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Farmer Producers Company and Agricultural Sustainability: A Status in Kalahandi District of Odisha, India

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Abstract Agriculture, being the important sector in Indian economy in terms of absorbing more than half of the total workers, continues to be less remunerative. The marginal and small farmers constitute around 86% of the total farmers. They are mostly unorganized and integrated with a lack of supportive environment in terms of institutional support, infrastructure, production ecosystem, access to on time resources and effective coordination with stakeholders. Farmer Producers Company (FPC), the latest version of farmer institution in India, has been developed to organize the marginal and small farmers, and enhance their capacity to multiply their income through agricultural sustainability. With this background, the present paper attempts to answer the following questions: what is the status of agriculture with a sustainability perspective in FPC context; and what are the unique practices (innovation, value addition, collaboration, risk coverage and institutional governance) adopted by the better performing FPC to attain agricultural sustainability. The study was conducted in a district (Kalahandi) in Odisha with a higher number of FPCs. It was found that none of the FPCs follows the risk coverage mechanisms. However, the relatively better performing FPC was found with the practices of value addition, innovation, collaboration and institutional governance. The bivariate correlation of all these facilitating variables with agricultural sustainability index was found to be significant. However, the extent of relationship between any one of these variables and agricultural sustainability index was found to be insignificant when we controlled the other facilitating variables. It is inferred that all the facilitating variables, viz. innovation, value addition, collaboration, institutional governance along with risk coverage are important when they are implemented simultaneously to ensure better agricultural sustainability scenario.

Keywords Farmer Producers Company, Agricultural Sustainability, Innovation, Collaboration, Value Addition, Institutional Governance, Risk Coverage

1. Introduction

Agriculture sector plays a crucial role in Indian economy in terms of accommodating more than half of the total workers. Over the years, there has been an incredible transformation noticed in this sector. However, the

contribution from this sector to the overall gross domestic product (GDP) of the country has been declining and reached less than one-fifth of the GDP. Besides, the share of the gross fixed capital formation (GFCF) in agriculture sector is less than 10 percent. Relatively lower remunerative agriculture sector along with a large share of marginal and small farmers (more than 86 percent of the total farmers) are known to be unorganized and integrated with a lack of supportive environment in terms of institutional support, infrastructure, production ecosystem, access to on time resources and effective coordination with stakeholders [1]–[8]. Apart from the above anthropogenic challenges, natural threats such as increasing climate variability also affect the marginal and small farmers. It is observed that the small farmers were marginalized due to their lack of organizing and coordination among themselves to enter the value chain.

Several institutional models were developed to integrate the farmers in the value chain and enhance their income. The important farmer institutions in India include cooperative society, self-help group, farmers' club, farmers' associations, farmer producers' organization and farmer producers' company. These institutions develop a collective strength within farmers' group to amplify their voice towards developing a stronger value chain network. Presently, several government schemes and programs have relied on Farmer Producers Company (FPC) as a vehicle to improve the economic conditions of the farmers especially for improving the market accessibility and income of the farmers. FPC is characterized by the features of cooperative society and private limited company.

At present, there are about 16870 FPCs registered and operating in India with assistance from NABARD, SFAC, NCDC, state governments and self-promoted organizations. About 5% of all FPCs registrations in India are from Odisha. It has been observed that many of the FPCs are not in operation to facilitate enhancing farmers' income and agricultural sustainability. The present article delves to answer the following research questions: (1) what is the state of agricultural sustainability in the research context among the two extreme (better performing and poor performing) FPCs? And (2) what are the missing links between the poor performing FPC and the unique features of the better performing FPCs?

2. Literature Review

Sustainability is a dynamic and multifaceted concept. Researchers have varied views on this concept without having a consensus. The ideology of agricultural sustainability was first stated by Thomas Malthus in his book "Principle of Population" published in 1798, where he mentioned that an ever increasing population could outpace agricultures capacity. The concept of "Agriculture Sustainability" gained its significance since the publication of the 'Brundtland Report in 1987. By exploiting the land through increased productivity, technical advancements that are constrained by economic expansion adapt to the shifting requirements of people [9].

