Economic Assessment of Black Pepper under Hilly Zone Multi-storyed Ecosystem of Karnataka, India

This is an original research article

Abstract

India is one of the largest producers, exporters and consumers of spices across the world. At global market India spices are in high demand due its medicinal and culinary value. Major exported spices from India were turmeric, chilli, black pepper, mint products, cumin, cardamom, garlic, curry paste and spice oils etc. Among these spices the share of black pepper is noticeable and which is grown abundantly in hilly zone multi-storyed ecosystem of Karnataka. There is a lack of understanding the economics of the crop and constraints faced by the hilly region farmers to cultivate black pepper. Hence, the study analyses the socio economic status, livelihood sustainability of the farmers, processing practices and constraints faced by the black pepper cultivators in hilly zone of Karnataka by using primary data. The selected farmers were classified based on their income levels and garett's ranking technique was followed to prioritize the constraintsas perceived by the farmers. The study found that majority of the farmers who cultivate black pepper under multi-storyed cropping system were low income group farmers. In this region still black pepper is mainly cultivated by adopting traditional practices, hence expenditure on farm yard manure was the major item for both establishment and annual maintenance costs. Timely non availability of labours and high wage rates were identified as larger impacting constraints. The study concludes that there is a huge scope for mechanization of harvesting and other labour intensive functions to facilitate farmers which impact positively on black pepper economics and the investigation suggests for the integrating of markets with necessary market intelligence services to the gross root levels in the black pepper ecosystem in Karnataka to minimize higher price volatility.

Key words: Hilly zone, multi-storyed, black pepper, constraints

Introduction

India has a great extent of diversity in the climate and soils, which enables to grow a variety of spices, nearly 70 species grown in the world are native to the India and is often referred as "Home of spices" (Dubey, 2017). India is one of the largest producers, exporters and consumers of spices across the world. At global market Indian spices are in high demand due its medicinal and culinary value. India exported 1.76 million tonnes of spices in the year 2020-21, which was about 46 per cent increase in exports of 1.21 million tonnes from 2019-

20 (IBEF, 2022). Major exported spices from India were turmeric, chilli, Black pepper, mint products, cumin, cardamom, garlic, curry paste and spice oils etc. Among these spices the share of black pepper is noticeable. Black Pepper (*piper nigram*) is popularly known as king of spices or black gold is a perennial vine growing in parts of south Indian states such as Karnataka, Kerala and parts of Tamil Nadu and prominently the Western Ghats (hilly zone) are the main Indian regions where the crop finds a suitable growth environment. Kerala and Karnataka alone contribute nearly 75 per cent of total Black Pepper production in India. Karnataka holds a largest share in its production of 556400.46 tonnes which is accounting for 60.46 per cent to India's total black pepper output for the year 2021-22 (National Horticulture Board, 2021-22). In Karnataka, Kodagu, Chikamagaluru, Hassan, Dakshina Kannada and Uttara Kannada districts forms major share to the state in area and production of black pepper and also which is grown abundantly in hilly zone of Karnataka as one of the commercial crop usually grown under multi-storyed farming system. There is a lack of understanding the economics of the crop and constraints faced by the hilly region farmers to cultivate black pepper. To address these research gaps a study has conducted to know socio economic status, sustainability of the farmers, processing practices and constraints faced by the black pepper cultivators in hilly zone of Karnataka.

Methodology

The study is based on primary data. The required data for the study was collected from the sample farmers by personal interview method by using pre-tested schedules in hilly zone of Karnataka, India. Simple random sampling technique was used in selection of farmers. Three Talukas namely Sirsi, Siddapur and Mundagod are purposively selected from hilly zone of Karnataka. From each selected taluk, 15 farmers were selected randomly, in total making of 45 sample farmers. Later the selected total 15 farmers from each taluka were grouped with different income level groups as depicted in the table1.Further, economic evaluation of black pepper growing farmers was carried out using descriptive statistics.

