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Assessing the Sustainability of Farmer Producer Companies (FPCs) in Western Himalayan Region

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Abstract: This study assesses the sustainability and future prospects of Farmer Producer Companies (FPCs) in Himachal Pradesh (HP). According to the secondary data collected from the Horticulture Development Project (funded by World Bank), National Bank for Agriculture and Rural Development (NABARD), Shimla and Small Farmers Agribusiness Consortium (SFAC) there are 216 FPCs registered, with the highest numbers in Shimla (36), Mandi (33), Sirmaur (31) and Kangra (26), accounting for over 50% of the state's FPCs. Most FPCs were formed between 2021 and 2023, with a linear growth rate of 35.11 percent annually since 2015. The study evaluates the activities of FPCs, revealing that 53 percent focus on horticultural crops, 41 percent on agricultural and allied activities, and fewer on handicrafts, dairy, fishery, and forestry. Using the ARIMA model, it forecasts the registration of 500 more FPCs by 2030. The study recommends training programs, sustainable harvesting, marketing techniques, and NTFP diversification to enhance the sustainability of FPCs. The Himachal Pradesh government's initiatives in registering well-established natural FPCs further promote sustainability.

Keywords: Farmer Producer Companies (FPCs), Linear growth rate (LGR), Sustainable Development Goals (SDGs), ARIMA model

The concept of producer companies, introduced in India in 2002 as part IX A of the Companies Act 1956 under economist Y K Alagh, offered Indian farmers a new path towards livelihood sustainability (Jose 2018). The first producer company was registered in 2004, and the number grew to 15,948 by 2021, with a significant increase in registrations during the financial years 2020 and 2021 (Padaliya et al., 2022). According to the Union Ministry of Corporate Affairs, there were 16,000 Farmer Producer Companies (FPCs) in the country as of February 2023, with 65 per cent of these being registered in the past three years (2020-21, 2021-22, 2022-23) (DTE 2023). In December 2019, Small Farmers' Agri-business Consortium (SFAC) released a “Strategy Paper for Promotion of 10,000 Farmer Producer Organizations (FPOs)”, which was followed in July 2020 by the release of Operational Guidelines by the Department of Agriculture, Co-operation & Farmers' Welfare (SFAC 2019; DACFW 2020; Govil and Neti 2021). The scheme aims to provide holistic and broad based supportive ecosystem to facilitate development of vibrant and sustainable income oriented farming and for overall socio-economic development and wellbeing of agrarian communities (DACFW 2020). When the Scheme for Promotion of 10,000 FPOs has been announced since then the large numbers of producer companies continued to be promoted in the subsequent two years (FY20 and FY21), since most of the registrations took place during the Covid-19 pandemic from period March 2020 – March 2021 (Neti and Govil 2022)

Himachal Pradesh has seen the evolution and adaptation of FPCs, building on existing cooperative structures. The concept of collective action among farmers in the state dates back to the pre-independence era, addressing issues of fragmented landholdings and limited market access. While FPCs in Himachal Pradesh are relatively new, their development since the mid-2010s indicates growing adoption. The state's Prakritik Khetti Khushhal Kisan Yojana promotes climate-resilient natural farming, an agricultural approach that avoids synthetic inputs and aligns with natural ecological processes. Several initiatives, including the HP Horticulture Development Project (World Bank-funded), National Bank for Agriculture and Rural Development (NABARD), Small Farmers Agribusiness Consortium (SFAC), State Project Implementing Unit (SPIU), and Dr. YSP University of Horticulture and Forestry in Solan, support natural farming in Himachal Pradesh. Companies like Chaupal Natural Farmer Producer Company, Solan Natural Farmer Producer Company, Pachhad Natural Farmers Producer Company Limited, Karsog Valley Farmer Producer Company Limited, and Kutlehar Naturals Farmer Producer Company Limited offer training, technical support and capacity-building programs. These initiatives have significantly promoted the sustainability and growth of FPCs in the state, indicating a promising future for farmer-driven collective enterprises in Himachal Pradesh.