Producer groups have elected officials who are accountable to their members and are membership-based or federation-based institutions [10]. With the advent of the "green revolution" [11], economic and agricultural policy changes have led to a shift in the world's use of synthetic fertilizers and pesticides, from organic to inorganic, and the substitution of livestock manure for synthetic chemicals. Decision-making authority over the use of inputs has also shifted from farmers to input suppliers. Studies by Gomez and Sanchez [12] and Dale et al. [13] highlight the multifaceted nature of sustainability, which calls for profitable operations at the farmer's level, fair wealth distribution at the society level, compatible eco-systems, and protection for environmental stewardship.

According to Von Wiren-Lehr [14], Zhen and Routray [15] Hayati et al., [16], the three multifaceted components of sustainable agriculture are interdependent and classified according to spatial and temporal perspectives with normative approach. According to Douglas [17], Yunlong and Smit [18], sustainability in agriculture has a multifaceted role that is subjected to food sufficiency [19] and is concerned with maximising food production within the limits of profitability, subjected to community where it focuses on reconstructing economically and socially [20], [21] viable rural systems, and sustainability towards stewardship [22], [25] focuses on controlling environmental damages. Agriculture sustainability seeks to be equal and equitable in order to improve the production system's productivity and social outcomes [21], [23], [24]–[26].

Collective strength of farmers may be able to enhance their competitiveness through more access to resources. [27] suggest that a producer's organisation might become a successful strategy for addressing the challenges that marginal and small farmers' encounter. Farmer Producers Company is a tool that promotes small and marginal farmers to collaborate collectively for innovative agriculture through product aggregation and marketing [28]–[31]. Farmer Producers Company is a New Generation Cooperative [31], which incorporates components of a cooperative society and a private limited company is known as Hybrid Company [32]. An organised framework needs to exist to share services by absorbing price risk through diversification, intensifying the political voice of small holders, reducing the cost of marketing through value addition, getting access to markets for farmers and ensuring economic viability [33].

The study on the economic effects of producer organisations in Gujarat [34] revealed that the engagement of farmers led to higher levels of income, consumption, and investment as well as a lower amount of debt. Firms have benefited from the association on both the backward and forward linkages. A producer company's objective is

to boost collective strength and get a fair price for its product. However, an investigation [35] in Cuttack district of Odisha of 131 households revealed that the absence of knowledge of resource institutions caused them to operate in the traditional way. Their primary issues include marketing constraints, intermediary exploitation, and distressed sales.

There is a gap existing in terms of a theoretical framework, methodology, and context specific appropriate variables to measure sustainability in the context of FPC. The following literature gaps have also been identified:

1. Out of the three established dimensions of sustainability, viz. economic, environmental and social, the existing literature focused more on environment.
2. Regardless of the theoretical links that have been proposed between innovation, value addition, risk, and collaboration with agriculture in the literature that currently exists [7], [36]–[40], there is a paucity of scientific empirical evidence to support these relationships in ensuring agricultural sustainability.
3. The body of knowledge is not enriched enough to address the question of why FPCs fail to scale up and persist even after their existence within the system for more than a decade.

2.1. Problem

In spite of different agricultural policies (National Agricultural Policy 2000, State Agricultural Policy 1996,2008, 2013, 2019), programmes (National Mission for Sustainable Agriculture), schemes (Cooperatives, SHGs, JLGs, FPOs/FPCs), and institutions (Cooperatives, SHGs, JLGs, FPOs/FPCs), as well as the formation and promotion of 10,000 FPOs under the central sector scheme, it is found that the adaptation of *innovation, value addition, risk coverage, collaboration and institutional governance is* neglected among marginal and small farmers in FPC context which lead to the *state of agricultural sustainability* weak particularly among marginal & small farmers in the study area of Odisha.

2.2. Research Questions

Based on the research problem, the following research questions are addressed: what is the status of agriculture with sustainability perspective; and what are the unique practices adopted by the better performing FPC to attain agricultural sustainability.

