Agro-Economic Policy Briefs

Aiding the Future of India's Farmers and Agriculture

(Photo Source: https://krishijagran.com/commodity-news/edible-oil-prices-fall-by-rs-10kg-in-last-30-days-experts-expect-further-decline/)

For kind attention of:

The Hon'ble Prime Minister's Office,
the Ministry of Agriculture and Farmers' Welfare,
and all others interested

On Critical Policy Issues in India's Agricultural Economy

Issue 25, December 2021

Contents

Compiled and Edited by
Centre for Management in Agriculture (CMA)
Indian Institute of Management Ahmedabad

Contact: **Poornima Varma**, Coordinator or
Prof. Ranjan Kumar Ghosh, Chairperson CMA or
Drishti Vishwanath
Research Associate
alertsbriefs@iima.ac.in

Based on Research & Contributions of 15 Agro-Economic Research Centres and Units, supported by Ministry of Agriculture & Farmers' Welfare

Economic Benefits of Micro Irrigation in Maharashtra for Sugarcane

Sangeeta Shroff and Varun Miglani

Introduction

- Maharashtra is a water stressed state with the availability of water being extremely uneven both temporally and spatially.The state is experiencing rapid urbanisation and industrialisation and hence besides agriculture, water has several competing uses. Barely 18 percent of the gross cropped is irrigated and in view of the scarcity of water, the state is making all round efforts to promote Micro Irrigation (MI) which is well recognized as a water saving technology.
- The state ranks second in area and production of sugarcane, after Uttar Pradesh, with more than 70 percent of the sugarcane area being irrigated. Hence, since a large part of the scarce water resources of the state is utilized for sugarcane, the government is undertaking major initiatives to promote MI for sugarcane so as to conserve water for other crops and ensure the recharge of ground water.
- A field survey was conducted to study the economics of MI for sugarcane crop in Maharashtra, where the drip method was adopted. The selected sample of farmers were surveyed in two periods, prior to the adoption of the technology, and after the adoption of the technology. Therefore, data was collected for the same variables, such as production, costs, returns and yield, for sugarcane, before the reference year and for the reference year which was 2019-20. The district selected was Pune which is a major sugarcane growing belt adopting drip irrigation.

Findings

- The farm economics with respect to sugarcane indicated that the average total variable costs for sugarcane cultivation under drip irrigation was Rs.152,893 per hectare as compared to Rs.168,890 per hectare without drip irrigation. Thus, it was observed that drip irrigation brought about a reduction in costs.
- Labour man-days and labour costs in drip irrigation reduced by 37 percent and 40 percent respectively in comparison to flood irrigation. The main reason for reduction in labour cost was that the farmer does not require labour for irrigating fields each time compared to flood irrigation. The farmer only requires two labour man-days in case of drip, once to put drip laterals at the time of sowing and another for removing the drip laterals after harvest from the field. Almost all farmers were using water soluble fertilisers through fertigation, which further reduced labour requirements and improved yields. The weed growth was negligible due to usage of drip, because water with fertigation goes straight to the root of the plant and the surrounding area is dry, leaving limited scope for weeds to grow. This reduced the labor cost for weeding, intercultural operations and weedicides.
- As water soluble fertilizers are more expensive, the cost of fertilizers for sugarcane were observed to be 7.7 percent higher in drip as compared to surface method. The same was observed with respect to plant protection costs and seed costs which were 12.7 percent and 11 percent higher in case of drip.

- The use of drip for sugarcane resulted in huge reduction in water charge as the water charges paid reduced by 72 percent mainly because less water is consumed with drip in the cultivation of sugarcane. Further, less use of water also resulted in a 20 percent reduction in electricity cost. The total hours of pumping reduced by 57 percent in drip irrigation cultivation which brought about the reduction in electricity cost.
- Sample farmers reported that on an average, they used to irrigate their sugarcane fields 57 times with flood method as compared to 52 times with drip. However, hours of pumping per irrigation per hectare is 2.6 hours using drip method compared to 6.1 hours without drip. This leads to total hours of pumping of 145 hours in drip method compared to 332 hours without drip. Under drip method, more land is covered under irrigation in a short time span and farmers are able to better manage their irrigation schedule compared to flood irrigation method.
- Under drip method, per hectare yield of sugarcane was 1446 quintals compared to 1067 quintals without drip which means that yield increased by 35.5 percent. The price received by farmers using drip was also higher. Hence reduced costs, higher yields and higher prices resulted in sugarcane farmers receiving a net profit of Rs.245,542 per hectare with drip compared to Rs.81,247 per hectare without drip, i.e., an increase of 202.2 percent.

