

Institutional Finance for Upscaling Post-Harvest Processing Infrastructure in India

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There is no equitable world with hunger. While colossal Food Loss & Waste has been happening on one hand, India ranked 107 out of 121 countries on the other, as per the Global Hunger Index in the year 2022. The need of the hour is to achieve food security, nutritional security of all people and income security of the farmers by leveraging the entire agricultural value chain activities, in line with the Sustainable Development Goals. While probing the role of institutional finance in establishing post-harvest agri-processing facilities, the study relied on primary data, secondary data, and few case studies. Primary data, gathered from 357 farmer members of 60 FPOs across five states, forms the basis for the study. It is noticed that, on an average basis, less than or equivalent to 40 per cent of the farmer members in the 5 sample states avail agricultural value chain activities from the FPOs. Financial position of most of the sampled FPOs is not satisfactory especially from the viewpoint of obtaining (investment) credit. Only 11 per cent of the FPOs in India have access to institutional credit. Broadly, formal credit has not been flowing to these new-business entities to the desired level. It is observed that the presence of money lenders (21.01%) and traders (19.88%) still exists in respect of all the five study states despite the availability of formal sources of finance from banks/financial institutions. There is a lot of scope for institutional investment credit especially for creation of post-harvesting infrastructure facilities in order to leverage the entire agri-value chain activities in India. Finally, the paper puts forth several policy recommendations aimed at strengthening post-harvest infrastructure, particularly from the standpoint of FPOs, and agri-based MSMEs.

Keywords: Post-Harvest processing, institutional finance, FPOs, MSMEs, SDGs

JEL Classification: Q14, Q18, Q01, Q19

Introduction

While production in Agriculture & allied sectors is *seasonal* and confined to *certain pockets* of the country, its consumption is *perennial* and *universal*. As per the

FAO estimate (2022), between 691 and 783 million people in the world faced hunger in 2022 on one hand, and approximately one third of the food produced is lost or wasted (Food Loss & Waste –

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FLW) on the other hand. According to the latest United Nations Environment Programme Food Waste Index Report, 74 million tonnes of food was wasted in India, as against 931 million tonnes at the global level (17%) during 2022-23. This wastage of food in India is roughly equivalent to 22 per cent of production of our food grains or 10 per cent of total food grain and horticulture produce in the country. Further, according to the 2022 Global Hunger Index, India ranked 107 out of 121 countries, perhaps due to its exorbitant post-harvesting losses to the extent of Rs.89,000 crore, which is equivalent to one percent of its GDP.

FLW mainly depends on climate, crops, storage facilities, technology, traditions, and human behaviour (Vishwa Mohan, 2023). The FLW is a missed opportunity to ease pressure on natural resources, reduction of greenhouse gases (GHGs), food availability, and enhancement of the farmers' income. The main reasons behind FLW in India are inadequate post-harvest processing infrastructure in agriculture especially lack of hygienic cold storage facilities, no established transportation & distribution networks, poor handling of post-harvest produce, non-conversion of cutting-edge research ideas into commercial products, low investment credit for creation of fixed assets, etc. Besides, most of the Indians prefer (farm) fresh and (hot) foodstuff from the kitchen. Though the processed foods have been gaining traction in recent times, their share in the consumption of total food basket is not substantial.

Since the entire world has been facing basic challenges like poverty and hunger, Sustainable Development Goals (SDGs) place special emphasis on food security from agriculture & allied sectors besides efficient management of natural resources in order to achieve inclusive, dynamic, and resilient path to prosperity by 2030. The OECD/FAO Report (2022) states that average global agricultural productivity should increase by 28 per cent during the next decade to achieve zero hunger and keep

GHGs on track in line with the targets set in the Paris Agreement.

However, agriculture in India faces profitability challenges, partly because it is often not viewed as a commercial business. Profitability varies significantly by crop, region, and climatic zone. Many high-value crops and well-managed farms demonstrate that profitability in agriculture is possible through adoption of right strategies and practices. One such good practice is collectivization of farmers through farmer producer organizations (FPOs). FPOs and their members play a crucial role in the post-harvest space by leveraging the entire agri-value chain (i.e., production, grading, processing, packing, storing, certification, branding, and marketing). In fact, agricultural value chain activities enhance incomes of the farmers considerably thereby contributing to their financial security. This can be a reality when the farmers have free access to right inputs, proper extension services, timely and adequate credit, advanced technology, competitive markets, and proper institutional support. As more than half of the population in India are still dependent on agriculture & allied sectors, food and nutritional security of the country can be achieved fully by focusing on post-harvest processing facilities.

In view of the aforementioned, scaling up of post-harvest technologies (PHT) is one of the important ways through which the FLW can be contained, enhance the incomes of the farmers, apart from achieving certain SDGs (SDG1 - No poverty, SDG2 - Zero hunger, SDG8 - Decent work & economic growth, SDG14 – Life below water, and SDG15 – Life on land). *PHT can be defined as the application of science and technology to agricultural commodities which acts after harvesting food from farms for preservation, processing, packaging, storage, transportation, and marketing*". It is a path through which food comes from the farm to the consumer's plate. PHTs can minimize the losses of fresh food and increase the value addition to crops, horticulture, livestock and fishery sectors.

