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Business analysis of dal mill (Krishi Sahyog farmers producer company Ltd.)

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Abstract
The present study undertakes a comprehensive economic analysis of pigeon pea (*Cajanus cajan*) cultivation and its subsequent processing under a Farmer Producer Company (FPC) framework, specifically examining the Krishi Sahyog Farmers Producer Company Ltd., situated in Amravati district of Maharashtra. With pigeon pea being a drought-tolerant, protein-rich pulse crop critical to Indian food security, this study aims to evaluate both farm-level production economics and post-harvest value addition processes to assess financial viability and operational efficiency within an organized producer structure. Primary and secondary data were collected from 60 member farmers and processing unit stakeholders. The input utilization pattern per hectare included 20.9 person-days of hired labour, 11.16 days of family labour, 5.98 bullock-pair days, and 4.91 hours of machine use. Inputs such as 12.74 qt of seed, 3.9 tonnes of manure, and macro-nutrients (N, P, K) were documented, with total cultivation cost (Cost C) computed at ₹78,322.21/ha and a benefit-cost ratio (B:C) of 1.54 indicating a 54% return on investment, thus confirming the economic sustainability of pigeon pea farming. For the processing unit, a detailed cost analysis revealed total fixed costs of ₹4,48,800 and variable costs of ₹1,30,75,242, with the latter dominated by raw material procurement (91.78%). The processing cost per quintal stood at ₹6,762.02, with a total cost incurred per quintal (including marketing and raw material) reaching ₹13,892.02. With a recovery rate of 62.5%, the mill produced 1,250 qt of Tur dal from 2,000 qt of raw pigeon pea, achieving a gross return of ₹1.62 crore and net returns of ₹27.26 lakh, yielding a processing B:C ratio of 1.20.
Constraints identified include pest infestation, price fluctuation, inadequate cleaning and drying, and lack of skilled labour, which impact both efficiency and profitability. These findings underscore the critical role of FPCs in enhancing value-chain integration, reducing transaction costs, and improving rural livelihoods. The study concludes that strategic support for FPC-led infrastructure, training, and market linkages can significantly elevate the socio-economic outcomes for smallholder pulse producers in India.

Keywords: Pigeon pea, dal mill, farmer producer company (FPC), processing cost, cost of cultivation, benefit-cost ratio, Krishi Sahyog FPC, value addition, rural entrepreneurship

1. Introduction
India's agriculture sector, largely dominated by small and marginal farmers, has been witnessing structural changes. To empower farmers and improve their incomes, the concept of Farmer Producer Companies (FPCs) has been introduced. FPCs are legally recognized entities formed by farmers to collectively undertake activities related to input procurement, value addition, processing, and marketing. These organizations help in improving market access, reducing transaction costs, and enhancing farmer welfare through shared infrastructure and services. Among agricultural products, pulses play a vital role due to their high protein content and nitrogen-fixing ability, which improves soil fertility. Tur (pigeon pea) is a major pulse crop cultivated extensively in India, particularly in Maharashtra, which is the leading state in tur production. Pigeon pea is drought-tolerant, rich in protein, and commonly processed into "dal," a staple food in Indian households. Krishi Sahyog Farmers Producer Company Ltd., established in 2019 in Asegaon Purna, Amravati, Maharashtra, exemplifies the role of FPCs in enhancing value through processing. The company operates a dal mill and seed processing unit, supporting over 600 farmer-members. It provides services like procurement, processing, marketing, and value addition of tur dal, ensuring better prices and market access. This study focuses on understanding the economics and operational

effectiveness of such FPCs, specifically in the pigeon pea sector. It aims to analyze the cost of cultivation and processing, break-even points, and challenges faced by the owner. The findings will contribute to policy recommendations for strengthening FPCs and improving sustainability and profitability in pulse production.

2. Objectives

- To work out cost of cultivation of pigeon pea of selected of farmer member.
- To work out cost of processing of pigeon pea.
- To identify constraints faced of processed product of pigeon pea.

3. Material and Methods

This study was conducted to analyze the economic aspects of pigeon pea (tur dal) cultivation, and processing by Krishi Sahog Farmers Producer Company Ltd. in Asegaon Purna, Tq. Chandur Bazar, Dist. Amravati (Maharashtra), during the financial year 2024 25. The aim was to assess cost structures, returns, processing cost and constraints in pigeon pea processing under an FPC framework.