Conclusion and Recommendations

- Sugarcane is a water guzzling crop, but only 25.73 percent of the area under the crop is irrigated by drip method. This indicates the huge untapped potential to adopt drip method in order to save water.
- A major constraint for drip users that observed was the shortage of electricity and its interrupted supply, with associated fears of short circuit. Also, often the power supply was received only at night when farmers were not present on their fields. Thus, there is a need to ensure increased and regular availability of electricity, at times when they can monitor the flow of water conveniently in their fields.
- Extension services and awareness programmes must be promoted in order to incentivise the farmers to adopt the technology. The farmers must also be educated on the technical and economic benefits of micro irrigation as their net returns, as well as the quality of produce will improve.
- The dealers supplying the drip system must ensure that after sales service is timely available, so that constraints in using this technology are eliminated. Promotion of micro irrigation not only for sugarcane but for other crops as well, will definitely change the face of the agricultural economy.

Acknowledgement

This Brief is part of a larger study entitled "Improving Water Use Efficiency in India's Agriculture: The Benefits, Impact and Challenges of Micro Irrigation under the Pradhan Mantri Krishi Sinchayee Yojana: Per Drop More Crop (PMKSY-PDMC) in Maharashtra by Sangeeta Shroff & Varun Miglani, submitted to the Ministry of Agriculture and Farmers' Welfare, Department of Agriculture, Cooperation and Farmers Welfare, Government of India, June 2021.

For further details, contact:
Sangeeta Shroff
Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, Pune
sangeeta@gipe.ac.in; Phone: 9923063688

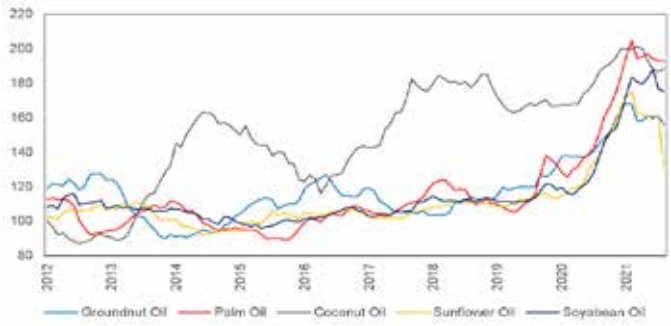
Examining Domestic and International Price Linkages of Edible Oils

Sakshi Saini

Introduction

- The prices of edible oils have witnessed a sharp increase in the last year. Figure 1 presents the price indices of major edible oils produced and/or consumed in India. Palm oil increased by around 60 percent in 2020-21, while sunflower oil and soyabean oil rose by more than 50 percent. Since edible oils constitute a significant part of the household food consumption expenditure (about 7 percent of the total food consumption expenditure in 2011-12), soaring prices hurt the interest of domestic consumers, especially poor households who cannot sustain their consumption patterns.

Figure 1: Wholesale Price Indices of Edible Oils in India



Source: *Ministry of Commerce and Industry, Government of India*

- The rise in the prices of edible oils is driven largely by the surge in international prices. India depends heavily on imports of edible oil to meet the gap between domestic demand and supply that has resulted in high sensitivity of domestic prices to international price pressures. Disruption in the supply chain due to the Covid-19 pandemic further aggravated this demand-supply mismatch.

- India has been importing more than half of its domestic requirement of edible oils over the years. The total availability or consumption of edible oils was estimated to be 24 million tonnes with per-capita consumption of 19.2 kg in 2019-20. However, the net domestic production of edible oils was only around 10.65 million tonnes, whereas, 13.41 million tonnes (about 56 percent of total requirement) were imported in 2019-20. Over the years, India's imports account for about 60 percent of its edible oil requirements, thus, leaving the prices vulnerable to global shocks.

- This heavy reliance on imports of edible oils is attributed to the low productivity in the domestic oil sector. The domestic production and yield of oilseeds have remained stagnant over the years. India produced 33.42 million tonnes of oilseeds with a yield of 1236 kg/hectare in 2019-20 in contrast to the production of 32.48 million tonnes with a yield of 1193 kg/hectare in 2010-11. The production of oilseeds is insufficient to meet the growing demand for edible oil, thus, necessitating the imports of edible oil.

- The continued dependence on edible oil imports to meet domestic requirements has led to a significant drain of foreign exchange and exposed the edible oil sector to international price volatility. The study examines volatility linkages among the prices of major edible oils consumed in India. It also assesses the level of interaction between the prices of domestic and international edible oils.