Table.1: Classification of farmers based on income Level

Category	Income (Rs/year)
Low Income Group (LIG)	<2,50,000
Semi- Middle Income Group (SMIG)	2,50,000-4,00,000
Middle Income Group (MIG)	4,00,000-7,50,000
High Income Group (HIG)	>7,50,000

The constraints faced by farmers in cultivation and marketing of black pepper in the study area were analysed. Garett's ranking technique was followed to prioritize the constraintsas perceived by the farmers. The farmers were asked to rank the various constraints based on their intensity and magnitude. These orders of merit were transformed into units of scores by using the following formula.

$$P_i = \frac{100(R_{ij} - 0.50)}{N_j}$$

Where,

P_i= Per cent position

R_{ij} = Rank given for the ith factor by the jth individual

N_j = Number of factors ranked by the j^{th} individual

The per cent position is converted into scores by referring to the table given by Garrett and Woodworth (1969). Then for each factor the scores of the individual respondents were added together and divided by the total number of respondents for whom scores were added. These mean scores for all the factors were arranged in descending order and the most influencing factors were identified through the ranks assigned.

Results and Discussion

Findings of the investigation were presented as per the requirement presented in the specific objectives of the study.

The demographic indicators of sample farmers were depicted in table2. It shows that, the majority of the farmers (40%)fall under low income group followed by semi middle income group and high income group with around 27 per cent and only 3 per cent farmer's accounts middle income group.By considering age as indicator the middle income group famers were age old with on an average of 62 years followed by low income group farmers with around 60 years. In hilly zone, it is prominent that, age old elders leading families and all the responsibilities will be borne by the family heads. Hence the average age of family head was around 55 years. Similar results were found in the study conducted by *Pushpaet. al, 2020 and Pushpa et. al, 2021*.

As concerned to the formaleducation of sample farmers, middle income group farmers have highest years of education with 17 years as compared to other income groups of the farmers. However, average years of schooling was more than 13 and no one illiterate. It indicates that,the hilly zone residents were highly educated and literacy rate in the zone is 90.73 per cent according to the census, 2011. Among four different income groups the

average size of family is five members and the middle income group accounts the less family size with number four followed by low and semi middle income groups (5) whereas high income group holds highest family size of six members as compared to other income groups.The average size of the family is on par with hilly region average family size according to the census, 2011.

Table.2: Demographic indicators of sample farmers

Category	Sample Size	Age (years)	Education (years)	Family size
LIG	18.0 (40.00)	59.8	12	5
SMIG	12.0 (26.66)	50.7	13	5
MIG	3.0 (6.66)	62.0	17	4
HIG	12.0 (26.66)	51.0	14	6
Average	**45.0 (Total)**	**55.2**	**13.26**	**5**

Note: Figures in parentheses indicate percentage to the total

The table3 depicts the occupation and the economic status of the black pepper growing families in the study area. All income group families have primary occupation as farming except middle income group (primary occupation was business). The black pepper growing farmers have very well established economic status which was proved here with average family income/farm of Rs. 3,27,182. Moreover, the farm income/acre was Rs.1,15,767. Whereas, the average family income was about Rs.5,49,005. However, in which high income group earns about Rs.698000.00 and low income group earns Rs.36666. The results extensively show that, black pepper growers were economically stronger and they have decent standard of living. The results are comparable with the study conducted by*Yogesh, 2017.*

Table 3.Occupation and economic status of the respondents

Category	Primary occupation	Family income		
		(Rs/Farm)	(Rs/Acre)	(Rs/Family)
LIG	Farming	2,18,225.0	124,700.0	2,18,255.0
SMIG	Farming	1,72,235.0	98,420.0	2,68,527.0
MIG	Business	51,468.8	82,350.0	4,12,893.0
HIG	Farming	8,66,800.0	1,57,600.0	11,26,347.0

