Per cent	58.62

Table 4: Processing cost of pigeon pea

Sl. No.	Particulars	Cost (₹/ton)	Per cent to total cost
A	**Variable Cost**		
1	Raw material cost	57,000.00	85.95
2	Gunny bag charges	670.45	1.01
3	Electricity and water charges	365.91	0.55
4	Loading and unloading charges	100.00	0.15
5	Transportation charges	555.74	0.84
6	Wages for labour	250.34	0.38
7	Telephone charges	3.35	0.01
8	Commission charges	1,742.33	2.63
9	Repair and maintenance	186.36	0.28
10	Miscellaneous	538.70	0.81
11	Interest on working capital at 7 per cent per annum	4,298.92	6.48
	Total variable cost	65,712.10	99.09
B	**Fixed Cost**		
1	Depreciation on building	17.89	0.03
2	Depreciation on machinery	39.27	0.06
3	Insurance and license fee	54.57	0.08
4	Salary to permanent employees	437.73	0.66
5	Interest on fixed capital at 10 per cent per annum	54.94	0.08
	Total fixed cost	604.35	0.91
C	Total processing cost (A+B)	66,316.50	100.00

Table 5: Returns of pigeon pea processing

Sl. No.	Particulars	Unit	Price (₹/kg)	Recovery percentage	Total (₹/ ton)
D	**Main product**				
	Dal (Grade – 1)	₹	88.43	60.67	53,650.50
	Dal (Grade – 2)	₹	80.58	12.00	9,669.60
	Dal (Grade – 3)	₹	64.19	10.67	6,849.07
	Sub total	₹	-	83.34	70,169.17
E	**By product**				
	Chunni + Bhusa	₹	15.6	16.66	2,598.96
F	Total (D+ E)	₹	-	100	72,768.13
	Gross returns	₹	-	-	72,768.13
	Net returns (F-C)	₹	-	-	6,451.63

Table 6: Financial feasibility of pigeon pea processing unit in the study area

Sl. No.	Particulars	Units	Pigeon pea
1	Net present value (NPV)	(₹ Lakhs)	11.52
2	Internal rate of return (IRR)	%	35.85
3	B:C ratio	₹	1.10
4	Payback period	Years	4.2

Conclusion

This study has analysed cost of processing of pigeon pea processing units. The total cost of cultivation was ₹35,166.18 per hectare. The total variable cost formed the maximum share with 69.20 per cent. Among variable cost, the highest share contributed was the cost of human labour with 19.91 per cent which was due to involvement of household farmers and labours in major cultivation practices of pigeon pea. The total processing cost was recorded as ₹66,316.50 per ton. Among total processing cost, total variable cost contributes a share of 99.09 per cent with worth of ₹65,712.10 per ton and fixed cost contributes a share of 0.91 per cent with worth of ₹604.35 per ton. The total gross returns for the processing unit was ₹72,768.13 per ton and the net return for the processing unit was ₹6,451.63 per ton. The net present value of the unit was found to be ₹11.52 lakhs at the end of economic life of project. The economic life of the project was appraisal to be 15 years. The internal rate of return was computed at 12 per

cent and it was found to be 35.85 per cent which was higher than the present bank rate. The value addition in pigeon pea was found to be a profitable venture and high benefit cost was realized for the processed products. Hence, the entrepreneurs can take up processing activities as a valuable and profitable business venture. In the cost of cultivation of pigeon pea, the variable cost accounted 69.20 per cent of the total cost in which the wages for human labour formed the maximum share of 19.91 per cent. Lack of labour and high cost of labour was the major problem in pigeon pea cultivation. Hence increase in mechanisation may help to perform the operation including harvesting.

References

1. Anonymous. Agricultural Statistics at a Glance. Directorate of Economics and Statistics. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India 2020.
2. Amin R, Kachroo J, Bhat A, Kachroo D, Singh SP, Isher AK. Status of Growth in Area, Production and Productivity of Major Crops in Jammu Province of J&K State. Indian Journal of Agricultural Research 2017;51(4):333-338.
3. Babu BNP, Rudragouda CS, Reddy YBV. Trends in Area, Production and Productivity of Coffee across the Major Coffee Growing States in India. International Journal of Agriculture Sciences 2019;11(4):7896-7900.
4. Cuddy JDA, Della Valle PA. Measuring the Instability of Time Series Data, Oxford Bulletin of Economics and Statistics 1978;40(10):79-84.
5. Danish F, Amin R. Status of Growth in Area, Production and Productivity of Major Crops in Jammu Province of J&K State. International Journal of Economics, Commerce and Research 2017;7(3):1-12.
6. Dasyam R, Bhattacharyya B, Mishra P. Statistical Modeling To Area, Production and Yield of Potato in West Bengal. International Journal of Agriculture Sciences 2016;8(53):2782-2787.
7. Israel KS. Economics of tamarind seed powder processing unit in Karnataka. Int. J. of Com. and Bus. Manage 2019;12(2):67-72.
8. Israel KS, Murthy C, Hosamani BPDR. Value addition of tamarind products in Karnataka. J. of Pharmacogn. and Phytochem 2019;8(6):726-730.
9. Israel KS, Murthy C, Patil BL, Hosamani RM. Economics of tamarind concentration and juice processing unit in Karnataka. J. of Pharmacogn. and Phytochem 2019;8(5):916-921.
10. Israel KS, Murthy C, Patil BL, Hosamani RM. Study the trend in area, production and productivity of tamarind. J. of Pharmacogn. and Phytochem 2019;8(5):283-289.
11. Israel KS, Murthy C, Patil BL, Hosamani RM. Management of tamarind dried processing unit in Karnataka. J. of Pharmacogn. and Phytochem 2019;8(5):911-915.
12. Kumawat DK, Kumawat RC, Jheeba SS. Growth Rates and Instability in Area, Production and Productivity of Fenugreek in the State of Rajasthan. Annals of Agricultural Research 2016,37(4).
13. Mech A. An analysis of growth trend, instability and determinants of rice production in Assam. Indian Journal of Agricultural Research 2017;51(4):355-359.
14. Misra CM. Trends in area production and productivity of groundnut in India: Issues & challenges. Journal of Research in Agriculture and Animal Science 2017;4(7):1-6.
15. Misra CM. Trends in area production and productivity of groundnut in Uttar Pradesh: Future business implications. International Journal of Business and Management Invention 2017;6(2):65-70.
16. Naik RB, Navadkar DS, Amale AJ. Trends in Arrivals and Prices of Chickpea in Western Maharashtra. Agricultural Situation in India 2015;LXXII(1):5.
17. Panwar S, Kumar N, Kumar A, Paul R, Sarkar SK. Analysis of Trend in Area, Production and Productivity of Okra (Abelmoschus Esculentus) in India. Current Horticulture 2019;7(2):56-58.
18. Parthiban JJ, Rajesh R, Sundar GS. Trend Analysis of Area, Production and Productivity of Groundnut and Estimation of Cost of Production in Tiruchirappalli District. International Journal of Agriculture Sciences 2019;11(10):8488-8490.
19. Sharma, Amod. Trends of area, production and productivity of major fruit crops in North Eastern Region in India. Economic Affairs 2012;57(3):259-276.
20. Sharma, Amaod. Trends in area, production and productivity of food grain crops: an overview. Economic Affairs 2013;58(1):1-12.