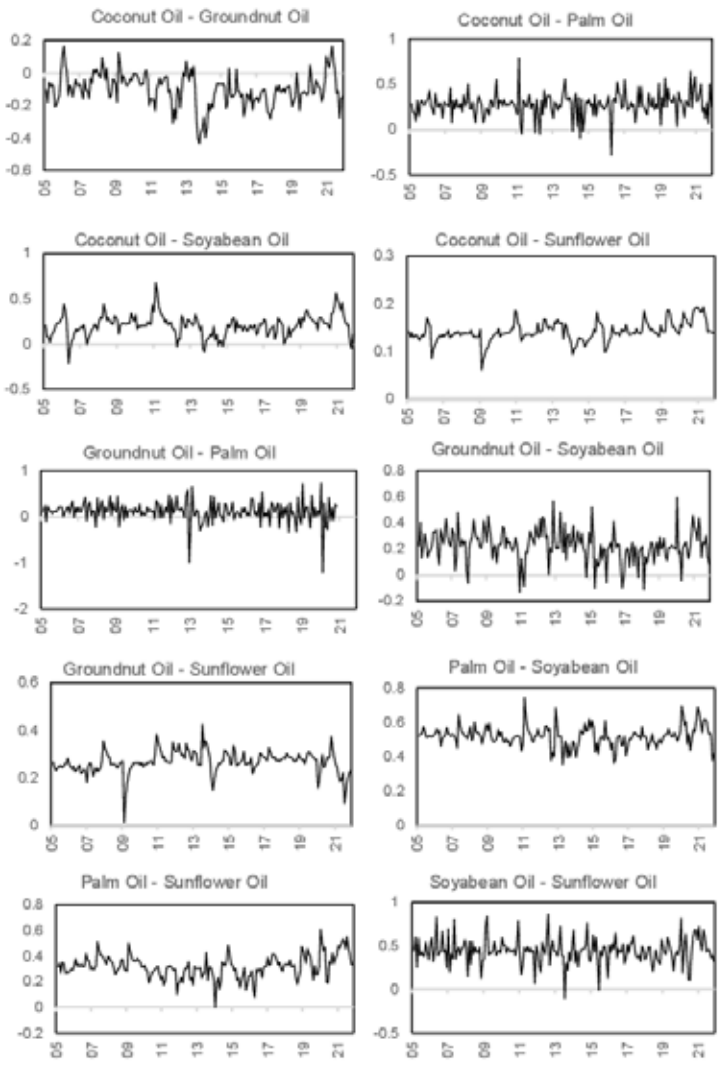
- The extent of volatility linkages among domestic edible oil market and with the international edible oil prices is examined using Multivariate

Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model and Diebold-Yilmaz spillover index methodology. The empirical analysis is based on secondary time-series data. Edible oils selected for the analysis are coconut oil, groundnut oil, palm oil, soyabean oil and sunflower oil. Monthly wholesale price indices of selected edible oils are obtained from the Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. The international prices of edible oils are obtained from World Bank Commodities Price Data (the Pink Sheet). The time period considered for the analysis is January 2005 to November 2021.

Findings

- Figure 2 illustrates the Dynamic Conditional Correlations (DCC) among the domestic prices of different edible oils estimated using the DCC-GARCH model. Results suggest high conditional correlations between palm oil and soyabean oil (average correlation of more than 50 percent) implying strong volatility linkages between them. Soyabean oil and sunflower oil are also found to have high correlations (around 44 percent on average) between them. Overall, DCC estimates reveal that palm oil, soyabean oil and sunflower oil exhibit high volatility linkages among them, whereas, groundnut oil and coconut oil are least interconnected with other edible oils.

Figure 2: Dynamic Conditional Correlations between Edible Oils



Source: *Author's calculations*

- Table 1 reports the results obtained from spillover analysis among domestic edible oil prices in India. The own-spillover index of soyabean oil is the lowest (50.35 percent) among all edible oils, followed by palm oil (63.83 percent) and sunflower oil (64.25 percent). The cross-spillover from sunflower oil and palm oil to soyabean oil is high (22.85 percent and 19.87 percent, respectively), whereas, the cross-spillover from groundnut oil and coconut oil is low (5.81 percent and 1.11 percent, respectively). Soyabean oil not only receives spillovers from palm oil and sunflower oil but also transmits large shocks to them. Results also indicate high directional spillovers (to and from spillovers) between palm oil and sunflower oil implying significant interdependences between them. Contrastingly, both groundnut oil and coconut oil are neither receptive to shocks from other oils nor transmit significant shocks to them.

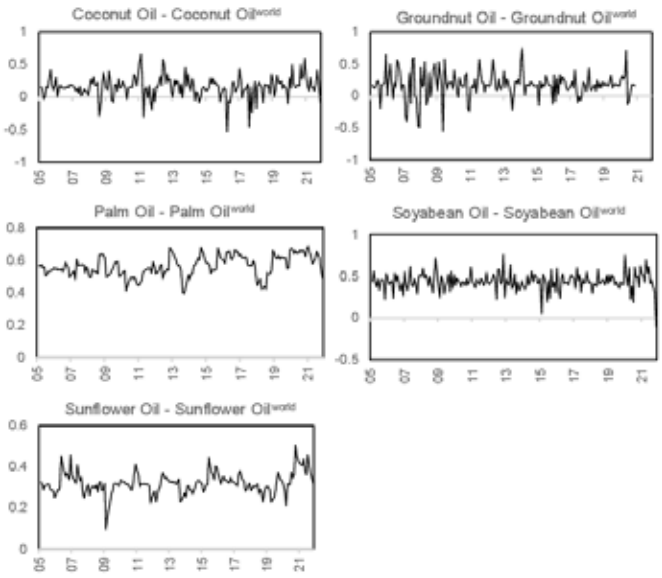
Table 1: Diebold and Yilmaz Spillovers among Domestic Edible Oils (%)

