Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

Naresh Kumar
Ph.D., Scholar and Professor,
Department of Agricultural
Economics, Indira Gandhi Krishi
Vishwavidyalaya College of
Agriculture, Raipur,
Chhattisgarh, India

Dr. BC Jain
Ph.D., Scholar and Professor,
Department of Agricultural
Economics, Indira Gandhi Krishi
Vishwavidyalaya College of
Agriculture, Raipur,
Chhattisgarh, India

Dr. MR Chandrakar
Ph.D., Scholar and Professor,
Department of Agricultural
Economics, Indira Gandhi Krishi
Vishwavidyalaya College of
Agriculture, Raipur,
Chhattisgarh, India

A study on cost of cultivation and post-harvest losses of banana in Bilaspur District of Chhattisgarh State

Naresh Kumar, Dr. BC Jain and Dr. MR Chandrakar

Abstract
As a consequence of technology, research and policy initiatives, India continues to be the second largest producer of fruits and vegetables with a share of about 13.6 per cent and 14 per cent to the worldwide fruits and vegetables production respectively. Due to its significant share in the worldwide horticultural production, India is very well recognized as fruits and vegetables basket of the world India's varied climate and physic-geographical conditions ensures availability of all kinds of horticultural crops such as fresh fruits and vegetables, spices, nuts, flowers and plantation crops (cocoa, cashew nut, and coconut). As per the NHB database (2016-17) India produced about 92.8 million tons of fruits and 175 million tonnes of vegetables with 6.40 million hectares and 10.30 million hectares land under fruits and vegetables cultivation, respectively. Chhattisgarh state are Mango, Guava, Lime, Litchi, Cashew-nut", Cheeku etc., apart from these major fruit crops minor fruits like Custard apple, Bael, Ber, Anola etc., are also grown both as cultivated and wild crop. The total area of the fruit crops in the state is" 26,1,512 hectares. Along with the production of 25,92,450 million tonnes in the year 2017-2018. Fruit production in Chhattisgarh contributes 25.27 per cent of total horticultural crops. Mango is having highest area among the fruit crops followed by banana, papaya, and guava while in terms of fruit production.

Keywords: Economics of banana, cost of production, farm profit, cost concept post-harvest losses in banana at market level

Introduction
Banana (*Musa paradisica*) is one of the most important commercial tropical fruits traded. Eve was said to have used banana leaves to cover he modesty in the Garden of Paradise as revealed from antiquity. Banana is thus called "*Apple of Paradise*". It is also known as "*Adam Fig*". Banana is a type of fruit from herbaceous plants of the genus *Musa*. *Musa* species grow in a wide range of environments and have varied human uses, ranging from the edible bananas and plantains of the tropics to cold-hardy fiber and ornamental plants. They have been a staple of the human diet since the dawn of recorded history. These large, perennial herbs, 2–9 m in height, evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time is secondary loci of genetic diversity in Africa, Latin America, and the Pacific. Musa species attained a position of central importance within Pacific societies: the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material, and numerous ceremonial and religious uses. Although mostly consumed locally in the Pacific region, the fruit enjoys a significant worldwide export market.

Methodology
The study area in Chhattisgarh state comes under Bilaspur district. Bilaspur district have highest area under banana crop contributing in 15.94 percent. So, Bilaspur district will be selected for banana crop in the study. Three blocks will be selected randomly in Bilaspur district under Masturi, Belha, and Takhatpur for the present study. Five villages will be selected from each block. So, fifteen villages will be selected from Masturi, Belha and Takhtpur each. In all, fifteen villages will be selected for the study.
Ten farmers will be selected from each village. So there will be fifty farmers from Masturi, fifty farmers from Belha and fifty farmers from Takhatpur blocks in Bilaspur district. In all 150 farmers will be interviewed for the study. For the estimation of post-harvest losses at different levels twenty retailers and five wholesalers will be selected from each district. In all, forty retailers and ten wholesalers will be interviewed for the study.

