Factors Influencing Profit Chain of Little Millet by FPO Farmers, Processors and Marketersin Tamil Nadu

ABSTRACT

Indian millet, often known as little millet (Panicum sumatrense), is a native of India. Sumatra, Indonesia is where this millet species got its name (deWetetal., 1983). It's important to the Indian diet. It is a good source of micronutrients and nutraceuticals, which have many benefits.Little millet (Panicum sumatrense) is known for a number of health benefits because it contains bio-active nutraceuticals including carotenoids and phenolic compounds, and it has a low glycaemic index, which is especially beneficial for those with diabetesit is a good source of phosphorus, and the fiber content lowers the body's fat content. The little millet, low calorie and antioxidant content contributes to a balanced diet and weight maintenance that can aid in weight loss.This study aims to analyses the little millet value chain and also examining the profitability of producers, processors, and marketers in Northern Tamil Nadu through a sample of 95 farmers. Using structured questionnaires and the Ordinary Least Squares (OLS) technique, the research identifies key factors influencing profits in each segment. For producers, application ofNitrogen and Potash fertilizer positively impact profits, while labour and seed exhibit negative effects. Processors benefit from positive associations with labour and transport, although the impact is relatively minor. Marketers' profits are positively linked to labour, transportation, and storage, emphasizing the significance of efficient logistics. The findings underscore the need for strategic interventions to enhance the millet value chain and address challenges within the industry. Hence, it is recommended that the policy should focus on increasing farmers' productivity and profits by offering incentives, extending farmers support, and introducing innovative technologies.

Key words: *Profit chain, Profitability, FPO, Little Millet, OLS regression.*

Introduction

Millet, a nutritious group of cereal grains classified under the Poaceae family, is often referred to as "coarse cereals" or "cereals of the poor." Beyond traditional uses, millets have found their way into modern food products such as cookies, bread, health mixes, and more. Little millets are a good source of dietary fiber and therefore can be utilized for the utilization for the formulation of prebiotics drinks, which helps in digestion (Swarnima Dey *et al., 2022).*The Indian Peninsula is where little millet (Panicumsumatrense) was initially cultivated (Weber and Fuller, 2007).Little millet belongs to the family Poaceae, sub-family Panicoideae and the tribe Paniceae (Rachie, 1975). Little millet (Panicum sumatrense L.) is grown in India under various agro ecological situations and commonly known as samai, samo, moraio, vari, kutki. Little millet is a hardy crop which can withstand drought better than most of other cereal crops and water logging to a certain degree, also. Hence, it can provide us with food security in unfavourable climatic conditions. Little millet is rich in vitamin B, minerals like potassium, phosphorus, iron, zinc and magnesium. Therefore, it can address nutritional sensitive agriculture, which aims at nutritional enhancement to combat the present scenario of micronutrient malnutrition (Arunachalam et al., 2005, Kundgol et al., 2014 and Selvi et al., 2015). In India, little millet growing states are Karnataka, Tamil Nadu, Odisha, Madhya Pradesh, Chattisgarh, Jharkhand, Andhra Pradesh, Uttarakhand, Maharashtra and Gujarat**.**There are two varieties of little millet: robusta and nana (House et al., 2000). It's important to the Indian diet.While minor millets had superior nutritional content, their limited availability in refined and processed forms has hindered widespread usage (Shanthakumar *et al*., 2010). Over the last three decades, there has been a significant decline in the direct consumption of millet as food (Vilas, 2018). Despite being a leading millet producer, India faces a high malnutrition rate globally (Gragnolati*et al*., 2005; Von Grebmer*et al*., 2008). In rural areas, finger millet, small millet, and foxtail millet are commonly consumed, with foxtail millet emerging as the preferred choice (Durgad, 2021). Value addition in millets through collectivizing the produce, marketing linkages and better business plan increased the income of millet FPO in Tamil Nadu (Balaji et al, (2023) and Angles et al., 2023). Traditional farming practices involve individual farmers, while Farmer Producer Organizations (FPOs) play a crucial role in providing inputs, guidance, procurement, and wholesale distribution of value-added millet products (Gokul *et al*., 2019). Recognizing the significance of millets, the government of India proposed to the United Nations to declare 2023 as the International Year of Millets (IYOM). This proposal garnered support from 72 countries, leading to the United Nations General Assembly (UNGA) officially declaring 2023 as the International Year of Millets on March 5, 2021. As of 2021, India holds the title of the largest millet producer, commanding a share of 41%, followed by Niger (12%) and China (8%). Moreover, an additional significant benefit of millet is its rich nutritional composition, contributing to elevated levels of energy, proteins, dietary fiber, and vitamins. These nutritional elements have a profound impact on combating diseases such as diabetes, cancer, cardiovascular issues, and neurodegenerative conditions. There is a pressing need for a stronger emphasis on institutional support, market initiatives, and sustainability efforts to alleviate poverty levels.