	Coconut Oil	Groundnut Oil	Palm Oil	Soyabean Oil	Sunflower Oil	From Others
Coconut Oil	84.95	8.48	2.74	1.15	2.68	15.1
Groundnut Oil	3.48	69.9	5.26	10.73	10.64	30.1
Palm Oil	1.84	3.59	63.83	15.03	15.71	36.2
Soyabean Oil	1.11	5.81	19.87	50.35	22.85	49.6
Sunflower Oil	0.63	8.73	9.4	17	64.25	35.8
To others	7.1	26.6	37.3	43.9	51.9	33.30%

Source: *Author's calculations*

- Considering the linkages between domestic and international prices of edible oils, DCC results suggest that the extent of volatility linkages between domestic and international prices of palm oil is the highest, approximately 56 percent on average (Figure 3). Domestic soyabean oil price also exhibits a high correlation (around 44 percent on average) with the international price of soyabean oil. Considerable interconnectedness of 32 percent is also observed between the domestic and the international price of sunflower oil. On the other hand, the volatility linkages between the domestic and international prices of groundnut oil and coconut oil are relatively low, approximately 17 percent and 15 percent, respectively.

Figure 3: Dynamic Conditional Correlations between Domestic and International Prices of Edible Oils



Source: *Author's calculations*

- Panel (a-e) of table 2 presents the results obtained from volatility spillover analysis

between domestic and international prices of edible oils. The total spillover index is highest for palm oil (27.1 percent), followed by soyabean oil (17.6 percent). In the case of both palm oil and soyabean oil, international volatility transmission to domestic prices is quite high as indicated by large directional spillovers from international price to the domestic price (32.68 percent and 26.41 percent, respectively).

Table 2: Diebold and Yilmaz Spillovers between Domestic and International Prices of Edible Oils (%)

(a)	Coconut Oil	Coconut Oil^{world}	From Others
Coconut Oil	91.03	8.97	9
Coconut Oil^{world}	1.17	98.83	1.2
To Others	1.2	9	5.10

(b)	Groundnut Oil	Groundnut Oil^{world}	From Others
Groundnut Oil	95.38	4.62	4.6
Groundnut Oil^{world}	18.35	81.65	18.3
To Others	18.3	4.6	11.50

(c)	Palm Oil	Palm Oil^{world}	From Others
Palm Oil	67.32	32.68	32.7
Palm Oil^{world}	21.48	78.52	21.5
To Others	21.5	32.7	27.10

(d)	Soyabean Oil	Soyabean Oil^{world}	From Others
Soyabean Oil	73.59	26.41	26.4
Soyabean Oil^{world}	8.76	91.24	8.8
To Others	8.8	26.4	17.60

(e)	Sunflower Oil	Sunflower Oil^{world}	From Others
Sunflower Oil	89.07	10.93	10.9
Sunflower Oil^{world}	5.54	94.46	5.5
To Others	5.5	10.9	8.20

Source: *Author's calculations*

- The results indicate high susceptibility of domestic prices of palm oil and soyabean oil to international prices. Both palm oil and soyabean oil constitute a large part of India's import basket of edible oils. India is the largest importer of crude palm oil and the second-largest importer of refined palm oil after China. In 2019, India's production of palm oil was only 2.77 lakh tonnes, whereas, it imported 86.78 lakh tonnes of palm oil (crude and refined), thereby accounting for more than 96 percent of its total domestic requirement of palm oil. This exorbitant reliance on imports to meet its domestic requirement makes domestic palm oil prices highly vulnerable to international price volatility. Similarly, India is also the largest importer of crude soyabean oil, importing more than 60 percent of its domestic requirement.
- International prices of sunflower oil and coconut oil are the net transmitter of shocks to the domestic prices, implying that the latter are considerably influenced by the former. On the other hand, domestic groundnut oil is the net transmitter of shocks to the international groundnut oil, transmitting around 14 percent of the spillovers to the international market. This can be explained by the considerable proportion (18.18 percent) of India's contribution to the world's production of groundnut oilseed. India is among the largest producers of groundnut oil and its export contribution is around 8.3 percent to world trade.

Conclusion and Recommendations

- To summarise, results reveal a strong level of bidirectional connectedness between soyabean oil, palm oil and sunflower oil, whereas, groundnut oil and coconut oil have relatively weak linkages between them and with other edible oils. These findings are largely in conjunction with the results obtained from the DCC-GARCH methodology.