Corresponding Author:
Naresh Kumar
Ph.D., Scholar and Professor,
Department of Agricultural
Economics, Indira Gandhi Krishi
Vishwavidyalaya College of
Agriculture, Raipur,
Chhattisgarh, India

Cost of cultivation

The cost of cultivation of the banana farmers was worked out by using various cost concepts *viz*. Cost A_1, Cost A_2, Cost B_1, Cost B_2, and Cost C_1, Cost C_2, Cost C_3 as defined below:

Cost A_1: Consist of following 16 items of costs

1. Value of hired human labour (permanent and casual)
2. Value of owned bullock labour
3. Value of hired bullock labour
4. Value of owned machinery
5. Hired machinery charges
6. Value of fertilizers
7. Value of manures (owned and purchased)
8. Value of seed (farm produced and purchased)
9. Value of insecticide and pesticide
10. Irrigation charges
11. Canal water charges
12. Land revenue and other taxes
13. Depreciation on farm implements (bullock drawn and use by human labour)
14. Depreciation on farm building, farm machinery and irrigation structure
15. Interest on working capital
16. Miscellaneous expenses (artisans, ropes and repair to small farm implements)

Cost A_2 = Cost A_1 + Rent paid for leased in land.
Cost B_1 = Cost A_1+Interest on value of owned fixed capital.
Cost B_2 = Cost B_1+ Rental value of owned land and Rent paid for leased in land.
Cost C_1 = Cost B_1+ imputed value of family labour.
Cost C_2 = Cost B_2+ imputed value of family labour.
Cost C_3 = Cost C_2+10% of cost C_2 on account of managerial function performed by farmer.

Income over cost A_1 = Output Value – Cost A_1
Income over cost A_2 = Output Value – CostA_2
Income over cost B_1 = Output Value – Cost B_1
Income over cost B_2 = Output Value – Cost B_2
Income over cost C_1 = Output Value – Cost C_1
Income over cost C_2 = Output Value – Cost C_2
Income over cost C_3 = Output Value – Cost C_3

Result and Discussion
Economics of banana

The economics of" banana crop "is presented in table 1 and figure 1. It clearly shows that the cost of cultivation per hectare of" banana "was higher on large farms as compared to" small "farms. Over all, on an average the cost of cultivation per hectare of" banana was found to be Rs.17,9450.27 "per hectare. The cost of cultivation in case of large farm was higher Rs.18,7063.35 per hectare as compared to small Rs.16,8152.84 per hectare and medium farms Rs.17,8391.35 per hectare. The cost of cultivation per hectare showed a rising trend with the increase in size of farm. It was due to the fact that the large farmers incurred more expenditure on modern farm input like quality seed, fertilizer, plant protection material, hired labour etc. As a result of borrowing from credit institutions and better economic status compared to small and medium" farmer.

Yield, value of output and cost of production per quintal

The yield, value of output per hectare and cost of production per quintal of" banana on the sample farms have been worked out in table 2 and figure 2, 1.3. "It indicates that the average yield per hectare of" banana was 773.25 quintal on the sample farms. The cost of production per quintal of banana "on an average was worked out to Rs".231.97. It came to Rs.222.71, Rs.231.37 and Rs.237.99 for "small, medium and large farm size respectively. It decreased with the increased in the size of farm due to higher yields in return to the cost of cultivation on the large farm. The average" gross income per hectare came to Rs.54,3585.43. It was Rs.53,6223.65, Rs.54,0178.02 and Rs.55,0781.64 on small, medium and large farmer respectively. The higher gross income on large farms was associated with the higher yield."

Table 1: Economics of banana on different size groups of farms (Rs./ha.)

S. No	Cost	Farm size			
		Small	Medium	Large	Overall
(A)	**Variable cost**				
1.	Human labour				
(a)	Family labour	15324.34 (9.11)	9214.23 (5.16)	6431.13 (3.43)	6955.71 (3.87)
(b)	Hired labour	9231.08 (5.48)	16123.21 (9.03)	20214.94 (10.80)	16114.39 (8.97)
	Total human labour	24555.42 (14.60)	25337.44 (14.20)	26646.07 (14.240)	25685.44 (14.31)
2.	Bullock labour	825.23 (0.49)	635.36 (0.33)	443.31 (0.230)	602.81 (0.33)
3.	Machine labour	6450.33 (3.83)	8795.23 (4.93)	11050.12 (5.09)	9148.84 (5.09)
4.	Plant (seed) cost (1.8x1.8 meter)	42255.14 (25.12)	42424.19 (23.78)	42613.22 (22.78)	42460.62 (23.66)
5.	Manure & fertilizer cost	23214.31 (13.80)	24337.12 (13.64)	25223.19 (13.48)	24426.40 (13.61)
6.	Plant protection chemicals	5340.21 (3.17)	6631.03 (3.71)	7534.42 (4.02)	6686.02 (3.72)
7.	Irrigation charges	6523.32 (3.87)	7231.21 (4.05)	7542.92 (4.03)	7185.43 (4.00)
8.	Interest on working capital@8%	10697.55 (6.36)	11258.32 (6.31)	11815.94 (6.31)	11350.47 (6.32)
	Total variable cost	144416.93 (85.88)	151987.34 (85.19)	159515.26 (85.27)	153231.51 (85.38)
(B)	**Fixed cost**				