Farmer Producer Companies (FPCs), are groups of growers organized under the Companies Act with support from the Small Farmers' Agribusiness Consortium (SFAC). Established in the last decade through initiatives by SFAC, state governments, and organizations like NABARD, these FPOs aim to empower farmers by eliminating intermediaries in the agricultural supply chain(*Source: Directorate of Marketing and Inspection, 2020*). The major driving forces of Famer Producer Organization such as NABARD engaged in aggregation of marketing activities while SFAC engaged in processing activities and consultancy services (Subhash et al. 2019, Angle S & Balaji P, 2023, Nandhini S et al. 2023). India presently hosts around 7,000 Farmer Producer Organizations (FPOs) with approximately 70 lakh farmers, led by Maharashtra (1622 FPOs). Initiated in the past decade through government, SFAC, State Governments, and NABARD efforts, these FPOs, in early stages and involving 100 to 1000+ farmers, require support for technical, financial, and infrastructural needs, including market access. The government aims to establish 10,000 FPOs by 2024, allocating Rs. 6,865 crores for this purpose, with SFAC as the central promoting agency. FPOs significantly benefitted the smallholder farmers in the adoption of modern agricultural technology, providing weather and advisory services, market intelligence system, access to high-quality farm inputs and services and access to credit and insurance (Prasad 2019, Annamalai, 2021 &Krishisutra 2013, Balaji P.n.d). Performance varies, with about 30% operating successfully, 20% facing challenges, and 50% in early stages, focusing on mobilization and business planning (*Source: SOIL Report 2021*). Tamil Nadu, over 900 Farmer Producer Organizations (FPOs), with a notable few serving as exemplary models for the state. These FPOs, recognized by the government for their effectiveness, exemplify successful cooperation among farmers. Functioning as collective entities, FPOs manage various agricultural activities from production to marketing, providing farmers with enhanced negotiation power. The Tamil Nadu government supports FPOs through special incentives and concessions, acknowledging their crucial role. Despite challenges, FPOs have significant potential to benefit farmers by facilitating access to finance, technology, and markets, presenting untapped opportunities for growth.Encouraging the producer ecosystems into formal and informal networks and organizations can be a quick and easy approach to connect with more people (Khandelwal A,2022, Balaji P et al. 2023). So it is essential to examine the profitability of producers, marketers, and processors in the process.

Materials and Methods

The primary and secondary data were collected from the sample farmers, processors and marketers in Northern Tamil Nadu, specifically in the districts of Tiruvannamalai, Dharmapuri, and Tirupathur, through a structured questionnaire. The survey involved a total of 95 sample respondents, encompassing little millet producers, processors, and marketers. Ordinary Least Squares (OLS) technique was used to estimate the profitability of sample farmers, processors and marketers.

The study used a modified model by Danlami (2014) in analysing the value chain along the profit level of producers, processors, and marketers as illustrated below

$$PRVi = \propto + \beta 1LARi + \beta 2SEDi + \beta 3FERi + \beta 4PESi + \beta 5TOCi + \beta 6TRSi + \beta 7STRi + \beta 9AGEi + \beta 10EDUi + \varepsilon i \quad (1)$$

Producer's model

$$PRV_{p} = \propto + \beta 1LARi + \beta 2SEDi + \beta 3UREi + \beta 4MOPi + \beta 5TOCi + \varepsilon i \quad (2)$$

Where,

LAR= Labours in Numbers
SED= Seeds in Kgs
N= Nitrogen in Kgs
P= Potash in Kgs
TOC= Total cost in Rupees

Processor's model

$$PRV_{pr} = \propto + \beta 1LARi + \beta 2TOCi + \beta 3TRSi + \beta 4STRi + \beta 5OTCi + \varepsilon i (3)$$