3.1 Area of Study

The research was undertaken at the Krishi Sahyog FPC, which specializes in pigeon pea processing (dal milling). The unit is situated along Amravati Partawada Road near Purna Nagar in Asegaon Purna.

3.2 Period of Study

The study focused on data from the financial year **2024-25**.

3.3 Source of Data

Both **primary** and **secondary data** sources were utilized:

- **Primary Data:** Collected via personal interviews using pre-tested schedules with FPC officials, supervisors, and member farmers regarding production, costs, marketing, and constraints.
- **Secondary Data:** Gathered from company reports, published documents, websites, and government records.

Sample Size

The study selected three tehsils in Amravati district Partawada, Chandur Bazar, and Achalpur. From each tehsil, 20 FPC-member farmers were chosen, totalling 60 farmers. Additionally, a representative APMC, vendors, and processors were selected based on availability.

Analytical Tools

Standard cost concepts were applied:

- **Cost A:** Hired labour (human, bullock, machine), seed, manure, fertilizers, plant protection, repairs, incidental charges, working capital, and interest on working capital (6% annually).
- **Cost B** = Cost A + Interest on Fixed Capital (10% annually) + Rental Value of Land
- **Cost C** = Cost B + Imputed value of family labour

1) Fixed cost

The fixed cost includes the data regarding the cost of machinery,

building, land, furniture, wages of payment employed abour, salary of staff, electricity charges, taxes, etc. collected from selected unit.

2) Variable Cost: The variable cost consists of expenditure on purchase of raw material, wages of casual labour, electricity, stationery, repair and maintenance of machinery, etc.

3) Total Cost

Total cost of processing comprised of the total fixed cost; total variable cost was calculated by adding these costs together

Total cost = Fixed cost + Variable cost constraints Faced

The constraints encountered during the processing of pigeon pea were identified through personal interviews with the FPC owner and staff. These included price fluctuations, infrastructural limitations, and climatic uncertainties affecting quality and quantity of processed dal.

Table 1: per hectare input utilization pattern of pigeon pea

Sr. no	Particular		Units	Physical Units
1	Hired human labour	Male	Days	9.01
		Female	Days	11.89
2	Family labour	Male	Days	5.1
		Female	Days	6.06
3	Bullock pair		Days	5.98
4	Machinery		Hours	4.91
5	Seed		qt	12.74
6	Manure		Tones	3.9
7	**Fertilizers**			
a	N		Kg	25.84
b	P		Kg	27.85
c	K		Kg	10.49
8	Plant Protection		Rs	2998.49
9	Irrigation		Rs	1020.76

Table 1. below presents the per hectare input utilization pattern for pigeon pea cultivation. It includes both human and animal labour, machinery usage, and input materials like seed, manure, fertilizers, and plant protection. On average, 9.01 male and 11.89 female hired labour days are used, supported by family labour of 5.1 male and 6.06 female days. Bullock pairs are employed for 5.98 days, and machinery is used for 4.91 hours per hectare. Input consumption includes 12.74 quintals of seed and 3.9 tonnes of manure. Fertilizer application consists of 25.84 kg of Nitrogen (N), 27.85 kg of Phosphorus (P), and 10.49 kg of Potassium (K). Additionally, Rs. 2,998.49 is spent on plant protection and Rs. 1,020.76 on irrigation. This pattern reflects the typical resource use intensity for effective pigeon pea production.