1.	Depreciation	425.23 (0.25)	650.31 (0.36)	785.11 (0.41)	650.50 (0.36)
2.	Land revenue	12.00 (0.00)	12.00 (0.00)	12.00 (0.00)	12.00 (0.00)
3.	Rental value of owned land	21140.87 (12.57)	23341.42 (13.08)	24246.61 (12.96)	23172.76 (12.91)
4.	Interest fixed capital	2157.81 (1.28)	2400.37 (1.340)	2504.37 (1.33)	2383.52 (1.32)
5.	Total fixed cost	23735.91 (14.11)	26404.01 (14.80)	27548.09 (14.72)	26218.76 (14.61)
	Total cost = (A+B)	168152.84 (100.00)	178391.35 (100.00)	187063.35 (100.00)	179450.27 (100.00)

Table 2: Per hectare yield value of output and cost of production per quintal of banana. (Rs./ha.)

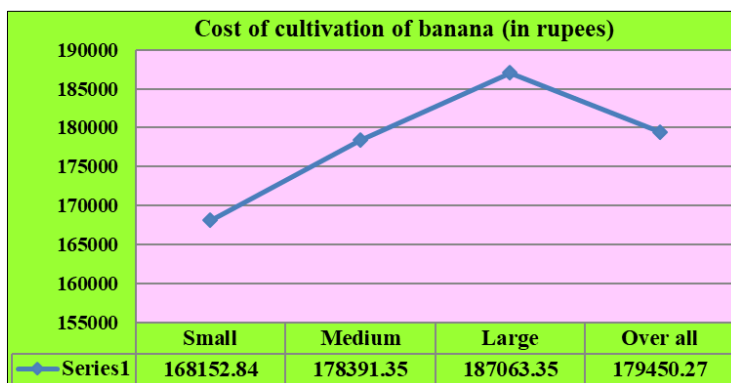| S. No.	Particulars	Small	Medium	Large	Overall
1.	Main yield (qt./ha.)	755.00	771.00	786.00	773.25
2	Price (Rs./qt.)	710.23	700.62	700.74	703.04
3	Gross income	536223.65	540178.02	550781.64	543585.43
4	Cost of cultivation	168152.84	178391.35	187063.35	179450.27
5	Cost of production (Rs/qt.)	222.71	231.37	237.99	231.97
6	Input output ratio	1:3.18	1:3.02	1:2.94	1:3.02

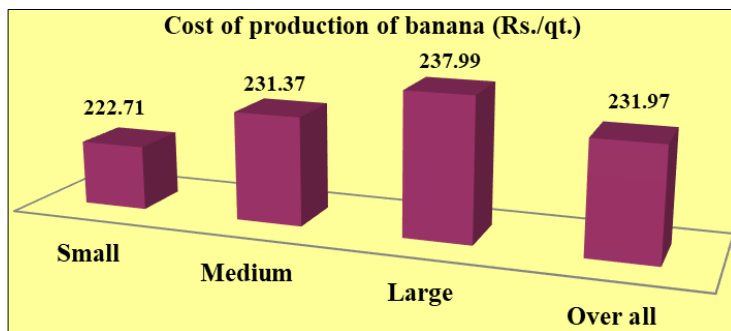**Fig 1:** Cost of cultivation of banana on the sample farms (Rs./ha.)