Overall	**Farming**	**3,27,182.2**	**1,15,767.5**	**5,49,005.5**

The table 4 shows the findings on average land holding, source of irrigation and type of farming followed by the hilly region black pepper growing farmers. The average land holding among all the selected categories of farmers was more than two and half acres, where 35 (more than three-fourth) farmers were using open well as source of irrigation. Traditionally, hilly zone is well known for open well irrigation as the region known for its typical lateritic soil structure according to the national soil profile maintained by the National Bureau of Soil Survey and Land Use Pattern. Moreover, all the farmers were practicing multi-storyed mixed farming system and this region strongly acknowledged for its typical and systematic multi-storyed cropping system. Hence, traditionally in the region black pepper is being grown as a component in multi-storyed cropping system rather than mono cropping practice as black pepper require staking material and it is a shade loving climber *(Shankarprasad, et. al, 2021)*. It is interesting that younger persons have the highest incomes and more children, while the oldest people have fewer children and insisting on being in business. This was because of large land holding and practicing agriculture in bigger land holding was more profitable *(Cesaro and Marongiu, 2017).*

Table 4: Land holding, source of irrigation and cropping system

Category	Land holding (acres)	Source of irrigation (No.)			Type of farming(No.)		
		Open well	Canal	Total	Mono	Multi-storyed	Total
LIG	1.75	13.0	3.0	16.0	-	15.0	15.0
SMIG	1.75	8.0	5.0	13..	-	11.0	11.0
MIG	0.625	4.0	-	4.0	-	5.0	5.0
HIG	5.5	10.0	2.0	12.0	-	14.0	14.0
Average	**2.6**	**35.0**	**10.0**	**45.0**	**-**	**45.0**	**45.0**

Usually the juvenile period of black pepper is three years. The cost incurred to grow black pepper vines till third year is referred as establishment cost.The cost of establishment of black pepper garden per acre was shown in the table5. It indicates that, the highest expenditure was incurred on farm yard manure (Rs.7713) followed by cuttings (Rs. 6625), land preparation (Rs. 2287.5) and planting accounts for Rs.580 by making a total cost of around Rs.17205.The highest total establishment cost was reported by high income group farmers of Rs. 15,220. These group farmers were keen establishing orchards with higher

concern and provide special attention towards maintaining the quality of the orchard. Even these results are on par with the study conducted by *Yogesh, 2017.*

Table 5: Cost of establishment of black pepper garden (Rs/Acre)

Category	Land preparation	Cuttings	Planting	FYM	Total
LIG	2,200.00	7,050.00	741.60	8,233.30	7,041.56
SMIG	1,900.00	7,050.00	450.00	8,850.00	7,175.00
MIG	2,600.00	5,350.00	600.00	5,600.00	4,550.00
HIG	2,450.00	7,050.00	612.50	6,325.00	15,220.75
Overall	**2,287.50**	**6,625.00**	**580.00**	**7,713.30**	**17,205.80**

The table 6 shows the yearly maintenance cost of black pepper garden. Usually, as discussed earlier, black pepper is cultivated in multi-storyed farming system as one component. Hence, there will not be any exclusive inter-cultivation practices for black pepper except application of plant protection chemicals and farm yard manure. Hence, expenditure was not madeon irrigation and fertilizer in the study period. However, regular earthing up with red soil is essential for better plant growth and to improve soil aeration *(Kandiannan, et. al., 2000).*The total annual maintenance cost was Rs. 13,943. Out of that, costinvolved for yearly application of farm yard manure was found highest (Rs. 6,112.5) which was around 50% of annual maintenance cost followed by harvesting (Rs. 4,037) and plant protection (Rs. 3,031). Quick and slow wilts are the major diseases which require utmost care for protecting the vines *(Krishnamoorthy and Parthasarathy, 2009).*

Table 6: Annual maintenance cost of black pepper garden (Rs/Acre)

Category	PPC	FYM	Earthing up	Harvesting	Total
LIG	550.0	5,600.0	750.0	1,400.0	8,300.0
SMIG	3,625.0	6,250.0	1050.0	4,575.0	15,500.0
MIG	3200.0	5,600.0	800.0	4,825.0	14,425.0
HIG	4,750.0	7,000.0	450.0	5,350.0	17,550.0
Overall	**3,031.25**	**6,112.5**	**762.5**	**4,037.25**	**13,943.5**