In this paper, we attempted to answer the research question “whether the FPOs in India enhanced the farmers' income by obtaining institutional credit and engaging themselves in the entire value chain activities i.e., from 'Farm to Fork?'”. Though banks/Financial Institutions (FIs) grant investment credit for establishment of post-harvesting facilities, inadequacy of finance has been felt by most of the stakeholders in the field; also, disaggregated data on credit for PHTs are not available in the public domain. In view of the above, by and large, we relied on primary data of our study on FPOs conducted in five Indian states namely Telangana, Karnataka, Odisha, Uttar Pradesh, and West Bengal in order to obtain policy insights.

Theoretical Background and Review of Literature

The Economic Survey 2022-23 mentioned that agriculture sector in India has been witnessing an average annual growth rate of 4.6 per cent during the last six years mainly due to significant contribution from productivity gains of crops and livestock, crop diversification coupled with right market linkages, farm mechanization, advanced technical know-how, etc. While production in agriculture tripled, thereby improving per capita production by more than 45 per cent, utilization of land has risen only by 10 to 15 per cent due to developments in science and technology and this enabled the farming community to ensure food and nutritional security (OECD, 2021). Artificial Intelligence and Machine Learning have been making fast inroads into the agriculture with robotics seen in large tracts of the Indian farms.

It is widely acknowledged that the small & marginal landholders have limited capacity in understanding price discovery mechanisms, accessing markets, and navigating challenges during the post-harvesting stage. As such, collective action is the most effective tool for addressing the major challenges faced by the small & marginal farmers. '*Collective Action Theory*'

propounds how and why individuals decide to collaborate as a group to enhance their negotiating power. In a recent study (Hannachi, Coleno, and Assens 2020), it was concluded that agricultural collectivism helped farmers in increasing their collective bargaining power and acting as a catalyst for leveraging the entire value chain.

It is well documented that Self-Help Group Bank Linkage Programme (SHG-BLP) addressed *adverse selection* and *moral hazard* problems in banking and financial landscape through group-based lending and peer pressure (NIRDPR, 2019). Till early 1990s, it was perceived that recovery of loans from the poor was difficult and thus they were not bankable; also, the bank officials knew little about creditworthiness of the poor borrowers (*adverse selection*). After introduction of the SHG-BLP in 1996 with the policy support from the RBI and National Bank for Agriculture & Rural Development (NABARD), the poor access formal credit from banks/FIs under group-based lending approach, without relying on an individual's credentials/collateral security. Hence, the group, as a whole, is responsible for repayment of loans along with interest to the banks/FIs and this nullifies *adverse selection* problem.

Moral hazard is any situation in which one person (SHG member) makes the decision about how much risk to take, while someone else (banks/FIs) bears the cost, if things go wrong (Paul Krugman, 2009). This phenomenon often arises due to information asymmetry, where one party possesses more information than the other. As the members of the SHG regularly interact with the bank officials in the scheduled meetings, information flows to the latter on each member's activities (economic or otherwise) to protect the interest of the lenders. Precisely, this information symmetry between bank officers and SHG members offsets moral hazard issue.

Similarly, the FPOs too can break the theoretical construct of '*impossible trinity in finance*' – free access

to (formal) credit, low interest rate, and collateral-free loans. The theory of impossible trinity in finance was proposed by Raghuram G Rajan in his book, *I do What I do* (2018). According to this, borrowers, at best, can have access to two out of three components as specified above. However, this theoretical construct can be circumvented through lending to the FPOs and other community-based organizations through institutional credit from banks/FIs backed by the government support. For instance, the FPOs can obtain medium/long term loans from banks/FIs under Agricultural Infrastructure Fund for investment in integrated post-harvest management Infrastructure and community farming assets namely warehouses, silos, pack houses, assaying units, sorting & grading units, cold chains, logistic facilities, primary processing centres, and ripening chambers, etc. Hence, the FPOs can have free access to credit i.e., big ticket loans (compared to small-size loans availed by SHGs) from banks/FIs at low interest rate without collateral security, for building post-harvest processing facilities.

As the Government of India announced a scheme in the year 2020 to promote 10,000 new FPOs across the country till 2027-28 with a total budgetary allocation of Rs.6,866 crore, leveraging of agri-value chains through FPOs is the next big thing in the Indian economy through adoption of PHTs. It is expected that the country will graduate from food/nutritional security to financial security of the farmers through implementation of such FPO related schemes. PHT will be a blessing in disguise for a country like India, wherein underemployment and disguised employment have been prevalent in agriculture & allied sectors. PHT offers several lucrative business opportunities in respect of procurement and storage (agri-warehousing, cold storage chains, silos, etc.); and processing (grading, milling, primary and secondary processing, packaging, branding, and marketing).