MATERIALS AND METHODS

Himachal Pradesh, a Himalayan state in northern India, which is situated between 30^0 22' N to 33^0 13' N latitude and 75^0 23' to 79^0 4' East longitude is known for its diverse agriculture and horticulture practices. In recent years, there has been growing interest in promoting sustainable agricultural practices; especially natural farming (NF). The secondary data has been collected from the Horticulture Development Project (funded by World Bank), National Bank for Agriculture and Rural Development (NABARD), Shimla and Small Farmers Agribusiness Consortium (SFAC). There are total 216 registered farmer producer companies in Himachal Pradesh according to the secondary data collected from Horticulture Development Project (funded by World Bank), National Bank for Agriculture and Rural Development (NABARD) and Small Farmers Agribusiness Consortium (SFAC). The highest number of FPCs registered is in Shimla district (36) followed by Mandi (33), Sirmaur (31) and Kangra (26). These four district accounts more than 50 per cent of total FPCs registered in Himachal Pradesh.

Linear Growth Rate : The trends in the growth of FPCs in the Himachal Pradesh were estimated using linear growth rates (LGR).

$Y = a+b_t$

where,

Y = Number of FPCs registered (2015-2023)

t = Time variable in year (1, 2, …..9)

a = Constant

b = Rate of change

The linear growth rate was calculated as:

Linear growth rate = $b/y \times 100$

where, b = regression coefficient, Y= Mean value of Number of FPCs registered (2015-2023)

Autoregressive Integrated Moving Average (ARIMA) Model: Autoregressive Integrated Moving Average (ARIMA) model was used for forecasting the growth of FPCs in the state of Himachal Pradesh with the help of R-studio software. The "R"-based software packages "tseries" and “forecast” were used to carry out the trend series analysis and forecasting of the growth of FPCs in Himachal Pradesh from 2024-2030. It forecast seven year (2024–2030) registered FPCs using forecast, prophet library and validation. Time series data are organized by time order and applied to develop and improve forecasting models. Prophet can handle trend shifts and outliers. The ARIMA model depends upon error lags *i.e.,* the difference between forecasted and actual outcomes. For the ARIMA model, data must be check for stationary autocorrelation. The Auto Arima function will check via autocorrelation function (ACF) and Partial autocorrelation function (PACF). Once the model is fitted using the Akaike Information Criteria (AIC), the best-fitted model is selected for forecasting. If the selected model does not meet the criteria, the process is repeated. Finally, the statistical validity of the prediction is verified using the Box-Ljung test (Thapa 2022)

RESULTS AND DISCUSSION

Status of Farmers' Producer Companies (FPCs) in Himachal Pradesh: The Linear Growth Rate (LGR %) was evaluated as 35.11per cent indicates that since the year 2015 every year the number of registration has grown at the rate of 35 per cent. It is due to the policy support provided from state government along with support and assistance extended through Small Farmers Agribusiness Consortium (SFAC), National Bank for Agriculture and Rural Development (NABARD) as well as countless efforts of Horticulture Development Project (funded by World Bank) working at the grass root level. 53 per cent of Producer Companies are working with Horticultural crops and 41 per cent are dealing with agricultural and allied activities, while only very few are active in the areas of handicrafts, dairy, fishery and forestry).

Forecasting the growth of Farmer Producer Companies (FPCs) in Himachal Pradesh: There is blue line through which only one spike of black line are crossing which means that data is not highly correlated with itself and this pattern show that data is stationary (Fig. 3). The partial correlation function (PACF) will be employed for checking the stationary of the data, PACF has no issue because there are minimum spikes and none of them are crossing blue lines.

The last stationary test is by augmented dicky-fuller test (ADF) where the p value of ADF should be less than 0.5 or at least it should be 0.5. If the value p value is less than or equal to 0.5 then it means data is not stationary and estimated p value is 0.57 which is means data is stationary. Now comes Auto Arriva function which shows the best fitted model comes in the ARIMA (p, d, q) and the best model is (0,1,0) where the Akaike information criterion (AIC) value should be as small as possible. The forecasting of the data for the next 7 years at 95 percent of confidence interval will be filtered (Fig. 4). The last step is to validate the test with the help of Box-Ljung test; this test should have p value more than 0.5 which means data is not autocorrelated (Table 2). There will be highest 605 more companies and lowest will be 182 more companies listed in the state in next seven years at 95 per cent of confidence interval. The Auto-Regressive Integrated Moving Average (ARIMA) show there is upward growth from the year 2020-2023 (Fig. 4). If the company sustains and work effectively for a long term it will enhance the human productivity and therefore sustainability of company will be influenced. Small and marginal farmer's livelihood sustainability to a great

extent will depend upon the equitable access to product markets.