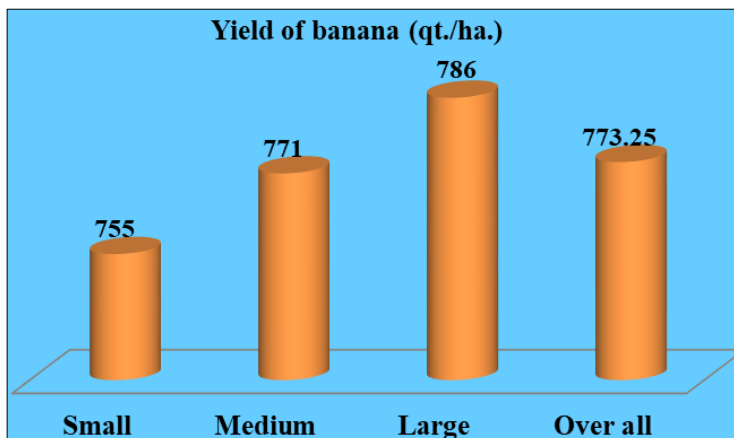**Fig 2:** Cost of production of banana on the sample farms" (Rs./ha.)

Fig 3: Yield of banana (qt./ha.)

Measures of farm profit

The values of net income, family labour income and farm business the per hectare the sample farms of different size groups have been worked out in the table 3 and figure 4. The table indicates that, on an average the value of net average family labour income and farm business income per hectare came Rs.40,7001.67 and Rs.38,1445.39, respectively, on the sample farms of different sizes. Overall on an average the input-output ratio of" banana came to 1:3.02 "on the sample farms."

Table 3: Cost and return of banana on the sample farm for different groups of farm (Rs./ha.)

S. No	Particulars	Farm size			
		Small	Medium	Large	Overall
1.	Input cost	168152.84	178391.35	187063.35	179450.27
2.	Output cost	536223.65	540178.02	550781.64	543585.43
3.	Net income	368070.81	361786.67	363718.29	364135.16
4.	Family labour income	400218.29	405380.55	412383.34	407001.67
5.	Farm business income	376919.61	379638.76	385632.36	381445.39
6.	Farm investment income	391369.49	387528.46	390469.27	389691.44

Cost and returns on the basis of cost concept"

The cost and returns on the basis of cost concept in the production of" banana "have been presented in the table 4 and figure 5 that, the per hectare cost-A_1, A_2, cost-B_1, B_2, and cost-C_1, C_2, C_3 at the overall level were Rs.14,4322.97, 14,4322.97, Rs.14,6706.50, 16,9879.15, and Rs. 15,3620.36, 17,9450.19, 19,7395.21 per hectare, respectively on the sample farms. The average income per hectare over cost - A_1, A_2, cost-B_1, B_2 and cost-C_1, C_2, C_3 were worked out to Rs.39,9262.12, 39,9262.12 Rs.39,6878.93, 37,3706.15 and Rs.38,9965.07, 36,4135.24, 34,6190.22, respectively. The income over different costs also increased with the increase in the farms size because of higher output in relation to total input cost."

Table 4: Per hectare yield value of output and cost of production per quintal of banana.

S. No.	Cost/category	Small	Medium	Large	Overall
A.	**Break-up cost**				
1.	Cost A_1 (all actual expenses)	129529.82	143435.42	153881.24	144322.97
2.	Cost A_2=Cost A_1+Rent paid for leased in land	129529.82	143435.42	153881.24	144322.97
3.	Cost B_1=Cost A_1+Interest on value of owned fixed capital	131687.63	145835.79	156385.61	146706.50
4.	Cost B_2=Cost B_1+Rental value of owned land and rent paid for leased inland	152828.05	169177.21	180632.22	169879.15
5.	Cost C_1=Cost B_1+Imputed value of family labour	147011.97	155053.02	156385.61	153620.36
6.	Cost C_2=Cost B_2+Imputed value of family labour	168152.39	178391.44	187063.35	179450.19
7.	Cost C_3=Cost B_2+10% of cost C_2 on account of managerial function performed by farmer	184967.62	196230.58	205769.68	197395.21
B.	**Income over different cost**				
	I.O.D.C. A_1	406693.83	396742.06	396900.04	399262.12
	I.O.D.C A_2	406693.83	396742.06	396900.04	399262.12
	I.O.D.C. B_1	404536.02	394342.23	394396.03	396878.93
	I.O.D.C. B_2	383395.06	371000.81	370149.42	373706.15
	I.O.D.C. C_1	389211.68	385125.00	394396.03	389965.07
	I.O.D.C. C_2	368071.26	361786.58	363718.29	364135.24
	I.O.D.C. C_3	351256.03	343947.44	345011.96	346190.22
C.	**Gross income**	**536223.65**	**540178.02**	**550781.68**	**543585.43**
D.	**Input output ratio**	**1:3.18**	**1:3.02**	**1:2.94**	**1:3.02**