Smallholders have little or no accessibility to formal credit because of their poorly documented assets

that are hard to use as collateral for seeking loans from the banks/FIs (Chen et al., 2015), higher transaction costs and credit risks associated with the small loan amounts (IFC, 2012). Since the existing post-harvesting infrastructure can handle only 60 to 75 per cent of annual production of perishable fruits, flowers and vegetables, banks/FIs should develop credit products with a primary focus on cold chains rather than just cold storages to reduce FLW (Kohli et al., 2015).

There is a huge unmet demand for high-value food commodities/few processed foods mainly due to high disposable incomes, rapid urbanization, and rise in the living standards of people. This trend presents remunerative opportunities for the farmers to benefit by diversifying their crops as well as production (Hamshere et al., 2014). The farmers may also benefit from the expanding overseas markets for high-value food commodities (Swinnen and Maertens, 2014) driven by the presence of Indian diaspora abroad. However, the Indian farmers, especially small & marginal farmers, are unable to participate in the market-oriented agri-food systems due to certain challenges viz., inadequate post-harvest infrastructure, fluctuating global food prices, and increasing consumer concerns for safe and high-quality food, coupled with stricter food safety standards (FAO, 2012). As the competition in agri-food markets is likely to intensify due to liberalization and globalization, the challenges in the agriculture & allied sectors can be better addressed by establishing value chains that unite farmers, aggregators, traders, processors, exporters, and financial institutions (Chen et al., 2015). By doing so, transaction costs can be reduced, and competitiveness of the entire value chain can be improved (Trienekens, 2011).

The holistic nature of the value chain approach places special emphasis on the competitiveness and risk management of each activity. Therefore, in terms of financing, the product market orientation within the value chain can be considered as a substitute for physical collateral and serves as a

method to mitigate lending risks (Narayanan, 2012). Banks/FIs can regard value chains as a critical entry point to expand their business with various actors in the chain, particularly small-scale producers and entrepreneurs, with a view to decreasing transaction costs and mitigating credit-related risks (Miller and Jones, 2010).

The above literature review highlights the need for strengthening the post-harvest infrastructure in the country to support the farmers, especially small & marginal, with regard to institutional finance. Many previous studies emphasize on resorting to '*value centric approach*' in order to enhance the share of the farmer in the consumer's rupee of expenditure in the market. As creation of infrastructure at the individual farmer's level is fraught with many challenges, the concept of forming groups can streamline this process by harnessing the advantages of aggregation. Therefore, our study aims at evaluating the significance of institutional finance to the FPOs and (agri-based) Micro Small & Medium Enterprises (MSMEs) for scaling up of post-harvest processing infrastructure in the Indian context.

Research Methodology

We conducted a field study in April – July, 2022 to examine whether the FPOs in India addressed the farmers' distress and enhanced their income by engaging themselves in entire value chain activities in Telangana, Karnataka, Odisha, Uttar Pradesh and West Bengal. The study relies on both primary data and secondary data to understand the role of institutional finance in establishing post harvesting facilities. Also, certain case studies have been documented to showcase the approach of few organizations (FPOs/agri-based MSMEs) while availing institutional finance and for better comprehension of the research problem.

Sampling Plan: Specifically, the primary data were collected from farmer members of 60 FPOs spread across five states namely Karnataka, Telangana,

Odisha, West Bengal and Uttar Pradesh during April - July, 2022. The study covered 60 FPOs located in the above mentioned 5 states. As such, primary data were collected from 357 farmer members (5 states * 2 districts * 6 FPOs* 6 farmers) through purposive sampling. One limitation of the study is non-coverage of Western and Central regions of India mainly due to time constraint. Figure 1 portrays sampling plan of primary data.

Discussion & Analysis

As the world has been witnessing onset of disruptive technologies such as artificial intelligence, machine learning, block-chain, and internet of things, the agriculture sector can take advantage of these developments in order to create new job opportunities apart from kick starting the rural entrepreneurship especially in the PHT domain. For instance, traceability of agri-produce can be done from initial production to processing stage, by embracing block-chain technology and if any contamination occurs in between, it can be identified in time (Sunny et al., 2020). A case in point is that Sahyadri FPO in Nashik, Maharashtra adopted block-chain technology in its agri-processing facilities. Sahyadri Farms has been using block chain technology in its value chain for traceability of agri-produce from 'farm to fork' thereby increasing transparency and efficiency in its business operations. Block chain allows collection of reliable data by recording every step in a specific product's value chain. As a result, end-users/customers have instant access to information such as finer details of harvest including its quality. For this, the customers need to scan a quick response (QR) code shown on the product packaging to access the details of provenance/origin. While improving customer's trust, the solution enables the farmers to obtain other details: each individual produce was shipped to which person/place and at what price it was sold. Additionally, the system shows how much money the farmer receives and spends on processing,