- Results demonstrate that domestic prices of palm oil, soyabean oil and sunflower oil (in that particular order) are highly vulnerable to international price shocks. Reducing dependency on edible oil imports is important to limit exposure of domestic edible oil prices to international price volatility.
- The government relies on high import duties to curb the growth of edible oil imports and stimulate domestic production. While high tariffs are beneficial for domestic oilseed farmers and processors, these trade policies have been ineffective in discouraging imports. They also result in price shocks to consumers, especially poor households, whenever there is a surge in international prices. Rising imports of edible oils despite high tariffs imply that government needs to direct its attention more towards increasing domestic production of edible oils rather than international trade policies.
- Since oilseed production has not kept pace with the growing domestic demand, the focus needs to be laid on promoting oilseed production to reduce dependence on imports and achieve self-sufficiency in edible oils. The oilseed sector has enormous potential for future growth. Production needs to be revitalised through comprehensive measures including area expansion, irrigation facilities, high-quality seeds, efficient crop management, farm mechanisation and low-cost technology adoption to enhance production and productivity of oilseeds. Government should also provide assurance of high guaranteed prices, subsidy and marketing support to protect the interests of domestic oilseed cultivators from the highly competitive international edible oil market.
- There is also an urgent need to raise awareness about the optimum level of edible oil consumption as high consumption of oils can lead to health disorders among the population. Further, production and consumption of mustard oil can be promoted as it is domestically grown oil, low in saturated fatty acids compared to other edible oils like palm oil and soyabean oil, that are imported in bulk. This will help in reducing the burgeoning import bill and achieving self-sufficiency in edible oils.

For further details, contact:
Sakshi Saini
Agro-Economic Research Unit, Institute of Economic Growth, Delhi
s.sakshi@iegindia.org ; Phone: 9582029066

Livestock Enterprise: Way Forward to Livelihood Security in Nam Deuri Village, Assam

Anup Kr. Das and Ranjit Borah

Introduction

- Nam Deuri village is situated in the north-western part of Jorhat town, at a distance of 20 km from the district. The inhabitants of the village are known as the 'Deuri' community, which have been recognized as one of the plains aboriginal tribes in the Brahmaputra valley of Assam. More than 97 percent of the population of the village belongs to the scheduled tribe community, and they reside near the river Brahmaputra.
- Livestock is an essential part of tribal life. Besides contributing to food and crop production, livestock and poultry are considered as live savings. For the families of the village, livestock is a daily source of earning and is an insurance against their hardship. In addition, livestock products form an integral part of the local diet

as more than 95 percent of the population is non-vegetarian.

- The livestock sector occupies an important position in the economy of the village. Mixed farming involving crop and livestock integration has been a way of life in the village. An abundance of green fodder, availability of grazing land (char areas1 of the village), suitable climate, *etc*. make Nam Deuri village favourable for dairy development. The rearing of pigs, poultry and ducks are most popular among the tribes, and are considered to be their age-old tradition. Almost all the tribal families rear one or two pigs in their backyard, but large-scale pig farms are very few. There is high market demand for pork and eggs.

- The village offers a very congenial environment for goat rearing as well. The demand for mutton is quite high both in urban and rural areas of the district. Similarly, there are hardly any tribal families who do not rear a few birds in their houses. However, production practices of almost all the farmers are traditional in nature. The demand for meat and eggs exceeds the production in the district by a large extent, and thus the demand is met from supply of meat and eggs from outside.

- The objective of the study was to examine the existing size, productivity and profitability of livestock enterprises, besides examining the contribution of livestock enterprises to the total farm income. Attempts were also made to identify the constraints, opportunities and to document technical and supportive interventions for livestock production. The investigation was carried out by using secondary level data, and a primary survey of the entire village, comprising 262 households.

Findings

- Demography plays an important role in subsistence tribal farms, since most of the agricultural operations in these farms are carried out by family labour. Out of the total sample population, 50.66 percent were male and 49.34 percent were female (see Figure 1A). 26.78 percent of the population were below the age of 18 years, 8.13 percent was above the age of 60 years (see Figure 1B). 65.09 percent of the population were in the age group of 18 – 60 years, constituting the main work force for different farm and non-farm activities.

Figure 1A: Percentage of Population by Gender

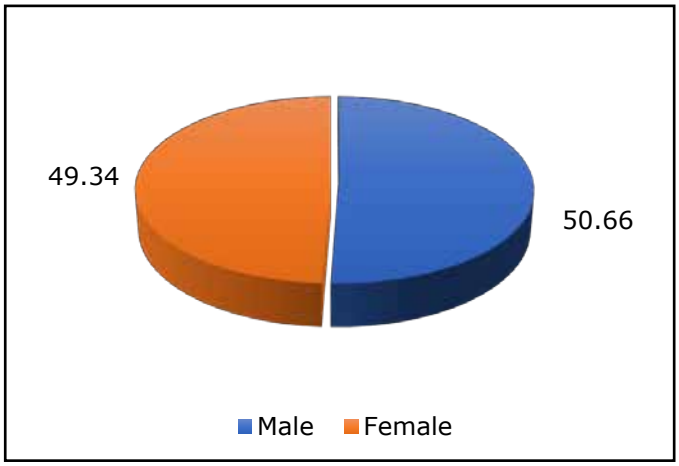
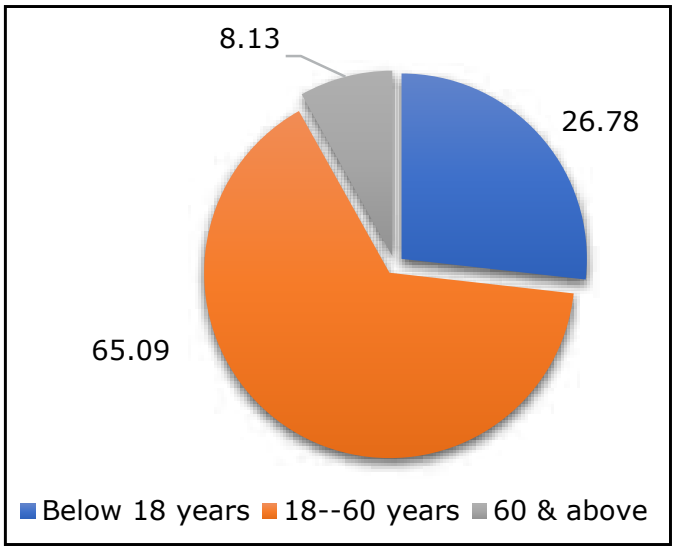