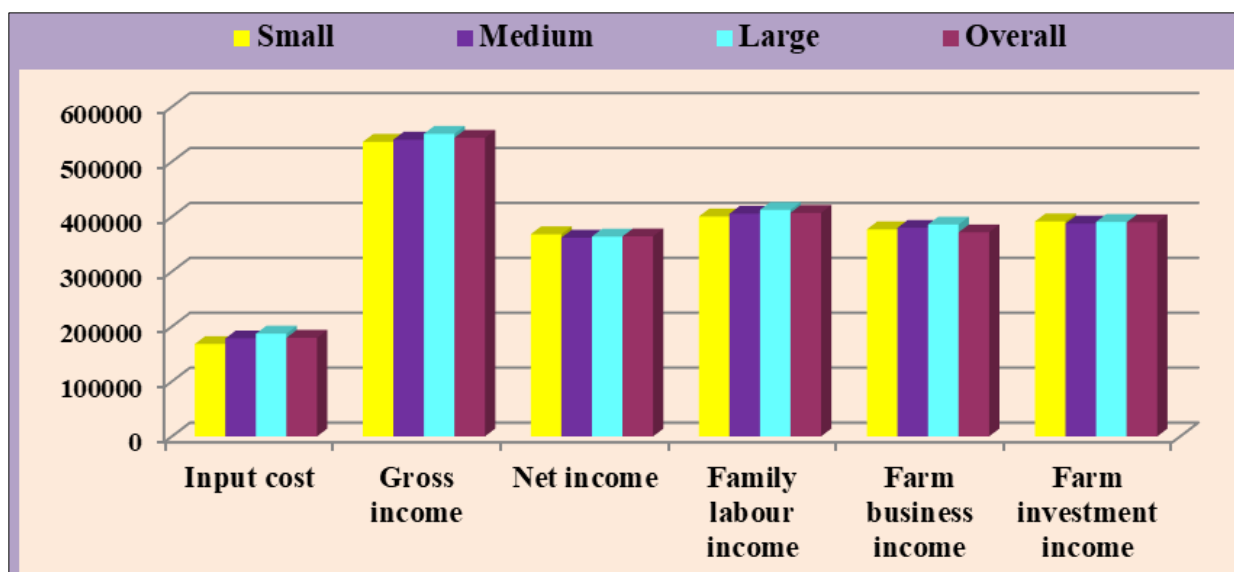**Note:** Figures in parentheses indicates in total percentage

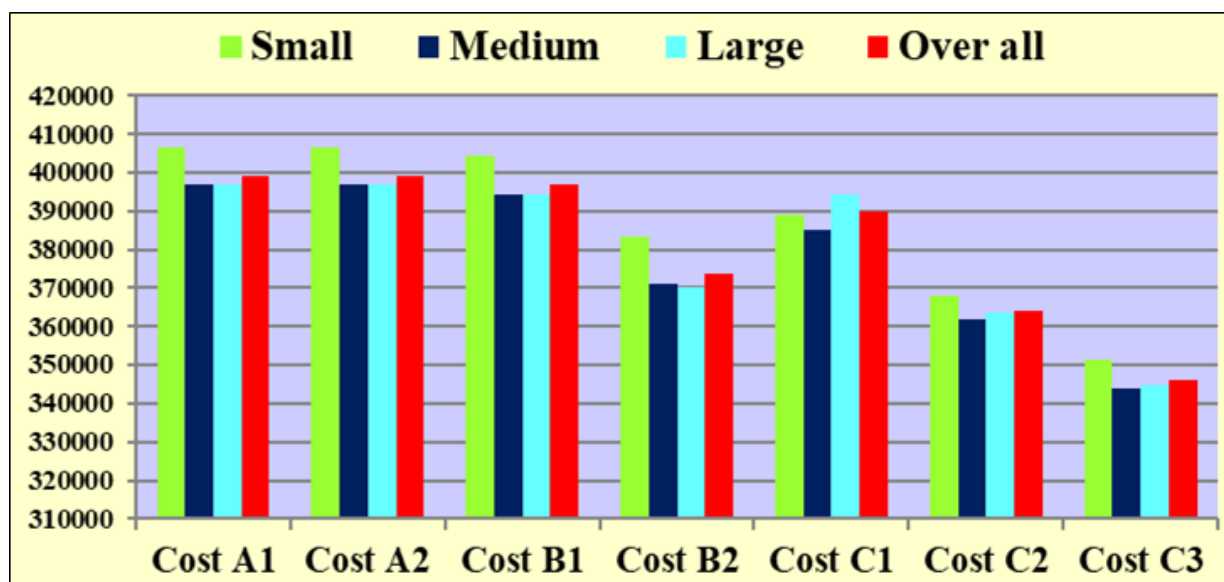**Fig 4:** Cost and return of banana on the sample farm for different groups of farms (Rs./ha.)