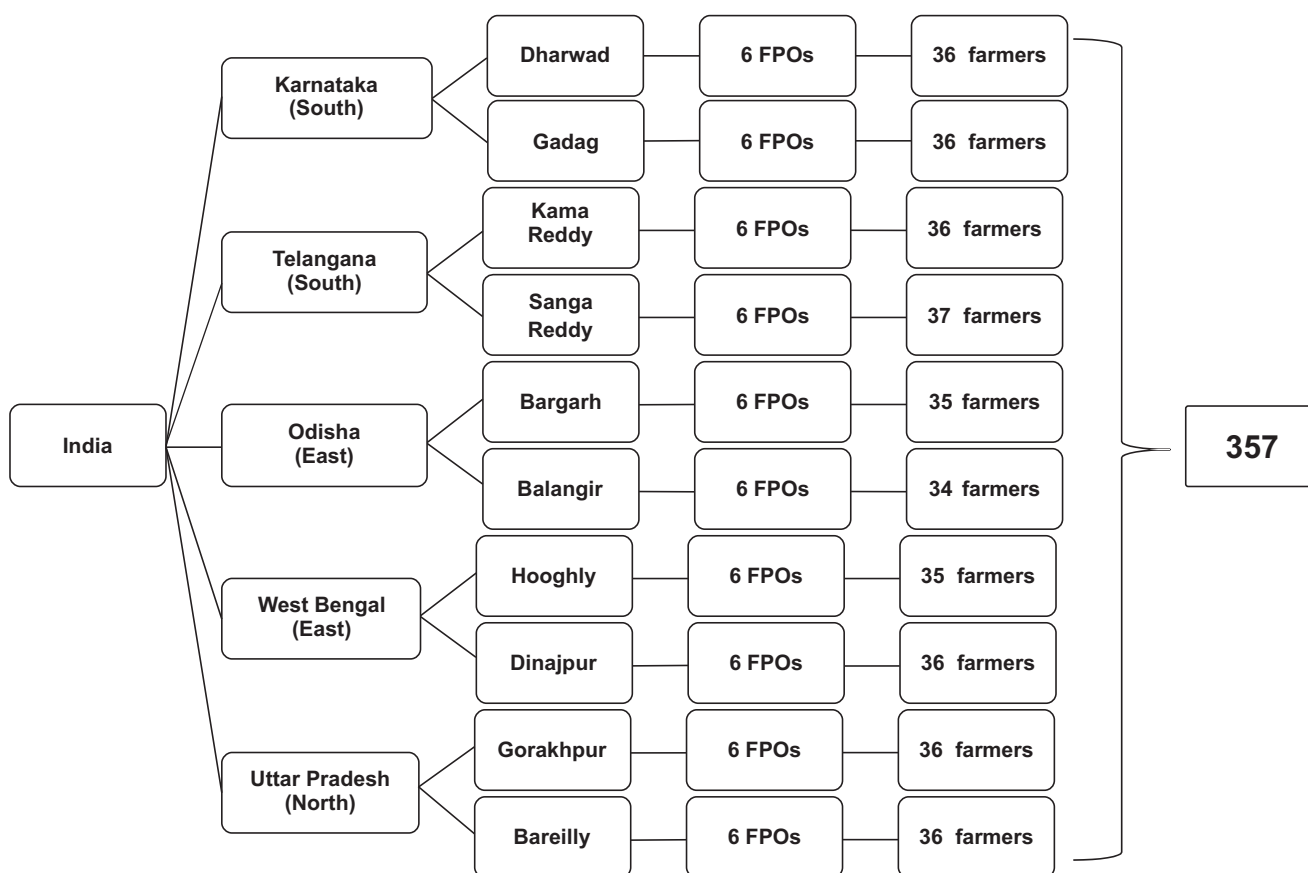


Figure 1: Sampling Plan of Primary Data from Members of FPOs

Essentially, the sample states and districts were selected based on the operational activity of FPOs during FY2019-20 and FY2020-21. Besides, the secondary data were retrieved from public domains such as NABARD, RBI, and the Ministry of Agriculture & Farmers' Welfare, Government of India.

packaging, transport, etc. Essentially, the block chain enables buyers and sellers to interact without an intermediary in a secure and trusted environment. Besides, block chain also ensures food safety of the products and helps Sahyadri Farms to achieve sustainability of its business activities.

Kazhani Farmer Producer Company in Erode adopted block chain technology to trace the origins of red banana cultivation to consumption thereby improving the farmers' income, and their standards of living (Nandhini *et al*, 2023). Similarly, Samunnati, SEEDS (Social Education & Economic Development Society), and Synchrony launched their integrated block chain operations in August, 2021

and minimized information asymmetry in the FPO agri-value chains (University of Hyderabad, 2021).

As part of our study, sampling of primary data was done in 5 states and descriptive statistics of the sampled FPOs are given in Table 1 below. According to Table 1, over 88 per cent of the sample consists of male farmers and just 12 per cent of female farmers, reflecting the actual position of gender mainstreaming prevailing in India. The data indicates that the majority of farmer members are from Other Backward Classes (71.15%), followed by Scheduled Castes (10.64%), and Scheduled Tribes (11.76%). Caste has an impact on access to agricultural credit in rural India (Rao, 2018).