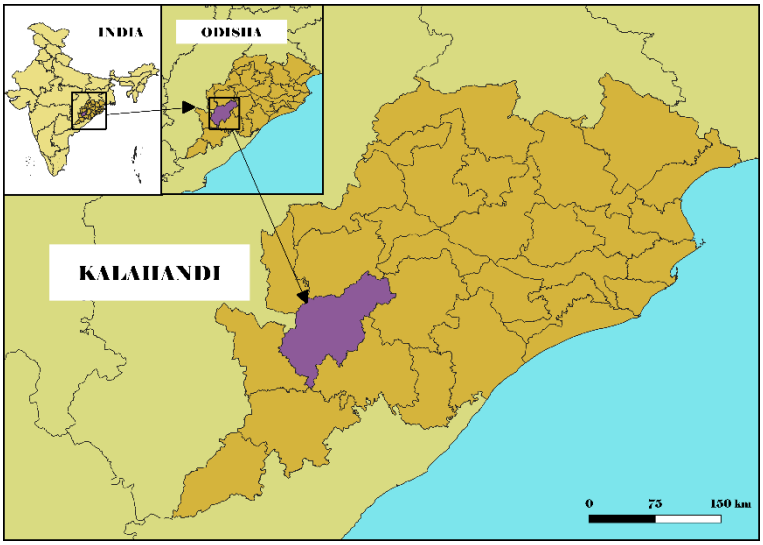
2.3. Objectives

The important objectives of this paper include: to assess the state of agricultural sustainability among marginal and small farmers in operational FPCs; and (2) to ascertain the unique practices adopted by the better performing FPC to attain agricultural sustainability.

2.4. Research Context

This paper has covered four blocks in Kalahandi district of Odisha, India, viz. Bhawanipatna, Junagarh, Narla, and Golamunda (Figure 1). This district was selected for the study as it had higher and better performing Farmer Producers Companies (FPCs). The status of FPCs in India, Odisha and Kalahandi is given in Table 1.

Narla, Bhawanipatna, Junagarh, and Golamunda are the four separate blocks where the four FPOs are located. One of the four FPCs, i.e. Manikeswari Company Limited produces ragi in Narla. Another FPC, Bamunikhol Farmers Producer Company Limited of Bhawanipatna produces maize. The Ghumra Farmer Producer Company Limited of Junagarh produces paddy. Similarly, the Patarani Producer Company Limited of Golamunda, produces onions.



Source: Survey of India

Figure 1. Map of the study area (Kalahandi)

Table 1. Status of Farmer Producers Company in, India, Odisha and Kalahandi

Total Number of FPC in India	16870
Total Number of FPC in Odisha	587
Number of FPC with NABARD	286 110 old FPC registered during 2015 to 2018 and 176 registered during 2020 to 2022.
Districts with highest number of FPC in Odisha	Kalahandi, Bolangir, Ganjam, Rayagada
Number of FPC in Kalahandi	24 11 old FPCs registered during 2015 to 2017 and 13 new FPCs registered after 2020
Crop taken for FPC business	Paddy, Pulses, Maize, Mango, Millets & Ragi, Onion, Banana, Cashew
FPC taken for our study	Criteria: We have taken all the four functioning FPCs (out of old 11 FPCs) in the district. Narla, Bhawanipatna, Junagarh, Golamunda
FPC with Product/Crop	Narla- Ragi; Bhawanipatna- Maize; Junagarh- Paddy; Golamunda- Onion
Study Period	The study has considered the FPC registered from 2015 to 2018 The study was conducted during 2021-2022

Source: Overview of FPO in Odisha, 2021 https://fpoodisha.nic.in/

3. Data and Methodology

As mentioned earlier that Kalahandi district of Odisha was selected as it had higher and better performing Farmer Producers Companies (FPCs). The district has 24 FPCs, of which 11 were old (registered and performing since 2015) and 13 newly registered FPCs (registered during and after 2020). Out of 11 old FPCs, all the four functional FPCs were selected for the study. These 4 FPCs were located in 4 different blocks, i.e. Narla, Bhawanipatna, Junagarh, and Golamunda. Among the four FPCs in four different blocks, the crops/ products they deal with are as under: Narla- Ragi, Bhawanipatna- Maize, Junagarh- Paddy, and Golamunda- Onion. A representative sample size has been taken by considering the confidence level (95) & confidence interval (4) of getting the sample frame from the facilitating & nodal agency. Accordingly, a sample size of 449 was considered for the study including 112 paddy farmers, 110 onion farmers, 112 maize farmers and 115 ragi farmers. The study was carried out in 2021–2022 among the households with FPC membership.