Table 2: Cost of Cultivation of pigeon pea

Sr.no	Particulars		Unit	Input	Cost per Input (Rs.)	Total Cost (Rs./ha)	Percentage To total Cost (%)
1	Hired human labour	Male	Days	9.01	350	3153.5	4.03
		Female	Days	11.89	250	2972.5	3.80
		Total		20.9	600	12540	16.01
2	Bullock Pair	Hired	Days	3.95	300	1185.00	1.51
		Owned	Days	2.03	300	609.00	0.78
		Total		5.98	600	3588.00	4.58
3	Machine Labour	Hired	Hours	1.52	930	1413.60	1.80
		Owned	Hours	3.39	1000	3390.00	4.33
		Total		4.91	1930	9476.3	12.10
4	Seed		qt	12.74	200	2548	3.25
5	Manure		Ton	3.9	1500	5850	7.47
6	Fertilizers	N	KG	25.84	35	904.4	1.15
		P	KG	27.85	55	1531.75	1.96
		K	KG	10.49	40.5	424.845	0.54
		Total		64.18	130.5	8375.49	10.69
7	Irrigation Charges		Rs.			1020.76	1.30
8	Plant Protection		Rs.			2998.49	3.83
8	Incidental Charges		Rs.			612.52	0.78
9	Repairing Charges		Rs.			480.86	0.61
10	Working Capital		Rs.			44942.42	57.38
11	Interest on Working Capital @7% per ha		Rs.			3145.97	4.02
12	Depreciation		Rs.			807.71	1.03
13	Land Revenue		Rs.			199.94	0.26
14	Cost A		Rs.			49096.04	62.68
15	Rental Value of Land		Rs.			21369.44	27.28
17	Interest on Fix Capital@ 10%		Rs.			4556.73	5.82
18	Cost B		Rs.			75022.21	95.79
21	Family Labour -	Male	Days	5.1	350	1785	2.28
		Female	Days	6.06	250	1515	1.93
		Total	Rs.	11.16	600	6696	8.55
22	Cost C		Rs			78322.21	100.00
	Total yield						
23	A) Main produce		Rs	18.46	6180	114082.80	
24	B) Bye produce		Rs	34.02	200	6804.00	
	Gross Return			52.48	6380	120886.80	
25	per qt Cost of Production		Rs			4242.81	
26	B: C Ratio					1.54	

Table 2. Represent a detailed econometric evaluation of the cost structure associated with pigeon pea (*Cajanus cajan)* cultivation on a per hectare basis. The analysis encompasses both direct operational inputs and indirect, imputed costs to reflect the comprehensive economic burden borne by cultivators.

Hired human labour, comprising both male and female workdays, accounts for 16.01% of the total cultivation cost, thereby underscoring the labour-intensive nature of pigeon pea farming operations. The integration of bullock labour (4.58%) suggests partial reliance on traditional draught power, likely influenced by regional agro-ecological conditions and resource availability. In contrast, mechanization including both hired and owned machine labour constitutes 12.10%, indicating a moderate degree of mechanization utilized during critical field operations such as ploughing, sowing, and harvesting.

Expenditures on biological and chemical soil fertility inputs are notable, with seeds, farmyard manure, and macro-nutrient fertilizers (Nitrogen, Phosphorus, Potassium) collectively representing approximately 21.41% of total costs. This highlights the agronomic emphasis on soil fertility management and nutrient optimization. Water resource allocation and phytosanitary measures are evident through irrigation costs (1.30%) and plant protection chemicals (3.83%), demonstrating efforts to mitigate abiotic and biotic stress factors.

Further cost refinement is achieved through inclusion of incidental expenses, repair costs, and depreciation, enhancing the accuracy of financial estimation. Working capital, comprising 57.38% of total cost, is the predominant financial outlay, with an additional 7% interest rate applied, mirroring real-world capital borrowing scenarios.

The computation of Cost B integrates land revenue, rental value of land, and interest on fixed capital, summing to ₹75,022.21/ha, and accounting for 95.79% of total expenditure. The inclusion of imputed family labour, valued at ₹6,696 (8.55%), results in the final Cost C of ₹78,322.21/ha. With a gross return of ₹1, 20,886.80/ha, the cost of production per quintal is derived as ₹4,242.81, yielding a benefit-cost ratio (B: C) of 1.54. This ratio indicates a favourable economic outcome, with returns exceeding investment by 54%, validating the economic viab lity and sustainability of pigeon pea cultivation under the given agronomic and market conditions.

Table 3: Total fixed cost of processing unit

Sr.no	Particular	Amounts	Percentage %
1	Depreciation of construction @5 %	200000	44.56
2	Depreciation of Machinery @10 %	150000	33.42
3	Depreciation of furniture @10 %	9000	2.01
4	Depreciation of Appliances and fixture @10%	35800	7.98
5	Depreciation of Vehicles @10%	54000	12.03
	Total Fixed cost	448800	100.00

Table 3. Total fixed cost of the processing unit comprises various depreciation expenses associated with essential infrastructure and equipment. As detailed in the table, the highest share of fixed cost (44.56%) is attributed to the depreciation of construction, followed by machinery depreciation at 33.42%. Vehicles and appliances account for 12.03% and 7.98%, respectively, while furniture contributes a smaller share of 2.01%. These fixed costs, totaling ₹4,48,800 annually, reflect the long-term capital investment required for the sustainable operation of the processing unit.