Fig 5: Cost concept of banana on the sample farms (Rs./ha.)

Post-harvest losses in banana at market level
The estimated post-harvest losses per quintal of banana handled at different stages at market level are presented in table 5. Post-harvest losses in banana at market level were estimated at wholesaler and retailer level. It has been reported that total post-harvest losses at market level was found 5.27 kilogram per quintal out of which contribution of losses at wholesaler and retailer level was 3.04 and 2.23 kilogram per quintal respectively. Maximum share of losses among different operations of marketing was found in transportation (wholesaler level) being 20.68 per cent to the total losses at market level. Contribution of losses in selling was found maximum among different operations at retailer level being 13.66 per cent to the total losses at market level

Table 5: Post-harvest losses of banana at market level

S. No.	Stage	Losses (Kg./qt.)	Percentage
1	**Losses at wholesaler level**		
	(a) Sorting & grading	0.43	8.15
	(b) Packaging	0.56	10.62
	(c) Storage	0.70	13.28
	(d) Transportation	1.09	20.68
	Sub total	3.04	57.66
2	**Losses at retailer level**		
	(a) Transportation	0.66	12.52
	(b) Sorting Grading	0.60	11.38
	(c) Selling	0.72	13.66
	Sub total	2.23	42.03
	Total	5.27	100.00

Summary and Conclusion
Growing fruits gives better returns to farmers as compared to cereals so beside health benefits vegetables can increase the income of Indian farmers. Export quality fruits fetch good price in international markets and contribute strengthening economy of the nation. Outputs of all agricultural commodities produced in the field have to undergo a series of operations such as"harvesting, transportation, processing, storage and exchange before they reach the consumer, and there are appreciable losses of outputs during these stages of their handling. The sum quantity of outputs lost in these operations at all of these stages is referred to as" "post-harvest losses". Losses of horticultural produce are a major problem in the post-harvest chain. The total post-harvest losses in banana was 17.58, kilogram per quintal. Maximum share of losses was at farmer level in 12.31 kilogram per quintal.

References

1. More SS. Economics of production and marketing of banana in Maharashtra state. M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad, 1999.
2. Mali BK, Bhosle SS, Shendage PN, Kale PV. Economics of production and marketing of banana in Jalgaon district of Western Maharashtra. Indian Journal of Agriculture Marketing. 2001; 17(1):173-179.
3. Kumari, Priyanka, Kumar, Sanjay. A study on post-harvest losses and constraints in banana cultivation in Vaishali district (Bihar). The Pharma Innovation Journal. 2018; 7(6):93-9.
4. Gajanana TM. Marketing practices and post-harvest loss assessment of banana variety poovan in Tamil Nadu. Agricultural Economics Research Review. 2002; 15(1):56-65.
5. Madan MS, Ullasa BA. Post-Harvest Losses in Fruits, in K.L. Chadha and O.P. Pareek (Eds.) (1993), Advances in Horticulture – Fruit Crops Part-IV, Malhotra Publishing House, New Delhi, 1993.
6. Mali BK, Bhosale SS, Shendage PN, Kale PNPV. Economics of production and marketing of banana in Jalgaon district of Western Maharashtra. Indian J Agric. Mark. 2000; 17(1):173-181.

7. Manoj Kumar K, Sreekumar B, Ajith Kumar GS. Crop Insurance scheme: A case study of banana farmers in Wayanad district, Discussion Paper No. 54, Kerala Research Programme on Local Level Development Centre for Development Studies, Thiruvanathapuram, 2006.

8. More SS, Dudhate DG, Kalalbandi B. Constraints faced by banana grower in production marketing and finance of banana. Indian Journals of agricultural Marketing. 2008; (3):310-315.