Addressing normative components such as economic, social, and environmental concerns, the study has adopted these sustainability dimensions for calculating agricultural sustainability. The sub-dimensions and operational indicators were further established for each dimension (Table 2). The sub-dimensions emerged through the review of literature, expert discussion, self-observation, and study-specific characteristics. A structured interview schedule was used for data collection.

3.1. Techniques for Data Analysis

To examine the state of sustainability in agriculture within the study's context, the composite index technique was used. The agricultural sustainability index component is made up of a number of sub-components and indicators.

As the scales used to calculate each of the sub-components (Table 2) vary, an index is required to calculate all of the components altogether. As a result, the scale of each derived sub-component was converted using the composite index approach and is calculated as follows:

$$Index_S = Sd\text{-}S_{min} / S_{max} - S_{min} \quad (1)$$

Where, S_d is the value of the sub-components of the area d, and S_{min} and S_{max} indicate the minimum and maximum values of each sub-component that is determined by the data from the study area. Once standardized, the sub-components are averaged by using the following formula, and then calculate the value of its main components.

$$Md = \sum index_{sdi}/n \quad (2)$$

The value of M_d is equal to one of the main components in the area d (environment, Economic, Social). The di index reflects the value of the sub-components that are indexed by i. Based on these equations, the Agricultural Sustainability Index (ASI) grades can be obtained by using the following equation:

$$Asi = W_{envi}Envi_d + W_{eco}Econ_d + W_{soc}\ Socd / W_{env} + W_{eco} + W_{soc} \quad (3)$$

Where, ASI represents the index value for the susceptibility in area, d, measured by three major components. W_{mi} represents the number of sub-components that reflect to the main component. It has been displayed by using the radar chart.

Table 2. Dimensions, Sub-indicators and Operational Indicators for Measuring Agricultural Sustainability

Sustainability Dimensions	Sub-Indicators	Sources	Operational Indicator	Source	Type of Data
Economic	Economic Cost Benefit (crop efficiency)	Hani et al., 2006; Von Cauwenbergh et al., 2007	a) Input price (economic cost not accounting cost) b) Total Output (Price) (at market price)	Developed by authors	a) Input price/b) Total Output (Price)
	Land Productivity	Rasul & Thapa, 2003; Nambiar et al., 2001	a) Total Output (price) (at market price) b) Total area	Developed by authors	a) Total Output (price)/ b) Total area
	On-time access to resources	Developed by us	a) Inputs includes (credit, infrastructure, transport) b) b) market c) support services	Developed by authors	Yes/No
	Economic empowerment and equity	Cauwenbergh et al., 2007 but rationalize to our study	a) Ownership of agriculture assets and land (access to assets) b) b) Capacity to negotiate market (No distress sale- information, volume, institutional sale)	Developed by authors	Yes/No
Environment	Soil and Land Quality	Ingels et al., 1997; Nambiar et al., 2001 but rationalize to our study	a) Soil Quality b) Land Maintenance c) Agricultural practice with respect to technology, irrigation,	Developed by authors	1-10, Yes/No
	Weather condition and adaptability	INEA, 2002; MAFF, 2000	a) Rainfall b) Cooping Strategy	Developed by authors	Yes/No, Descriptive
	Environmental resources and efficiency	Developed by us	a) Fertilizer Use efficiency b) Water Use efficiency	Developed by authors	Yes/No, Ratio
	Biodiversity	INEA, 2002	Availability of natural species such as insects, pest, worms, birds, fishes, natural silt from pond, others in-terms of their status (increase, decrease, almost changed, endangered, extinct	Developed by authors	Ordinal (1,2…...increase, decrease)
Social	Food self sufficiency	Roy et al., 2013; Herzog and Gotsch, 1998	Depending on stock piles (in months)	Developed by authors	Highest no of months depending upon stock piles
	Access to social institutions and resources	Smith & MC Donald, 1997	a) Membership of community-based organization (Benefited-access to services, b) b) Access to resource organization)	Developed by authors	Yes/No
	Empowerment and gendered equity	Chand et al., 2015; Zhen &Routray, 2003	a) Information on different social development program b) Participation of CBOs c) If any single female member got benefitted	Developed by authors	Number Nominal Yes/No
	Adaptability including attitude (to adopt emerging technology)	Developed by us	Adapting any new technology/ techniques/ practices	Developed by authors	Yes/No