Figure 1B: Percentage of Population by Age Groups

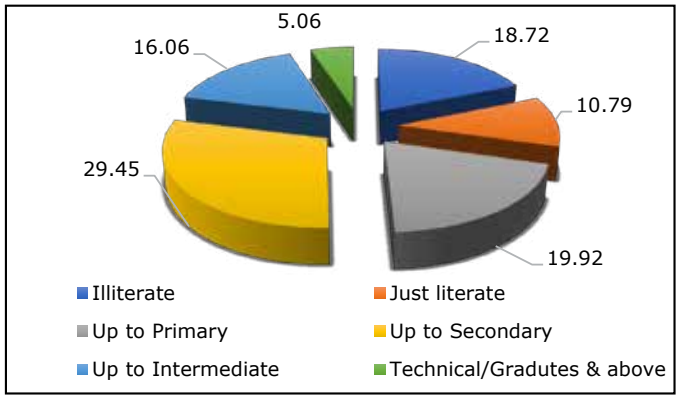


Source: *Field Survey*

[1] *Char areas refer to tracts of land surrounded by the waters of an ocean, sea, lake, or stream*

- The education level of farmers is a key indicator for bringing in commerce to agriculture. Figure 2 presents the status of literacy of the villagers. Out of the total population, 81.28 percent were literate. However, almost 30 percent recorded the highest level of education as secondary education. On an average, 10.79 percent of the total population were just literate, 19.92 percent had completed education up to the primary level and 16.06 percent had completed education up to the intermediate level. Only 5.06 percent were graduates and above.

Figure 2: Status of Literacy



Source: *Field Survey*

- The distribution of farmers according to their occupations indicates that out of the total workers, 62.07 percent were cultivators and 2 percent were agricultural labourers. Nearly, 2.90 percent workers were engaged in household industries. 33.03 percent of the workers fell in the category of other workers, which included the service sector, trade, commerce, transport, casual labour in 2019.

- Crops were found to be the primary enterprise for a majority of the farmers of the village. However, almost all the farmers were found to practice integrated farming systems such as crops, livestock, fishery and forestry in different combinations. The farms were found to mostly operate at a subsistence level and their marketable surplus was quite insignificant, with the production mostly being used for home consumption. The major farming systems followed by the farmers were (a) crops and livestock, (b) crops, livestock, fisheries, and (c) crops, livestock and farm forestry.

- The farmers cultivated *kharif* paddy in 211.47 hectares. Similarly, mustard, potato and peas were grown in 12.28, 21.89 and 30.05 hectares respectively. A number of mixed vegetables were grown in 110.50 hectares by a handful of farmers for commercial purposes. The major horticultural crops of the village were areca nut and coconut which were grown in 1.28 hectares by the farmers.

- Farm business average annual net income received by the farmers from different crop enterprises during 2019 was Rs.40,809. Rice, different mixed vegetables, mustard, potato, peas, areca nut, coconut and bamboo were the major crops. The allied activities like fishery and livestock contributed an annual net income of Rs.1,098 and Rs.37,607, respectively.

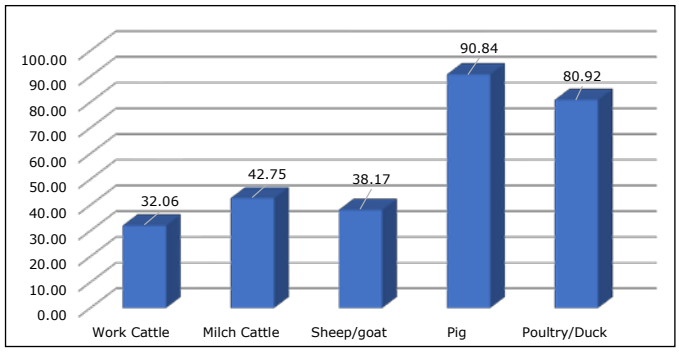
- The annual average income from all sources was recorded at Rs.1,83,484 per household for the year 2019, of which the contribution of farm income was Rs.79,514 (43.34 percent), off farm income was Rs.3,631 (1.98 percent) and non-farm income was Rs.1,00,339 (54.68 percent). The contribution of livestock resources alone was Rs.37,607.00, which stood at 20.50 percent of the total average annual income from all sources, and 47.30 percent of the total farm income of a family.