Where,

LAR= Labours in Man days
TOC= Total cost in Rupees
TRS= Transport cost in Rupees
STR= Storage cost in Rupees
OTC= Other cost in Rupees

Marketer's model

$$PRV_{mrs} = \propto + \beta 1LARi + \beta 2TOCi + \beta 3TRSi + \beta 4STRi + \beta 5OTCi + \varepsilon i \quad (4)$$

Where,

LAR= Labours in Man days
TOC= Total cost in Rupees
TRS= Transport cost in Rupees

STR= Storage cost in Rupees
OTC= Other cost in Rupees
From the equations (1, 2, 3 and 4) PRV, LAR, SED, FER, PES, TOC, TRS, STR, OTC, AGE and EDU refers as profits, labour, seed, fertilizer, pesticides, total cost, transports, storage, other cost, age, the level of education and εi indicates the residual error in the model.

Result and Discussion

Descriptive analysis

Producer's model

The Table 1 revealed the descriptive analysis of producers that , labour hours, seed rate, nitrogen levels, potash levels, and profits. The average labour hours invested is approximately 18.95, with a standard deviation of 3.75 and a range from 13 to 25. Seed rates average 8.84, exhibiting variability with a standard deviation of 4.33 and a range from 4 to 17. Nitrogen levels and potash levels average 11.25 and 12.04, respectively, both displaying moderate variability. Nitrogen levels range from 8 to 15, while potash levels range from 6 to 19. Profit averages 23,281.56, with a standard deviation of 142.27 and a range from 23096 to 23532.

Table 1: Descriptive analysis of Producers model

	Labour	Seed rate	Nitrogen	Potash	Profit
Mean	18.94667	8.84	11.25333	12.04	23281.56
Standard Error	0.432838	0.500104	0.243172	0.429724	16.42846
Median	19	9	12	11	23265
Mode	25	9	13	9	23173
Standard Deviation	3.748489	4.331032	2.105933	3.721523	142.2746
Range	12	13	7	13	436
Minimum	13	4	8	6	23096
Maximum	25	17	15	19	23532
Sum	1421	663	844	903	1746117
Count	75	75	75	75	75

Processor's model

The Table 2 revealed the descrptive statistics of processor model that,labor, transport, and profits based on ten observations. On average, labour hours total 1880, with a standard deviation of 574.07, ranging from a minimum of 1050 to a maximum of 2600. Transport costs average 1170, showing a standard deviation of 363.01, and ranging from 600 to 1800.

Profits average 3440.8, with a standard deviation of 454.99, ranging from 3096 to 4532. The median values for labor, transport, and profits are 2075, 1225, and 3324.5, respectively.

Table 2: Descriptive analysis of Processors model

	Labour	Transport	Profit
Mean	1880	1170	3440.8
Standard Error	181.5367	114.7945	143.882
Median	2075	1225	3324.5
Standard Deviation	574.0693	363.0121	454.9947
Range	1550	1200	1436
Minimum	1050	600	3096
Maximum	2600	1800	4532
Sum	18800	11700	34408
Count	10	10	10

Marketer's model

The Table 3 revealed the descriptive analysis of marketer's model that,labor, transport, storage, and profits. On average, labour hours amount to 1745, with a standard deviation of 559.99 and a range from 1100 to 2500. Transport costs average 1095, showing a standard deviation of 302.26 and ranging from 650 to 1700. Storage capacity averages 546, with a standard deviation of 88.47 and a range from 400 to 650. Profits average 3469.3, with a standard deviation of 433.26 and a range from 3096 to 4530. Median values for labor, transport, storage, and profits are 1700, 1175, 580, and 3308, respectively.

Table 3: Descriptive analysis of Marketer's model

	Labour	Transport	Storage	Profit
Mean	1745	1095	546	3469.3
Standard Error	177.0828	95.58301	27.97618	137.0092
Median	1700	1175	580	3308
Standard Deviation	559.9851	302.26	88.46845	433.261
Range	1400	1050	250	1434
Minimum	1100	650	400	3096
Maximum	2500	1700	650	4530
Sum	17450	10950	5460	34693
Count	10	10	10	10

Profit chain of producers, processors, and marketers in Northern Tamil Nadu

Table 4, the study provides a comprehensive overview of the estimated models used to assess how various factors influence the profits of both producers, processors and marketers.