4. Result and Discussion

4.1. State of Agricultural Sustainability in Kalahandi among the Members of FPCs

The four FPCs were located in four different blocks of Kalahandi district. They are FPC1 on maize, FPC2 on ragi, FPC3 on paddy, and FPC4 on onion. The agricultural sustainability index (ASI) value of FPC2 was found to be higher and comparatively performing better than the other three FPCs (Table 3 and Figure 2). The FPC 4 is performing relatively poor. The higher sustainability index value of FPC2 was associated with the value addition, adaptation of technology, institutional collaboration for both backward and forward linkages of ragi business and practice of FPC level institutional governance. Risk coverage of FPC economic activities, which is also an important factor for sustainability, was found to be missing in all FPCs taken for the study. The FPC4 which is performing relatively poor was found to be missing all the above practices, viz. value addition, adaptation of new technologies, collaboration, institutional governance and risk coverage.

Table 3. Tabular Presentation of the State of Agricultural Sustainability Index (ASI)

Dimensions of agricultural sustainability	FPC1 (Maize)	FPC2 (Ragi)	FPC3 (Paddy)	FPC4 (Onion)
Economic	0.68	0.77	0.48	0.26
Environment	0.36	0.52	0.31	0.35
Social	0.59	0.66	0.46	0.69
Overall agricultural sustainability index (ASI) value	0.54	0.77	0.42	0.43