- In a sizable number of farms, average annual income derived from livestock enterprise was more than the average annual income derived

from crop enterprise. The different kinds of livestock reared by the farmers were work cattle, milch cattle, sheep/goat, pig, poultry and duck. The distributions of farmers according to the livestock component they reared have been presented in Figure 3.

- The survey found that around 90.84 percent of farmers were found to rear pigs followed by poultry and ducks (80.92 percent), milch cattle (42.75 percent), sheep/goat (38.17 percent) and work cattle (32.06 percent).

Figure 3: Distributions of Households according to the Livestock Rearing Pattern



Source: *Field Survey*

- Rearing of pigs was most popular in the village as it fetched good and stable income to the households by selling of high value meat and meat products. This diversification was mainly to minimize production risk and to allocate the scarce family resources optimally.

- The rearing of livestock is a very important activity in Nam Deuri village of Assam as well. It provides the villagers with a handsome amount of additional income and employment. Draught animals were also equally important for the farmers with agricultural field activities. Bullocks and buffaloes were the main draught animals in Nam Deuri village.

- The study observed several constraints. Firstly, there was a dominance of local breeds and the traditional nature of farming was practiced. Demand-side challenges with respect to livestock rearing and management included a lack of knowledge about animal health care and scientific practices of feeding, a lack of knowledge regarding disease control measures, a lack of knowledge about livestock insurance and a lack of motivation and risk-bearing ability to take up livestock on a commercial basis.

- Furthermore, both cultivators and those that practiced livestock rearing were characterised by a low resource base and low purchasing capacity. Supply side challenges included a lack of provision of veterinary services and non-availability of concrete feedings stalls in the village, lack of market connectivity and transportation facilities, and high cost of medicine and feed.

Conclusion and Recommendations

- Rearing of livestock is a culture and tradition for the tribal farmers and it is the way of life for them. It also contributes to the farm income in a substantial manner. There are various char areas near the villages with an abundance of green foliage and a large grazing ground. Given that the district is not self-sufficient in the production of milk and eggs, the potential of livestock rearing is yet to be realised. Thus, it is important to retain livestock rearing as a livelihood activity and motivate farmers to take it up on a business mode in order to both enhance profitability and meet demand.

- Measures to promote sustainable livelihood development in the context of livestock rearing can include provision of institutional credit with a low rate of interest, insurance coverage for livestock at nominal premium, use of improved breed of animals and birds, training in scientific practices of feeding, responsive extension services, building market linkages, etc.

- The indigenous traditional knowledge and experience of the farmers pertaining to feeding and treatment against common bird and animal related diseases needs to be preserved; the study found that some farmers are aware of the medicinal properties of different herbs and shrubs available in their locality. Additionally, the availability of animal feed and medicines need to be enhanced to ensure farmers are able to access them at times of need.

For further details, contact:
Anup Kr. Das
Agro-Economic Research Centre, Assam Agricultural University, Jorhat
anup.das@aau.ac.in ; Phone: 8134994342

Problems and Prospects of Banana Cultivation in Bhagalpur District

Manindra Kumar Singh and Rajiv Kumar Sinha

Introduction

- Banana is one of the oldest horticultural products and is grown for both commercial and nutritional purposes. Banana fruit and its by-products have various economic and medicinal uses. The fruit is used for eating- both fresh and in its dried form. The flowers and the inner part of the stem are eaten as vegetables. Banana stems are used as cattle feed and for the manufacturing of starch and fibre. Its fibre is used for making artificial silk, mats, coarse, paper and chip string. Its leaves, especially the culinary varieties, are commonly used as cattle feed and dinner plates.

- Alcoholic beverages like banana wine, brandy, rum, beer and vinegar are often distilled from ripe banana. The ash of banana is rich in potash, and therefore, is used in making soap. The dried peel is used in blackening leather, because of its tannin properties. A paste made from pseudostem with water is applied for furnishing textiles. Banana-guava nectar, papaya-banana nectar, poha fruit cup, banana waldorf salad, banana bran muffins, banana cakes, banana roll, banana peanut cripsies and other products are also prepared from it.

- The area situated on the north-eastern part of the river Ganges in Bhagalpur division (which lies in agro-climatic zone-IIIA), Bihar is being used for the cultivation of bananas spread across seven blocks; Naugachia, Bihpur, Kharik, Gopalpur, Ismailpur, Narayanpur and Rangara. Banana is grown in 15 percent of the total cultivable land area in these regions with the dominant varieties grown including 'musa cavendishi' (dwarf variety), 'rebesta', 'alpam rebesta' and 'tissue varieties'. Earlier, the 'singapuri' variety was also grown because of its better taste, thin fruit rind and good market value. However, now its cultivation is not being done in the area due to its higher perishability.

- A field survey was conducted by AERC Bhagalpur with a sample size of 50 banana cultivator households in two villages; Tulshipur in Kharik block and Jamuniya in Naugachiya block in Bhagalpur district.