Table 4: Total Variable cost for processing of Pigeon pea

sr.no	Particular	Amounts	percentage %
1	Raw material(qt)	12000000	91.78
2	labo r charges (Day)	440000	3.37
3	electricity charges (Rs)	325600	2.49
4	Transportation charges (Rs)	113320	0.87
5	packaging charges (Rs)	96322	0.74
6	Maintenances charges (Rs)	100000	0.76
	Total variable cost	13075242	100.00

Table 4. presents the total variable cost involved in the processing of pigeon pea. The majority of the variable cost (91.78%) is attributed to the procurement of raw material, highlighting its critical role in overall expenditure. Labour charges contribute 3.37%, while electricity costs account for 2.49% of the total. Additional expenses such as transportation (0.87%), packaging (0.74%), and maintenance (0.76%) make up the remaining share. The total variable cost amounts to ₹1,30,75,242, reflecting the operational expenses directly linked to the volume of production.

Table 5: Total cost of pigeon pea processing unit

sr no	particular	Amounts	Percentage (%)
1	Fixed cost	448800	3.32
2	Variable cost	13075242	96.68
	Total cost	13524042	100

Table 5. provides a breakdown of the total cost incurred in operating a pigeon pea processing unit. It reveals that variable costs dominate the expenditure, accounting for 96.68% of the total, primarily due to raw material and labour expenses. In contrast, fixed costs constitute only 3.32% of the total cost, reflecting capital investments in infrastructure and equipment depreciation. The overall cost of processing amounts to ₹1,35,24,042, emphasizing the high dependence on variable inputs in the pigeon pea value chain.

Table 6: Cost of processing of pigeon pea

Sr. No.	Particulars	Amount (Rs.)
1	Total fixed cost	448800
2	Total variable cost	13075242
3	Total cost	13524042
4	Quantity processed per day in qt	10
5	Number of working days in a year	200
6	Quantity of pigeon pea processed per Season (qt)	2000
7	Fixed cost per qt	224.4
8	Variable cost per qt	6537.62
9	Processing cost per qt (7+8)	6762.02
10	Marketing cost per qt	1130.000
11	Cost of raw material per qt	6000
12	Total cost incurred by dall mill owner (9+10+11)	13892.02
13	raw material	2000
a)	Recovery (62.5%)	750
b)	Main produce (dall) qt	1250
14	Value of	
a)	pigeon pea @ / qt	13000
b)	Total Revenu (Gross returns)	16250000
c)	Net returns	2725958
	Benefit cost ratio	1.20

Table 6. Outlines the comprehensive cost structure and profitability analysis of pigeon pea processing. The total cost incurred by the dal mill owner is ₹13,892.02 per quintal, which includes fixed and variable processing costs, mark ting expenses, and the cost of raw material. With a processing volume of 2,000 quintals per season and a recovery rate of 62.5%, the mill yields 1,250 quintals of dal. The gross return from the sale of processed dal at ₹13,000 per quintal amounts to ₹1,62,50,000. After deducting total costs, the net return stands at ₹27,25,958, resulting in a benefit-cost ratio of 1.20. This indicates that the pigeon pea processing unit is economically viable, generating a reasonable profit over operational expenses.

Table 7: Recovery and Returns of pigeon pea processing

sr.no	Particular	Amounts	percentage %
1	Main product Tur dall of (qt)	1250	62.5
2	Husk (qt)	400	20
3	Tukadi Bran, Fine husk (qt)	250	12.5
4	Dust loss (qt)	100	5
	Total	2000	100

Table 7. Presents the recovery and returns from the processing of 2,000 quintals of pigeon pea. The primary output is Tur dal, which constitutes 62.5% (1,250 qt) of the total processed quantity, reflecting the efficiency of the milling process. By-products include husk (20%), tukadi bran and fine husk (12.5%), and dust loss (5%). This recovery pattern highlights the proportion of usable produce and by-products, which can be further utilized or sold, contributing to the overall profitability and resource optimization of the processing unit.