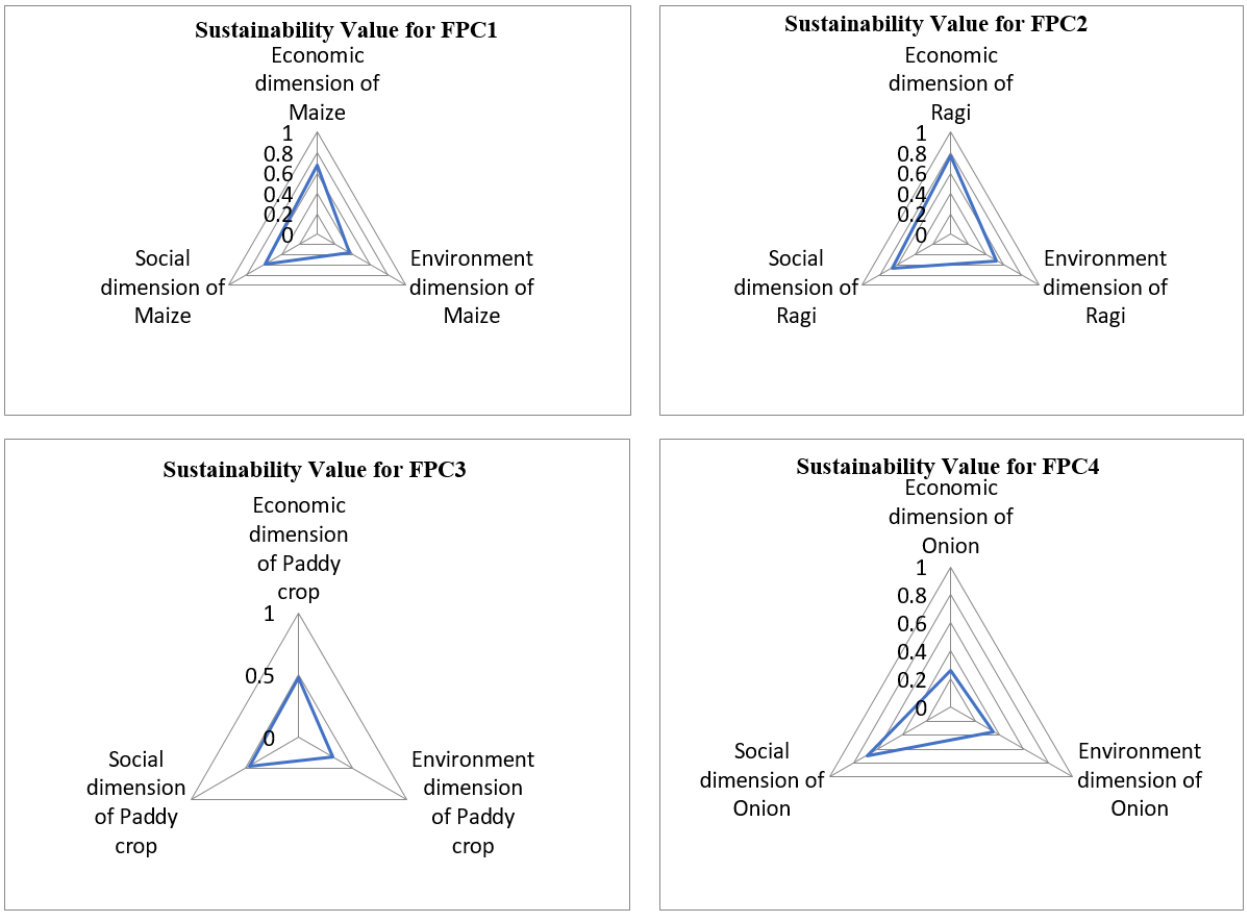


Figure 2. Sustainability Index value of crops under each Farmer Producers Company

FPC1 is performing very close to FPC2, and the difference in sustainability value is due to the fact that FPC1 did not have institutional collaboration.

It is also revealed from the Table 3 and Figure 2 that the environmental sustainability among FPCs was found to be relatively less than that of other dimensions. It is mostly due to the fact that the FPCs were formed with the vision to enhance the economic capability of the farmers and make their income better. In the process of increasing the income by breaching the sustainability conditions for environment, the FPCs failed and neglected to take care of the environmental sustainability.

The social sustainability, which lays in between economic and environmental sustainability, is due to the support of the facilitating institutions and grants received from the funding organisations. It is the fact that the support and grant services continue for a certain period. It is important for the FPCs to make themselves enabled in the long run to sustain and perform better. Hence, to become sustainable all the three dimensions of sustainability need to be focused, which contributes to overall sustainability.

4.2. Important Features of Better Performing FPCs

As mentioned earlier, FPC2 and FPC1 were found to have higher agricultural sustainability index value as compared to that of FPC 3 and FPC4. FPC2 is functioning better and more sustainable among the all four FPCs. FPC4 was the least sustainable one. Risk coverage is one of areas which was missing across all the FPCs. FPC2 adopted innovation across the entire production, post production, post-harvest and marketing of their produce and processed products. The extent of innovation in case of FPC1, FPC3, and FPC4 is very negligible. Innovation in the FPC1, FPC3, and FPC4 was adopted only at production level.

Value addition has been adopted by FPC1 and FPC2. In FPC2 the extent of value addition and the range of processed products were higher as compared to FPC1. FPC2 made several value-added products using innovative practices and techniques. The extent of value addition in FPC1 was practised only at production and post-production level. The more the extent of value addition, the higher return it gives to the FPC. Value addition was completely missing in FPC3 and FPC4.

Collaboration at a different level of operations makes it more effective for FPCs. FPC2 had better and stronger collaboration linkages as compared to FPC1 and FPC3. The collaboration condition was strong in FPC2, which led to its higher economic sustainability (Table 3). The collaboration in FPC2 was with Odisha Millet Mission and multi-national company which supported them across the operations such as skill training, assured price and buy back arrangement, government support, making value=added products from ragi. The millet mission also gives incentives to ragi farmers to retain ragi production in their agriculture practices.

Strong and planned mechanism for an efficient institutional functioning is an important aspect for any institution to grow better. FPCs as farmer institutions faced many constraints in its growth progress. FPC managed and governed by farmers are not professionals; it is mainly due to a lack of understanding of business and capability to manage a private limited company *(FPC registered under Company Act 2013; 2020).* Better institutional governance needs involvement of every member and awareness among the farmers to participate, to vote, to contribute, bringing transparency in business transaction and legal issues. The strength of relationship between institutional governance and sustainability was significant in FPC2. FPC2 has strong institutional governance as compared to FPC1, FPC3 and FPC4 due to involvement of professionals. The professionals work with the member farmers at village level cluster in building a strong rapport, understanding the challenges and scanning all possible business development.