SDGs Relevant with Farmer Producer Companies (FPCs): Agriculture can positively help in achieving seven SDGs (Nicholls et al. 2020) and five of these were the same as observed in study by Nhemachena et al. (2018), namely SDGs 1, 2, 12, 13 and 15. The others are as follows: SDG3- ensure healthy lives and promote wellbeing and SDG8- promote sustained, inclusive and sustainable economic growth. Based on the SDGs and the role of FPCs for furthering the same, developed the framework (Table 3), briefly describing SDGs related to agriculture that can be impacted by FPCs. FPCs are considered to be beneficial to

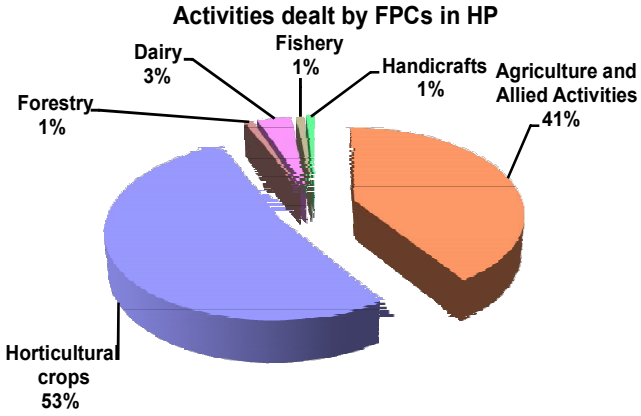

Fig. 2. Various activities dealt by FPCs in Himachal Pradesh

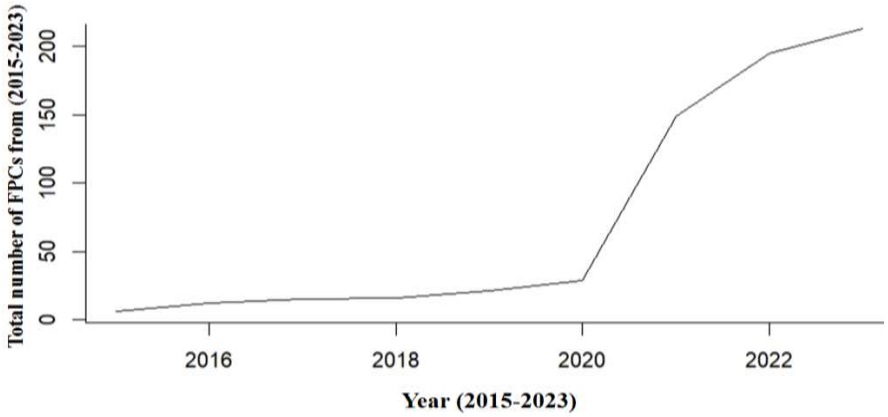

Fig. 1. Trend analysis of FPCs in Himachal Pradesh

Table 1. District wise number of FPCs registered in Himachal Pradesh (2015-2023)

District	Number of FPCs Registered (2015-2023)								
	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bilaspur	-	-	1	1	-	-	5	4	1
Chamba	-	-	-	-	-	-	16	4	1
Hamirpur	-	-	-	-	1	-	3	2	1
Kangra	1	-	1	-	-	2	10	6	6
Kinnaur	-	-	-	-	-	2	6	1	2
Kullu	-	-	-	-	-	-	12	2	1
Lahul and Spiti	-	-	-	-	-	-	-	2	1
Mandi	1	-	1	-	-	1	14	15	1
Shimla	1	2	-	-	4	-	20	5	4
Sirmaur	-	2	-	-	-	1	26	1	1
Solan	1	2	-	-	-	-	3	2	-
Una	2	-	0	-	-	2	5	2	2
Total FPCs registered	6	6	3	1	5	8	120	46	21
Cumulative	6	12	15	16	21	29	149	195	216
Total Paid up capital (₹ crore)	21.11	7.49	375.87	6.75	18.30	239.89	273.12	65.27	51.98
Cumulative	21.11	28.60	404.47	411.22	429.52	669.41	942.53	1007.80	1059.78
Current annual growth rate (%)					35.11				

the individual farmers owing to the short-term and long-term financial benefits (direct) and in terms of services and reduced costs (indirect benefits). These do grip the promise of realising no poverty (Goal 1) and reduce inequality by increasing income of poor (Goal 10). FPCs contribute towards better health and nutrition and sustainable agriculture (Goal 2) due to organic farming practices is well accepted (Mourya and Mehta 2021).