Table 4: Profit chain of producers, processors, and marketers in Northern Tamil Nadu

Variables	**Producers Profit**	**Processors Profit**	**Marketers Profit**
Constant	22827.58 (218.010)	2867.63 (7.718)	1308.252 (2.560)
Labour	-9.222** (-2.222)	-.297* (-2.292)	-.344*** (-3.730)
Seed	-9.299** (-2.332)	-	-
N fertilizer	24.267*** (3.617)	-	-
P fertilizer	36.364*** (7.078)	-	-
Transport	-	0.967*** (4.720)	1.402*** (7.267)
Storage	-	-	2.244** (3.351)
R^2	0.651	0.817	0.918
Adjusted R^2	0.631	0.764	0.877
Std. Error	86.36	220.8	151.8
Sig	<.001	<.001	.043

(Figures in parentheses indicates t value)

Note: ***, ** and * illustrate 1, 5 and 10 percent significance level

Producer's Model:

$$PRVi = \propto +(22827.58)LAR_{(-9.222)} + (22827.58)SED_{(-9.299)} + (22827.58)N_{(24.267)} + (22827.58)P_{(36.364)} + \varepsilon i$$

In the producer's model, the study found that Nitrogen and Potash had a positive impact on the producer's profit it is exactly matched with the findings of Dramadri*et al*. (2005) align with the notion that the amount of fertilizer used tends to rise with an increase in the farmer's resource holdings or income, and conversely, decrease as income decreases, as suggested by Ezeh *et al*. (2006).Specifically, a one percent increase in Nitrogen and Potash led to a substantial increase in the producer's profit, by approximately 24.267percent and 36.364percent, respectively. On the contrary, Labour and Seeds had negative coefficients, indicating that a one percent increase in these factors resulted in a decrease in the producer's profit by approximately 9.222 percent and 9.299 percent, respectively. These results suggest that investing in Nitrogen and Potash fertilizers can significantly boost agricultural productivity, aligning with government efforts to increase production.

Processor's Model:

$$PRVi = \propto +(2867.63)\,LAR_{(-0.30)} + (2867.63)\,TRS_{(0.967)} + \varepsilon i$$

According to the processor's model, Labor and Transport were identified as factors that positively influence the processor's profit, although their impact was relatively minor. A one percent increase in Labor was associated with a slight decrease in profit by .297 percent, aligning with the findings of Otunaiya and Akinleye (2003), Dramadri et al. (2005), Olawale et al. (2009), and Minot et al. (2000). As per Minot's observations in 'Malawi,' larger processors tend to employ more labour than smaller ones, the study suggests that processors utilize labour based on need. In the case of Transport, a one percent increase resulted in a marginal profit increase of 0.967 percent for processors. These results imply that Labor and Transport play a limited role in influencing processor profits compared to other factors.

Marketer's Model:

$$PRVi = \propto +(1308.252)\,LAR_{(-0.344)} + (1308.252)\,TRS_{(1.402)} + (1308.252)\,STR_{(2.244)} + \varepsilon i$$

TThe marketer's model revealed that labour, transportation, and storage had a positive relationship with the profit levels of marketers. A one percent increase in transportation and storage led to corresponding increases in marketer's profit by approximately 1.402 and 2.244 percent, respectively. However, labour costs had a negative association, with a one percent increase resulting in a decrease in marketer's profit by approximately .344 percent. These results emphasize the importance of efficient transportation and storage for marketers, while also highlighting the need to manage labour costs effectively.

Conclusion

The research investigates the millet value chain's impact on the profits of producers, processors, and marketers within a sample of 95 farmers in Northern Tamil Nadu, utilizing structured questionnaires and the OLS technique. The findings indicate that investing in Nitrogen and Potash fertilizers can significantly enhance agricultural productivity, aligning with government efforts to increase production. Labor and transportation play a limited role in impacting processor profits compared to other factors. Finally, efficient transportation and storage for marketers contribute to increased profits and highlight the need to manage labour costs effectively.This study result was similar with the findings of (Ranjit Kumar et al. 2022, Gokul Vignesh 2020) that the performance of Farmer Producer Organization is comparatively better when there is a strong management and capital structure.

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