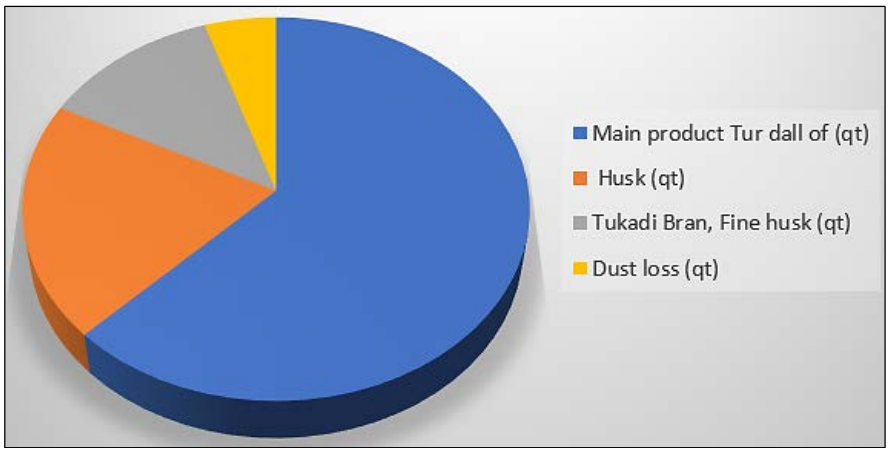

Fig 1: Recovery and Return Analysis

Table 8: Constraints faced by owner of processed product of pigeon pea

Sr no.	Particular	Ranking of dall mill owner
1	Pest infestation	I
2	Price fluctuation	II
3	Improper drying and cleaning	III
4	Lack of skilled labour	IV
5	Limited market Acce s	V
6	Packaging issues	VI
7	Lack of storage facility	VII
8	Adequate supply of funds for processing	VIII

The 9. Represent analysis of operational constraints in pigeon pea dal milling units reveals a hierarchy of critical challenges impacting efficiency and profitability. Pest infestation emerges as the most severe constraint, posing a significant threat to product integrity and post-harvest quality assurance. Price volatility is identified as the second-most pressing issue, contributing to market uncertainty and financial instability for mill operators. Inadequate drying and cleaning procedures rank third, highlighting technical inefficiencies in pre-processing stages that may compromise output quality. The shortage of skilled labor further exacerbates operational limitations, reflecting a gap in human capital and technical competency.

Additionally, limited market access restricts the scalability of processed outputs, impeding effective integration into broader value chains. Constraints related to packaging infrastructure and insufficient storage capacity adversely affect product preservation, shelf life, and supply chain continuity. Access to affordable and adequate working capital for processing investments ranks lowest, yet remains a fundamental barrier to technological upgrading and operational expansion. Collectively, these constraints underscore the need for targeted interventions in capacity building, supply chain modernization, and policy support to enhance the economic viability of small and medium-scale dal milling enterprises.

Conclusion

The present study offers a holistic assessment of pigeon pea (Cajanus cajan) cultivation and its value-added processing within the operational framework of Krishi Sahyog Farmers Producer Company Ltd. in Maharashtra. The economic evaluation at both the farm and enterprise levels underscores the strategic potential of Farmer Producer Companies (FPCs) in enhancing the livelihood resilience of smallholder farmers through aggregation, economies of scale, and market integration.

At the cultivation level, the comprehensive cost analysis revealed a total production cost (Cost C) of ₹78,322.21 per hectare, yielding a gross return of ₹1,20,886.80 and a favourable benefit-cost ratio of 1.54. This validates pigeon pea as a financially viable crop under semi-arid agro-climatic conditions, where input efficiency, particularly in labour, machinery use, and nutrient application, plays a crucial role in maximizing profitability.

On the processing front, the dal mill's operational cost of ₹13,892.02 per quintal, coupled with a processing recovery rate of 62.5%, resulted in net returns of ₹27.26 lakh and a processing benefit-cost ratio of 1.20. While the enterprise remains profitable, the dominance of variable costs especially raw material procurement highlights the sensitivity of profitability to price volatility and input market dynamics. The fixed cost structure, dominated by

depreciation on infrastructure and machinery, remains relatively marginal, indicating a capital-light processing model appropriate for small and medium-scale enterprises.

However, a series of structural and logistical constraints were identified, including pest infestation, irregular price movements, inadequate post-harvest practices, labour shortages, and limited access to formal markets and capital. These challenges not only hinder operational efficiency but also constrain the scalability and competitiveness of FPC-led agro-enterprises. Addressing these issues necessitates coordinated policy interventions focusing on skill development, cold storage and drying infrastructure, affordable credit mechanisms, and digital market access platforms.

In conclusion, the study reaffirms the economic and institutional relevance of FPCs as transformative vehicles in India's agricultural landscape. Strengthening the functional capacity of FPCs through targeted investments, innovation adoption, and value-chain integration can significantly enhance rural entrepreneurship, income security, and sustainable pulse production systems.

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