This study was restricted only for primary processing at producers level. At this stage lower level of value addition will be done for the black pepper by taking up of activities like

cleaning, drying and sorting after it's harvesting. All the listed activities were taken up at farmer's gate or field to fetch better prices for the product. The processing and marketing costs involved in black pepper production were shown in the table 7.The average costs was Rs. 1097.6 and more than 80 per cent cost was borne by drying process (Rs 907.6) and minimum amount was spent on transportation purpose (Rs. 190.0). Result of a study conducted by *Ganapathy et. al (2014)* shows similar findings for processing and marketing costs.

Table 7: Processing and marketing cost of black pepper (Rs/Acre)

Category	Drying	Transportation	Total
LIG	650	150	800
SMIG	800	225	1025
MIG	868	255	1123
HIG	1312.5	130	1442.5
Overall	**907.6**	**190.0**	**1097.6**

The costs and returns of black pepper over variable costs under multi-storyed traditional practices were presented in the table 8. Total variable cost under described practices was found to be around Rs.15000 per acre. It constitutes more 85 per cent by maintenance cost and around 15 per cent contributed by processing and marketing costs. The average gross return was Rs. 68,695 which was more four times higher than total variable costs. Hence, the study noticed that, four folds of income over total variable cost considering intercropping system where there is no much cost involved for intercrop. Majority of the cultivation practices were taken care by grooming activities of main crop ultimately arecanut. Hence, return over per rupee investment was higher than anticipated. These results are comparable with study of *Yogesh (2017).*

Table 8: Cost and returns over variable costs (Rs/Acre)

Category	Cost			Returns		Return over per rupee investment
	Maintenance	Processing	Total	Gross	Net	
LIG	8,300.0	800.0	9,100.0	63,750.0	54,650.0	7.0
SMIG	15,500.0	1,025.0	16,525.0	66,250.0	49,725.0	4.0
MIG	14,425.0	1,123.0	15,548.0	57,280.0	41,732.0	3.7
HIG	17,550.0	1,442.5	18,992.5	87,500.0	68,507.5	4.6

Overall	**13,943.5**	**1,097.6**	**15,041.1**	**68,695.0**	**53,653.6**	**4.6**

The crust of the study was analysing constraints faced by the farmers specifically for cultivation and marketing of black pepper. Table 9 the results of these constraints. Timely non availability of skilled labourers and high wage rate of labour and hired machines were severe constraints for production of quality black pepper. Similarly, harvesting and storage costs are high and high price volatility were found intensified problems for better marketing of black pepper in multi-storyed ecosystem. Moreover, these problems are similar for almost all the products in hilly zones *(Solh, 2018)*.

Table 9: Constraints faced by the black pepper farmers

Sl. No.	Constraints	Garret Score	Rank
1	Timely non availability of skilled labourers	67.15	I
2	High wage rate of labour and hired machines	64.38	II
3	Lack of knowledge about improved technologies	58.59	III
4	Frequent attack of plant diseases	56.09	IV
5	Harvesting and storage costs are high	55.73	V
6	High price volatility/fluctuation	47.14	VI
7	High cost of plant protection chemicals	45.65	VII
8	Improper co-integration of markets	43.52	VIII
9	Non availability of information on international trade	38.06	IX
10	High transportation cost	35.52	X

Conclusion

India is one of the largest producers, exporters and consumers of spices across the world. At global market Indian spices are in high demand due to its medicinal and culinary value. The present investigation concludes that majority of the farmers who cultivate black pepper under multi-storyed cropping system were low income group farmers. Further, study has identified constraints like timely non availability of labours and high wage rates. Hence, there is huge scope for mechanization of harvesting and other labour intensive functions to facilitate farmers. However, the study also identified marketing issues like unstable prices and non-cointegration of local markets and international markets. Hence, policy makers may

focuses on integrating of markets by providing necessary market intelligence services to the local markets, farmers and other stake holders in the black pepper ecosystem in Karnataka.

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