FPCs play a crucial role in making food accessible for poor where accessibility of food is very much important to achieve the Sustainable Development Goals (SDGs-2) in developing countries like India (Trebbin and Hassler 2012). Poverty is another issue resolved by FPCs as less amount of equity capital is accumulated during the initial phase of business. The strategy emerged from studies in Asia and Africa for contravening such vicious cycles of poverty was to harmonize small agro-enterprise. Accompanying with complementary interventions such as positive spill-overs including technological innovation, rural credit systems, communications, human capital formation and physical infrastructure (Singh 2012).

Case study of natural farmer producer companies in Himachal Pradesh: The consolidated information that brings together all the details of the natural farmer producer companies in Himachal Pradesh is given in Table 4.

Trend Analysis

POPI support: Most of these companies are receiving technical support from Dr. YS Parmar University of Horticulture and Forestry, Nauni, which indicates the importance of institutional support in establishing and running these companies.

Diverse business activities: The business activities range from processed items, spices, cereals, vegetables, fruits, pulses, garlic, and ginger. This diversification helps in risk mitigation and ensures a steady income for the farmers.

Member participation: The number of members varies significantly among the companies, with Pacchad having the highest at 112 members, and Kutlehar the lowest at 0 members. This could reflect the varying levels of community engagement and trust in these initiatives.

Equity mobilisation: There is a noticeable range in equity mobilized, with Pacchad mobilizing the highest amount at ₹1.47 lakhs, indicating perhaps a greater level of investment and financial health, while Kutlehar has the lowest at ₹0.18 lakhs.

Focus on value addition: Companies like Chaupal and Solan are focusing on value addition and processing, which can significantly enhance the profitability and marketability of their products.

The trend suggests that institutional support, member engagement and diversification of activities are crucial factors for the success and sustainability of Natural Farmer Producer Companies in Himachal Pradesh

The Linear Growth Rate (LGR) of 35.11 percent indicates a significant increase in the number of Farmer Producer Companies (FPCs) registered in Himachal Pradesh from 2015 to 2023. This growth is attributed to policy support from the state government and assistance from institutions such as the Small Farmers Agribusiness Consortium (SFAC), National Bank for Agriculture and Rural Development (NABARD), and the World Bank-funded Horticulture Development Project. A majority (53%) of FPCs are engaged in horticultural crops, while 41% are involved in agricultural and allied activities. Only a few FPCs are active in areas like handicrafts, dairy, fishery, and forestry, indicating a potential area for diversification. Districts like Kangra, Mandi, Shimla, and Sirmaur have the highest number of FPC registrations, showcasing regional concentration. The total paid-up capital of FPCs has grown significantly, reaching ₹1059.78 crore by 2023, reflecting strong financial backing and investments. Using the ARIMA model, the forecast indicates a continuous upward trend, with the number of FPCs expected to reach between 394 and 605 by 2030. This growth will enhance human productivity and sustainability of FPCs, ultimately benefiting small and marginal farmers by providing better market access. FPCs contribute to achieving several Sustainable Development Goals (SDGs) including No Poverty (Goal 1), Zero Hunger (Goal 2), Gender Equality (Goal 5), Decent Work and Economic Growth (Goal 8), Reduced Inequalities (Goal 10), Sustainable Consumption and Production (Goal 12), Climate Action (Goal 13), and Peace, Justice, and Strong Institutions (Goal 16). FPCs play a critical role in improving the livelihood of smallholder

Table 2. Farmers' producer companies growth forecast of Himachal Pradesh

Year	Point forecast	Lo 95	Hi 95
2024	238.875	159.0239	318.7261
2025	264.750	151.8234	377.6766
2026	290.625	152.3188	428.9312
2027	316.500	156.7977	476.2023
2028	342.375	163.8224	520.9276
2029	368.250	172.6555	563.8445
2030	394.125	182.8587	605.3913

Best model: ARIMA(0,1,0) with drift

Augmented Dickey-Fuller Test
Dickey-Fuller = -1.999, Lag order = 2, p-value = 0.5728

Box-Ljung test
X-squared = 0.64048, df = 2, p-value = 0.726

farmers, promoting sustainable farming practices, and fostering inclusive economic growth.