While over two third of the sample (66.95%) studied up to 10th standard, 13.73 per cent studied up to Intermediate. Around one tenth of the sample (10.08%) studied up to degree. Education equips individuals with necessary understanding of loan granting process from formal financial institutions (Aditya *et al.*, 2019; Kumar *et al.*, 2021). Besides, educated individuals are less susceptible to bribery, thereby ensuring integrity of loan sanctioning process. As per Table 1, more than two third of the respondents (67.79%) are falling under the middle age group of 36 and 55, followed by the age category of 18 to 35 (26.69%), prime age for productive agricultural operations.

It is observed from our field study that majority of the FPOs work as simple intermediaries in agricultural value chains by aggregating produce and involving in primary processing activities: grading and sorting. It is noticed from our primary

data that, on an average basis, less than or equivalent to 40 per cent of the farmer members in the 5 sample states avail agricultural value chain activities from the FPOs. Essentially, the farmers are unaware of these services, don't have adequate agri-value chain infrastructure, and face heavy debt-burden which pressurise them to resort to distress sales without opting for value addition. Brief details of these observations are captured in Table 2.

Table 2 shows that farmers in West Bengal, Telangana, and Karnataka are more likely to leverage the FPOs for value-added services such as storage, grading, processing, packing, certification, branding & marketing than their counterparts in other states. Value addition activities are expected to significantly boost the farmers' incomes. However, field research reveals that farmers face significant obstacles such as knowledge gap, inadequate agri-value chain infrastructure, and financial constraints while engaging in value-added activities.

Table 1: Profile of Respondents

	Variable	Particulars	No. of Respondents	In % terms
1.	Gender	Male Female Total	315 42 357	88.24 11.76 100.00
2.	Social Category	General Category Scheduled Caste (SC) Scheduled Tribe (ST) Other Backward Classes (OBC) Total	23 38 42 254 357	06.44 10.64 11.76 71.15 100.00
3.	Education level	Not literate 1 st to 10 th standard Intermediate Degree Post-Graduation Vocational/Technical/others Total	17 239 49 36 9 7 357	04.76 66.95 13.73 10.08 02.52 1.96 100.00
4.	Age	18-35 years 36-55 years ≥ 56 years Total	96 242 19 357	26.89 67.79 05.32 100.00

Source: Field Survey; N = 357 farmer members from 60 FPOs in 5 States

Table 2: Agricultural Value Chain Activities of FPOs

Value Chain Activity	No. of Farmer Members Saying 'Yes' (%)					All 5 States
	Karnataka	Odisha	Telangana	UP	WB	
i. Storage	36 (50.00)	25 (36.23)	33 (45.21)	19 (26.39)	32 (45.07)	145 (40.61)
ii. Grading	34 (47.22)	20 (28.99)	27 (36.99)	19 (26.39)	31 (43.66)	131 (36.69)
iii. Primary Processing	29 (40.28)	17 (24.64)	27 (36.99)	12 (16.67)	24 (33.80)	109 (30.53)
iv. Packing	15 (20.83)	9 (13.04)	14 (19.18)	12 (16.67)	15 (21.13)	65 (18.20)
v. Certification	15 (20.83)	9 (13.04)	14 (19.18)	12 (16.67)	15 (21.13)	65 (18.20)
vi. Branding & Marketing	14 (19.44)	9 (13.04)	14 (19.18)	19 (26.39)	12 (16.90)	68 (19.04)

Source: Field Survey; N = 357 farmer members from 60 FPOs in 5 states

Note: Figures in parentheses represent percentage and the same will not be equivalent to 100 after addition, due to multiple responses from the farmer members to a single question

Table 3 provides sources of finance for the farmer members of FPOs in 5 study states. As per Table 3, after becoming members of the FPOs, the farmers in their individual capacity (88.23%) could obtain finance from formal banking sector. This happens because of collective bargaining power of the FPOs

and negotiation with bank officers for obtaining loans at affordable interest rate. Further, it is heartening to note that 100 per cent of the farmer members in Telangana State, over 90 per cent of respondents in Odisha and West Bengal source finance from banks/FIs, after joining the FPOs.

Table 3: Sources of Finance of Farmers as Individuals

Sources of Finance	No. of Farmer Members Saying 'Yes' after joining FPO					All 5 States
	Karnataka	Odisha	Telangana	UP	WB	
i. Banks / Financial Institutions (FIs)	60 (83.33)	64 (92.75)	73 (100.00)	54 (75.00)	64 (90.14)	315 (88.23)
ii. Money lenders	22 (30.56)	16 (23.19)	12 (16.44)	17 (23.61)	8 (11.27)	75 (21.01)
iii. Traders	20 (27.78)	12 (17.39)	6 (8.22)	23 (31.94)	10 (14.08)	71 (19.88)
iv. Friends/ members of family	22 (30.56)	16 (23.19)	13 (17.81)	17 (23.61)	9 (12.68)	77 (21.56)

Source: Field Survey; N = 357 farmer members from 60 FPOs in 5 states

Note: Figures in parentheses represent percentage and the same will not be equivalent to 100 after addition, due to multiple responses from the farmer members to a single question