The result of intervening in FPCs and adopting value addition, collaboration, risk coverage, innovation and institutional governance among the members has resulted change in the level of income with an assured price. Especially the farmers of FPC2 have better and higher income due to adopting innovation, value addition, collaboration and better institutional governance. FPC2 collaborating with the Odisha Millet Mission and placed with processing of value-added products led them to a higher income. Farmers have created income generating assets such as farm machineries, live stocks, transporting auto, and repairing their houses. FPC3 has got collaboration through contract farming that also resulted in generating higher income, which is three times higher than the normal paddy production. But the contract with private party usually gets void due to over controlling by the contractors. FPC1 and FPC4 had a moderate rise in the level of income depending upon the market situation, price negotiation with traders and seasonality.

FPC2 has been performing well due to following value addition, collaboration, innovation and institutional governance simultaneously. The bivariate correlation of all these facilitating variables with agricultural sustainability index was found to be significant (Table 4).

However, the extent of relationship between any one of these variables and agricultural sustainability index was found to be insignificant when we control the other facilitating variables (Table 5). It is shown that the extent of relationship between innovation and sustainability has reduced and become insignificant when other variables remain in control.

The study found the similar line of results for other variables i.e. value addition, collaboration, and institutional governance. The outcome from the entire partial correlation table reflects the similar lower relationship between one of these variables and sustainability when other variables are kept under control.

Therefore, it is inferred that all the facilitating variables, viz. innovation, value addition, collaboration, institutional governance along with risk coverage are important when they are implemented simultaneously to ensure better agricultural sustainability scenario.

Table 4. Bivariate Correlation between facilitating variables and Agricultural Sustainability Index of FPC2 (Ragi)

Bivariate Correlations

		Innovation	Value_addition	Collaboration	Institution	Sustainability
Innovation	Pearson Correlation	1	.588**	.569**	.547**	.661**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	115	115	115	115	115
Value_addition	Pearson Correlation	.588**	1	.702**	.695**	.735**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	115	115	115	115	115
Collaboration	Pearson Correlation	.569**	.702**	1	.724**	.771**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	115	115	115	115	115
Institution	Pearson Correlation	.547**	.695**	.724**	1	.705**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	115	115	115	115	115
Sustainability	Pearson Correlation	.661**	.735**	.771**	.705**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	115	115	115	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5. Partial Correlation (FPC2 with ragi)

Partial Correlations

Control Variables			Innovation	Sustainability
Value_addition &Collaboration & Institution	Innovation	Correlation	1.000	.318
		Significance (2-tailed)	.	.001
		df	0	110
	Sustainability	Correlation	.318	1.000
		Significance (2-tailed)	.001	.
		df	110	0

Partial Correlations

Control Variables			Value_addition	Sustainability
Collaboration & Institution & Innovation	Value_addition	Correlation	1.000	.277
		Significance (2-tailed)	.	.003
		df	0	110
	Sustainability	Correlation	.277	1.000
		Significance (2-tailed)	.003	.
		df	110	0

Partial Correlations

Control Variables			Collaboration	Sustainability
Institution & Innovation & Value_addition	Collaboration	Correlation	1.000	.389
		Significance (2-tailed)	.	.000
		df	0	110
	Sustainability	Correlation	.389	1.000
		Significance (2-tailed)	.000	.
		df	110	0

Partial Correlations

Control Variables			Value_addition	Sustainability
Innovation & Value_addition & Collaboration	Institution	Correlation	1.000	.171
		Significance (2-tailed)	.	.071
		df	0	110
	Sustainability	Correlation	.171	1.000
		Significance (2-tailed)	.071	.
		df	110	0

5. Conclusions

The study has found that all the facilitating variables, viz. innovation, value addition and processing, collaboration and convergence, and institutional governance are highly important to be followed by the FPCs in ensuring agricultural sustainability. Moreover, the risk coverage, which was grossly missing in all the FPCs in the study context, can be explored further and generalized to the body of research.

This empirical study provides a base for the future research in Farmer Producers Company. Besides, the research can explore the environmental dimensions and with respect to Farmer Producers Company functioning in a very extensive and in-depth approach.

Though FPCs are at their nascent stage and need special attention, the policy makers, practitioners and facilitating agencies may handhold supportive environment for innovation, value addition and processing, risk coverage, collaboration and convergence and strengthen institutional

governance.

The study can be applied to other agricultural areas where there are similarities in farming systems. Further research may be focused on comparative analysis.

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