To ensure the sustainability and growth of Farmer Producer Companies (FPCs), several recommendations should be considered. Firstly, it is essential to encourage FPCs to diversify into areas such as handicrafts, dairy, fishery, and forestry to reduce dependency on a single sector and increase income sources. Promoting value addition and processing activities can enhance the profitability and marketability of products. Implementing comprehensive training programs focused on sustainable farming practices, advanced marketing techniques, and financial management is crucial. Continuous support and capacity-building initiatives will improve the skills and knowledge of FPC members. Strengthening institutional support by fostering stronger collaboration between government institutions, NGOs, and educational institutions can create a holistic and supportive ecosystem for FPCs. Facilitating knowledge

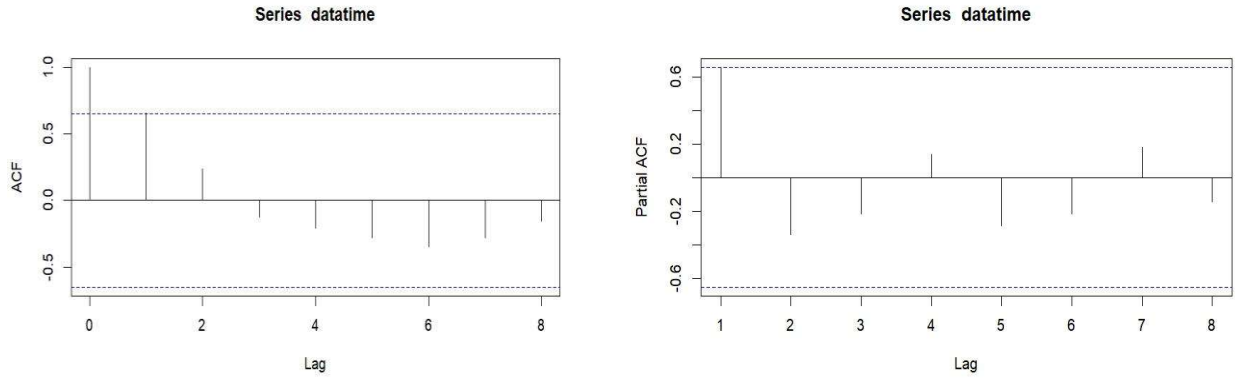

Fig. 3. Plot of autocorrelation function and partial autocorrelation function of residuals for farmer producer companies (FPCs)

Table 3. Sustainable development goals (SDGs) related with farmer producer companies (FPCs)

SDGs	Targets
Goal 1: No poverty	FPCs can lift smallholder farmers out of poverty by improving their farm incomes, access to inputs and credit at lower costs. Providing better market access and bargaining power for farmers and reducing post-harvest losses through better storage and processing facilities (Papnai et al., 2021)
Goal 2: Zero hunger	FPCs improve food security and nutrition by promoting sustainable farming practices that increase productivity and reducing food waste through better storage and processing techniques. Linking farmers to markets where they can sell their produce at fair prices (Mourya and Mehta 2021)
Goal 5: Gender equality	FPCs can empower women farmers by providing them with training and capacity building programs. Encouraging their participation in decision-making processes and creating new income-generating opportunities for women
Goal 8: Decent work and economic growth	FPCs can create new jobs in rural areas by promoting agro-processing and value addition activities instead of selling raw in the market. Providing farmers with better market access, which can lead to increased demand for labour and encouraging entrepreneurship among farmers
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation	FPCs increase the access of small-scale industrial and other enterprises particular in developing countries like India Provide financial services to small scale farmer in order to build infrastructure including affordable credit and their integration into value chains and markets (Mourya and Mehta 2021)
Goal 10: Reduced inequalities	FPCs can help reduce inequalities between small and large farmers by providing small farmers with access to the same resources and services as large farmers. Giving them a stronger voice in the market and helping them to improve their livelihoods (Venkatesan et al., 2020)
Goal 12: Ensure sustainable consumption and production patterns	FPCs can promote sustainable consumption and production patterns agriculture by encouraging farmers to adopt environmentally friendly practices. Helping farmers to improve the efficiency of their resource use that reduce food wastages.
Goal 13: Climate action	FPCs can help in mitigating climate change by promoting practices that sequester carbon in the soil and reduce greenhouse gas emissions from agriculture. It also helps farmers to adapt to the effects of climate change (Zobeidi et al., 2022).
Goal 16: Peace, justice and strong institutions	Develop effective, accountable and transparent institutions. Ensure responsive, inclusive, participatory and representative decision-making at all levels of institutions (Mourya and Mehta 2021)