Previous research studies conclude that there is a negative relationship between the SHG-BLP and share of money lenders in the rural credit (Dasgupta, 2001; Shylendra et al., 2010; Koichi and Keiko, 2011). However, it is noticed from our field survey that the presence of money lenders still exists in respect of all the five study states (21.01%) despite the availability of formal sources of finance from banks/FIs. It implies that the share of money lenders in rural financial landscape gradually declines once the formal banking gets expanded. It is observed from Table 3 that at least one fifth of the farmer members in the sample avail loans from traders, friends and members of (extended) family and money lenders perhaps due to inadequacy of finance from formal sources. Moreover, these informal lenders may provide loans at short notice that too without documentation. While, 30.56 per cent farmer members in Karnataka approach money lenders/friends and members of family, 31.94 percent of respondents from Uttar Pradesh resort to informal finance from traders/commission agents besides formal sources. As such, rural indebtedness still persists among the farmer members, who need counselling in respect of financial prudence, since informal finance is costly and reduces the marketable surplus of the farmers.

Further, based on the secondary data collected from audited annual reports of the 60 sampled FPOs, we

tried to examine the financial viability of these entities and their key financial indicators are reported in Table 4. It is noticed from Table 4 that average net profit margin of all 60 sampled FPOs was -0.16 per cent for the financial year 2020-21 as against -0.70 per cent during the previous financial year. As the sampled FPOs incur net losses during the study period, it may be concluded that their financial sustainability is less than satisfactory. However, it is a consolation that the sample FPOs recorded average cash profit during the study period. Further, it is observed from Table 4 that average current ratio of all FPOs stood at 2.04 times as on March 31, 2021 as against 3.30 times as on March 31, 2020. Current ratio indicates liquidity position of the FPOs. Ideally, current ratio should be 2:1 so that the FPOs can meet their current obligations without any problem. As such, average current ratio of 2.04 times of all FPOs in the study States as on March 31, 2021 is satisfactory to meet their working capital requirements.

According to an estimate, FPO requires Rs. 25-30 lakh to commence its operations, of which Rs.5-6 lakh must come from equity which can be leveraged up to 4:1 for loans. In fact, equity mobilization of FPOs must be higher in order to create and sustain member loyalty and patronage. The members may be hesitant to contribute equity capital to young

Table 4: Key Financial Indicators of the FPOs

Key Financial Indicator of Sampled 60 FPOs	FY 2020	FY 2021
i) Average Net Profit (Rs.)	-20,850	-4,843
ii) Average Cash Profit (Rs.)	-15,260	2,697
iii) Average Net Profit Margin (%)	-0.70	-0.16
iv) Average Current Ratio (:1)	3.30	2.04
v) Average Net Working Capital (Rs.)	4,04,894	6,31,659
vi) Average Long Term Loans (Rs.)	1,34,405	1,48,035
vii) Average Net Worth (Rs.)	3,18,274	4,19,068
viii) Solvency Ratio (:1)	0.42	0.35

enterprises (i.e., FPOs) especially if they don't perceive any significant benefits (Kanitkar, 2016; Singh, 2016). Generally, farmers see the FPO as a government project and therefore do not see the need for putting in their own money. On the other hand, banks/FIs are not willing to finance the FPOs for want of collateral and credit history (NABARD, 2018), absence of farmer-level data and lack of standardized grading and assessment models for FPOs (SOFPO, 2023).

Average net worth of the 60 FPOs in study states stood at Rs.4.19 lakh as of March, 2021. As such, most of the sampled FPOs in the study could not mobilize Rs. 15 lakh as paid-up capital and becomes eligible for receipt of full benefits under the Equity Grant Scheme of Govt. of India. It is also observed that average solvency ratio is 0.35 times as on March 31, 2021 which indicates that the sampled FPOs in the study States availed lower long term debt. Long term funds are essential for gross capital formation of FPOs, as they have to invest in agri-value chain facilities in terms of processing, value addition, market linkages, etc.

Further, it is noticed that the sampled FPOs don't have free access to formal credit in India mainly due to their low capital base, absence of credit history, lack of credit rating, non-maintenance of proper financial records, operations confined to high-risk

agriculture sector, non-bankable business plans, elite capture, unprofessional management/staff, etc. Our finding is in line with the observation of SOFPO Report, 2023 wherein it was mentioned that only 11 per cent of the FPOs have access to institutional credit in India. Based on secondary data, access to finance by the FPOs from banks/FIs in India is given in Table 5 below:

It is evident from Table 5 that 2,683 FPOs (around 11% of total FPOs in the country) received financial assistance of Rs.686 crore in FY 2022-23 from various credit agencies. However, average ticket size of the loan is Rs.25.57 lakh during FY 2023, which is very low, as far as value chain activities are concerned. It can be seen that credit to FPOs doubled i.e., from Rs.343 crore to Rs.686 crore during the period 2021-23, though there was a slight dip during the FY2022 perhaps due to Covid-19 pandemic. Besides, the number of assisted FPOs jumped from 444 to 2,683 during this period. According to Table 5, Samunnati is the major lender (75%) as far as credit to FPOs in India is concerned. This is followed by NABKISAN which extended loans to 700 FPOs to the tune of Rs. 140 crore (20.41%) during the FY2023. It is worth mentioning here that loans up to Rs. 2 crores for FPOs (including loans up to Rs. 50 lakhs for warehouse receipts) are covered under priority sector lending.