Findings

- The average production of bananas is estimated to be 1,35,000 bananas, i.e., 900 bunches X 150. There are about 50 local traders in the area.

- The field survey of banana growers indicates that 267.50 labour mandays are generated through the cultivation of banana per acre.

- When the various costs incurred in production of banana per acre of land were examined, the highest expenditure (in percentage terms) was found to be incurred on 'device to support plants' (21.50%). It was followed by fertilisers including micronutrients (20.65%) and the rent of land paid (20.15%). The expenditure in items such as hired labour charge (bunding, sowing, weedicides, irrigation, spraying, etc.), and extraction and seedlings was also found to comprise than 10 percent of the total cost (i.e., 12.09% and 10.75%) respectively. Table 1 documents the cost of each component of expenditure, and its share within the total expenditure, as well as the returns to calculate the total cost benefit ratio.

Table 1: Cost of Production-Banana (In Rs./Acre)

SN	Activity/Head/Item of Expenditure	Total (in Rs.)	Share of Head Wise Expenditure to Total (%)
1.	Ploughing of Field	2,800	1.89
2.	Seedlings	16,000	10.75
3.	Irrigation	3,470	2.33
4.	Fertilisers including Micronutrient, etc.	30,750	20.65
5.	Pesticides and Insecticides	4,000	2.69
6.	Removal of Infant Plants once in a week - 8 months	9,600	6.44
7.	Cleaning of field after bunching	2,250	1.51
8.	Device to support plants	32,000	21.50
9.	Leased-in land (Rent paid)	30,000	20.15
10.	Hired labour (bunding, sowing, weeding, irrigation, spraying, etc.)	18,000	12.09
	Total Expenditure	1,48,870	
	Returns		
	i. Received price from selling of output (800 ghoud X @ Rs 200/- in peak season.	1,60,000	
	ii. In the form of Green manure	10,000	
	Total Return		
	Cost : Benefit Ratio	1:1.14	

Source: *Inputs from survey*

- The harvest can be obtained for 4 years, and the cost of production remains almost the same in the second year. The cost benefit ratio was found to be 1:1.14 in the study area.
- In the agricultural year 2020-21, as per the statement of surveyed farmers, the cost of production could not be realised. This has been attributed to several reasons: (a) the study area

(the north-eastern part of Bhagalpur and Katihar districts) is prone to frequent flash floods of the Ganges and Kosi river; (b) sometimes, banana plants are damaged by storms; and (c) neel cows damage the crop in the fruiting season. In cases where the banana crop is damaged due to natural calamities, growers are not paid any compensation.

- Other challenges to banana production include fungal diseases such as black cigatoka and panama disease, which have a detrimental impact on the crop, and the lack of provision of soil test reports between the period April 2021-July 2021.

Conclusion and Recommendations

- To sum up, banana cultivation should be promoted in its traditional hinterland, as it creates large employment opportunities (about 267 labour mandays/acre).
- Given that the sale price of bananas, particularly during the peak season, is hardly enough to meet expenditures made in production, there is a need to remove market related imperfections and enable the provision of more profitable prices for banana growers. This can be addressed by the formation of 'Co-operative Marketing Societies for Bananas' and 'Other Important Fruits' (CMSB and OIF). These CMSB and OIFs can be directed to sell these products in other Indian states, and neighbouring countries such as Nepal, Bhutan, Bangladesh, Myanmar, where demand at higher prices prevails.
- Banana based processing industries, such as Owned Account Manufacturing Enterprises (OAMEs), NDMEs (Non-directory Manufacturing Enterprises) and DMEs (Directory Manufacturing Enterprises) need to be installed in the region. This will not only ensure better and encouraging returns to growers but also will effectively remove disquieting factors that farmers in the area have been experiencing.
- Steps are needed to check/control the prevailing diseases--cigatoka and panama. Additionally, soil test reports need to be made available on time. Banana growers need to be provided with insurance coverage in order to compensate the damage of their crop arising due to natural calamities.
- Scientists of KVK (Krishi Vigyan Kendra), Sabour, Bhagalpur should be advised to pay visits at regular intervals. Demonstrations may also be given.
- In order to incentivise banana cultivation, efforts need to be directed towards increasing net returns. One way to achieve this is by lowering the cost of production; a significant reduction might arise by convincing farmers to avoid the unnecessary and excess use of chemical fertilisers and instead, be encouraged to practice natural farming practices and green manure, bio-fertilisers, etc. with its likely advantages being expounded. Congruous emphasis towards the adoption of natural farming has recently been given by the Government of India and the State Government of Bihar as well.

For further details, contact:
Manindra Kumar Singh
Agro-Economic Research Centre, TM Bhagalpur University, Bihar
mksinghaerc@gmail.com; Phone: 8210661306

CENTRE FOR MANAGEMENT IN AGRICULTURE (CMA)
Indian Institute of Management Ahmedabad (IIMA)
Vastrapur, Ahmedabad, Gujarat 380015
e-mail: cma@iima.ac.in | **Phone:** +91-79-7152-4650, 7152-4651, 7152-4652
Web: www.iima.ac.in