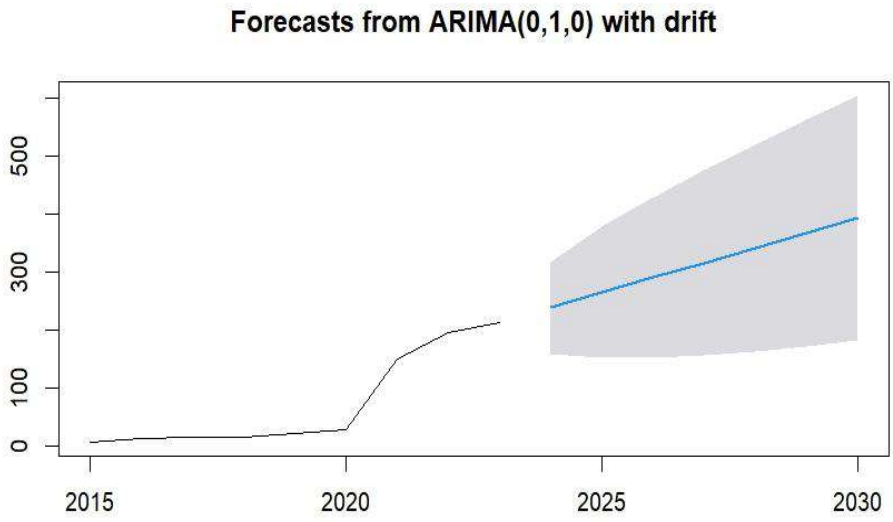

Fig. 4. Forecasting of farmer producer companies in Himachal Pradesh from (2024-2030) using ARIMA model

Table 4. Natural farmer producer companies in Himachal Pradesh

Company name	Major business activity	POPI name	Total members	Equity mobilised (₹ Lakhs)
Chaupal naturals farmers producers company ltd.	Processed items, apple, fruits & vegetables, pulses, millets	Dr. YS Parmar University of Horticulture and Forestry, Nauni	41	0.97
Solan natural farmer producer company ltd.	Spices, cereals (food grains & millets),vegetables, pulses	Dr. YS Parmar University of Horticulture and Forestry, Nauni	42	0.73
Pacchad natural farmers producers company ltd.	Garlic and ginger	Dr. YS Parmar University of Horticulture and Forestry, Nauni	112	1.47
Karsog naturals farmers producer company ltd.	Vegetable, millets, fruits, soyabean, coriander, wheat, gram, apple	Dr. YS Parmar University of Horticulture and Forestry, Nauni	10	0.35
Kutlehar naturals farmers producer company ltd	Growing of crops, market gardening, horticulture	Non-government company	0	0.18

sharing and best practices through workshops, seminars, and online platforms is also important. Increasing access to low-interest loans, grants, and subsidies will provide financial support for FPCs. Encouraging private sector investment and public-private partnerships can bring in additional resources and expertise. Finally, establishing a robust monitoring and evaluation framework to continuously assess the performance, impact, and challenges faced by FPCs is vital. Using data-driven insights to make necessary adjustments to policies and programs will ensure the sustainability and growth of FPCs.

CONCLUSIONS

The significant increase in Farmer Producer Companies (FPCs) in Himachal Pradesh from 2015 to 2023, driven by state policy support and institutional assistance, has led to substantial financial growth and enhanced market access for small and marginal farmers. Most FPCs are engaged in horticultural and agricultural activities, but there's potential for diversification into other sectors. Forecasts suggest continued growth, contributing to various Sustainable Development Goals. Recommendations for sustainability include diversification, value addition, training programs, stronger institutional support, financial assistance, private sector involvement, and robust monitoring frameworks. These efforts aim to improve smallholder farmers' livelihoods and foster inclusive economic growth.

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