Table 5: Lending to FPOs by Major Credit Providers

(Amount Rs. in Crore)

Name of the Lender	2020-21		2021-22		2022-23	
	Amount	No. of FPOs	Amount	No. of FPOs	Amount	No. of FPOs
1.Samunnati	243	165	216	379	513	1,941
2.NABKISAN	78	262	96	410	140	700
3.FWWB*	19	16	11	20	28	40
4.Caspian Debt	3	1	5	1	5	2
Total	343	444	328	919	686	2,683

Source: SoFPO Report, 2023; *indicates Friends of Women's World Banking

Viewed from this perspective, there is a great scope for credit enhancement from formal sources to the FPOs.

As per the provisional data from NABARD, total agricultural ground level credit in India stood at Rs. 25.10 lakh crore as of March 31, 2024; out of which investment credit was Rs.10.30 lakh crore (41.03%) and crop loans were Rs.14.80 lakh crore (58.97%). About 79 per cent of this total credit of Rs.25.10 lakh crore was disbursed by the scheduled commercial banks, while medium/large farmers, corporates, traders and input dealers receive a lion's share out of it. Hence, there is a great scope for institutional investment credit especially in respect of financing of PHTs to place the agriculture into the next orbit.

Of late, the concept of agricultural value chain finance has been gaining traction in agrarian economies dominated by smallholders, such as China and India. This approach, by addressing liquidity constraints, enables small-scale producers and entrepreneurs to enhance productivity and capitalize on the benefits of value addition. Value addition of agri-produce through PHTs commands higher prices and ultimately leads to enhancement of incomes of the farmers. Also, this investment in agri-infrastructure will have a multiplier effect on entrepreneurship, exports, and gross domestic product of the economy. In the following paragraphs, we have documented certain case studies wherein institutional finance has been sanctioned for creation of post-harvesting infrastructure in agriculture & allied sectors.

i) Sam Agri-tech (P) Ltd. was founded in Hyderabad in 1996 and it is an integrated exporter of horticulture produce such as pomegranate arils, cut coconut chunks, figs, etc. The company has the state-of-the-art facilities that have global accreditations like ISO: 22000 HACCP, BRC, US FDA, Global GAP, and SMETA, and Fair-trade.

The company also established systems for traceability, food safety protocols, hygiene and implemented robust processes and digital systems to track every activity of its value chain. During the FY2022-23, the company recorded gross sales of over Rs.60 crore and obtained short term as well as long term loans from State Bank of India for its operations and establishment of manufacturing facilities (Source: Field survey).

ii) Naarinja Rythu Mitra FPO, Sanga Reddy, Telangana started its operations in 2021 with four farmer members and now it has 200 farmers who cultivate cotton, soybean, fruits, and vegetables. The FPO obtained short-term loan from Samunnati to the extent of Rs.50 lakh @15.75 per cent p.a. during the FY2023. The FPO procures from the farmers and village level aggregators in Sanga Reddy and sells, in bulk, to agri-processing companies based in Dharwad (Karnataka) and Latur (Maharashtra). Besides, the FPO supplies agri-inputs to its members at reasonable prices. During the FY2023, the FPO recorded total turnover of Rs.3.32 crore (Source: Field survey).

iii) Dang Ahwa FPO, Gujarat received financial assistance of Rs.36 lakh from Union Bank of India under the Pradhan Mantri Formalization of Micro Food Processing Enterprises (PMFME) scheme. As on date, the FPO has 312 farmer members who cultivate Millets. It has been promoted by Astitva Foundation, an NGO and collaborated with Indian Institute of Millets Research (IIMR), Hyderabad to produce cookies, namkeens, poha, etc (Source: Shri Pankaj Mall, CEO, Astitva Foundation who attended a workshop at MANAGE, Hyderabad during December 19-21, 2023).

iv) Samarth Kisan Producer Company Ltd. has 6,500 farmer members based in Ujjain, Madhya Pradesh. The farmers cultivate soybean, wheat, and black gram and the FPO has a warehouse with a capacity of 3,200 MTs. The FPO achieved net sales

of Rs.14.22 crore during the FY 2022-23 as against Rs.7.80 crore during the FY2021-22. The FPO could attract multiple lenders namely State Bank of India, Yes Bank, NABKISAN, and Samunnati at affordable interest rate (10.65% p.a.) with a total sanctioned credit limit of Rs.5.80 crore, mainly due to its presence in its entire value chain activities (Source: review of literature).

It is noticed that the above organizations leveraged agricultural value chains and access financial services like revolving credit facilities, term loans, co-lending arrangements, credit guarantees, etc. and experienced significant business growth and ultimately enhanced the incomes of the farmers and other stakeholders.

Policy Recommendations & Conclusions

There is no equitable world with hunger. Agriculture, through its links to food security and nutrition, healthcare, sustainable livelihoods, and rural development, plays an important role in achieving the entire set of SDGs. Therefore, policy makers may focus on leveraging the entire agri-value

chains through creation of agro-processing clusters, mega food parks, cold storage chains, ripening chambers, etc. in order to achieve the SDGs such as SDG1 - No poverty, SDG2 - Zero hunger, SDG8 - Decent work & economic growth, SDG14 – Life below water, and SDG15 – Life on land. While providing credit to scale up agri-post-harvesting infrastructure, green finance should be promoted since climate change is a reality.

Banks/financial institutions should treat cash flow of the FPOs/agri-based MSMEs as collateral rather than physical assets alone while extending financial support to these fledgling business entities. Further, the rural youth/farmers should be imparted advanced training, and capacity building in PHTs encompassing Artificial Intelligence, Machine Learning, Internet of Things, and Block-Chain technologies. While the rural youth may be attracted to engagement themselves in business activities of FPOs, the urban youth may be encouraged to participate in food processing and exports. Table 6 shows technical, financial and other challenges of post-harvesting space and suggested policy response.

Table 6: Various Challenges of Post-harvesting Space and Policy Suggestions

Category of Challenge	Nature of Challenge(s)	Suggested Policy Response
i. Technical	<ul style="list-style-type: none"> ➤ Non-conversion of cutting edge research ideas into commercial products ➤ Obsolete technology and low purchasing power of the farmers ➤ Absence of right extension services and institutional support to the farmers ➤ Inadequate capacity building of farmers 	<ul style="list-style-type: none"> ➤ Innovation and entrepreneurship culture may be promoted through right ecosystem ➤ Conducting applied research on post-harvest processing, preservation, storage, and value addition of agri-commodities; block-chain, AI and ML may be leveraged in this regard. ➤ National FPO Academy may be set up to offer mini-MBA courses and focus on imparting training & capacity building, especially with regard to financial/digital literacy, to the office bearers of the FPOs/agripreneurs. ➤ Special training on food processing, packaging, and value addition of agricultural and livestock produce

Category of Challenge	Nature of Challenge(s)	Suggested Policy Response
ii. Financial	<ul style="list-style-type: none"> ✓ Low investment credit for creation of fixed assets in agriculture ✓ Absence of credit history as well as credit rating in respect of the FPOs ✓ Low capital base/equity of the FPOs 	<ul style="list-style-type: none"> ✓ As bank officials at branch level have negligible understanding about the FPOs, special training may be imparted to field officers/branch managers of banks in this regard. ✓ Value chain financing of FPOs may be encouraged to create a win-win situation for all stakeholders. ✓ Interest subvention may be extended to investment credit too. There is a need to phase out 'loan waivers' to improve institutional credit culture. ✓ Co-financing/Re-financing of banks/FIs to extend credit to the FPOs may be tried. ✓ Invoice Discounting / Trade Receivables Discounting System (TReDS) may be extended to agri-business industry ✓ FPOs may be transformed into professional organizations through right inputs, formal credit plus services, and matching equity grants, Collateral free loans, transaction based lending i.e., based on filing of returns related to goods & services tax, or based on digital foot prints, etc. ✓ Agri-MSMEs/FPOs may be allotted land on lease basis in industrial hubs/corridors, as cost of the land forms major component of their project cost. ✓ Convergence of SHGs and FPOs; federating these community based organizations would be a game changer in PHT space.
iii. Others	<ul style="list-style-type: none"> • Poor handling of post-harvest produce and lack of cold storage facilities • Absence of agri value chain infrastructure facilities • No established transportation & distribution networks • Underdeveloped market linkages 	<ul style="list-style-type: none"> • Custom Hiring Centres may be promoted to encourage the farmers/FPOs for adoption of increased farm mechanization. • Agri-infrastructure may be created across the country by utilizing the funds from Agri-Infrastructure Fund, Operation Greens, Mission for Integrated Development of Horticulture, Post-Harvest Marketing Scheme, Integrated Post Harvest Management scheme, PMKSY, PMFME, SFURTI, etc. • FPOs may be promoted in a big way to establish remunerative market linkages and collective bargaining power of the farmers. • Contract farming may be encouraged.

Agriculture is the key to fulfil half of the 17 SDGs. Green Revolution 1.0 transformed India from food-deficit to food-surplus country; subsistence farming to sustainable agriculture; consumption-based economy to export oriented economy. The Green Revolution 2.0 may be achieved through policy focus on collectives like FPOs/agri-based MSMEs,

scaling up of institutional credit to the PHTs, and exploring (export) markets through value addition. The power of innovation coupled with the power of aggregation is the panacea for most of the problems in agriculture. Therefore, strengthening of the FPOs/agri-based MSMEs by scaling up of post-harvest processing facilities through

institutional finance has the potential to improve lives and livelihoods of 12.6 crore small & marginal farmers across India. Essentially, strategic policy actions are called for to kick start innovation and entrepreneurship through adequate emphasis on knowledge, skills and technology in agriculture and allied sectors thereby achieving the US\$ 5 trillion Indian economy sooner than later.

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