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Analysis of area, production, productivity and export of black pepper with special reference to Kerala

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Abstract

Black pepper (*Piper nigrum* L.), is a major spice crop of the world. Annual production of black pepper in the world during 2020 is 6.21 lakh tons from an area of 6.09 lakh hectares. India occupies maximum area (42.55%) under black pepper with a production share of 16.76%. Maximum share of global production is by Vietnam (40.44%) followed by India (16.76%) Indonesia and Brazil (12.56% each). Highest productivity of black pepper during 2020 was recorded by Brazil (2801 kg/ha) followed by Vietnam (2210 kg/ha) and Malaysia (1376 kg/ha). The productivity of India was only 402 kg/ha during 2020. Karnataka followed by Kerala and Tamil Nadu are the major pepper growing and producing states in India. Average productivity of black pepper was highest in Tamil Nadu. Compound growth rate analysis indicated that in Kerala, the rate of area increase for pepper decreased. Among the districts of Kerala, Idukki has the most acreage, production and productivity of black pepper. In terms of both quantity and value, the USA is our top export destination, followed by UK. Overall exports of pepper during 2021-22 is 21882 kg with a value of Rs. 21882 lakhs. The presence of aged plants, as well as improper management and care and harvesting difficulties are the major reasons for the decrease in area and production. Coordinated efforts for planting new, high-yielding vines in place of the old ones and training the farmers on proper management of the vines will aid in restoring black pepper production and income.

Keywords: Black pepper, area, production, productivity, export

Introduction

Black pepper (*Piper nigrum* L.), well known as the “King of spices” or “Black gold” is supreme among spices. It occupies a special and eminent position in the world. It is thought that black pepper originated in the sub-mountain regions of India's Western Ghats. (Rahiman *et al.*, 1979) [5]. With its distinctive pungency and flavor, black pepper holds the top position among spices. It is an ingredient in many food preparations and a spice invariably served at the dining table. In addition to being used as a spice and medicine, pepper is a common ingredient in traditional Ayurvedic medicines and is a definite cure for colds and fever. Currently, more than 25 nations in Asia, Africa, and South America cultivate black pepper. (Ravindran, 2000) [6]. Until the 19th Century, India was the world's top producer of pepper. However, India was overtaken by countries like Vietnam and Indonesia (IPC, 2018) [2]. The top countries that import black pepper from India are the USA, Germany, UK, Vietnam, Japan, Netherlands and Sweden. Majority of the nation's black pepper production and growing area is in Kerala. Prices of pepper have risen by an unprecedented amount both domestically and internationally due to supply limitations in the major production centers of the world. Now garbled and ungarbled pepper is sold domestically for about Rs. 600 per kg. Due to this price hike, farmers have recently been quite interested in cultivating the crop. The area under the crop may rise as a result of this tendency. But for a proportionate increase in production, collaborative effort in crop management with proper fertilization and irrigation and control of diseases and pests is necessary. At this point when pepper is taking priority amidst the farmers of Kerala, this paper examines the area, production and productivity of the crop.

Materials and Methods

Collection of Data: The analysis is based on secondary information on area, production and exports that have been made available by various agencies and government divisions.

Selection of area: The study focused on the black pepper production and trade of Kerala, India, as well as globally. The status of India's exports of black pepper and its trading partners were also examined.

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Period of study

To analyze the global production of black pepper, data from 2019 to 2020 were used. Data from 2018-19 to 2022-23 were utilized to examine the black pepper production in India. Kerala's black pepper production, area, and productivity trends were studied during 1970-71 to 2019-20. The proportion of pepper in total spice exports as well as country-by-country pepper exports from India was studied during 2017-18 to 2021-22.

Compound Annual Growth Rate

The following formula was used to estimate the compound growth rate of black pepper area, production and productivity: Compound Growth Rate (CGR)

$$Y = ab^t e^E$$

Where,

Y = Production/ Area/ Productivity of black pepper.

A = Constant/ Intercept.

B = Regression co-efficient.

T = Time variable in year (1, 2, 3, n).

E = Error term.

The compound growth rate was calculated using the

logarithmic form of the exponential equation as below.

$$\ln Y = \ln a + t \ln b$$

After that, the relationship was used to calculate the compound growth rate (r).

$$R = \text{Anti } \ln \text{ of } (b - 1) \times 100$$

Significance of the compound growth rates were tested by

$$T = r / SE (r) \text{ where,}$$

$$SE (r) = [100 b \times SE (\ln b)] / \ln e$$

Results and Discussion

World production of black pepper

Black pepper production, area, and productivity by major countries during 2019 and 2020 are given in Table 1. The global annual production of black pepper during 2020 is about 6.21 lakh tons from an area of 6.09 lakh hectares. Out of global area of 6.09 lakh ha under pepper, 42.55% of area is in India with a production share of 16.76%. Maximum share of global production is by Vietnam (40.44%) followed by India (16.76%) Indonesia and Brazil (12.56% each). Highest productivity of black pepper during 2020 was recorded by Brazil (2801 kg/ha) followed by Vietnam (2210 kg/ha) and Malaysia (1376 kg/ha). The productivity of India was only 402 kg/ha during 2020.

Table 1: Country wise area (ha), production (tons) and productivity (kg/ha) of black pepper during 2019 and 2020

Country	2019			2020		
	Area	Production	Productivity	Area	Production	Productivity
Brazil	31000	80000	2581	27850	78000	2801
India	244560	137360	562	259148	104071	402
Indonesia	118200	78000	660	116375	78000	670
Malaysia	17477	24000	1373	17437	24000	1376
Sri Lanka	41000	19360	472	40241	21800	542
Vietnam	115000	280000	2435	113142	250000	2210
China	21000	32000	1524	20000	33000	1650
Madagascar	4000	4000	1000	4000	4000	1000
Total	603122	681306	1130	608964	620871	1020

Source: India- DASD, Other countries- IPC

Production and trade of black pepper in India

Tables 2 and 3 and Figure 1 provide state-by-state information on acreage, production and productivity of black pepper. The principal pepper-growing states in India are Karnataka, Kerala, and Tamil Nadu with an average production of 54,950 tons from an area of 2.66 lakh hectares (Table 2 and 3). Other states which have begun growing pepper in recent years, include Tamil Nadu, Andhra Pradesh, West Bengal, Orissa, Assam, Meghalaya and Tripura.

Table 3 depicts a consistent rise in the area planted with pepper in Karnataka from 2018-19 (1.48 lakh ha) to 2021-22 (1.90 lakh ha) and then a declining trend with an area of 1.80 lakh hectares in 2022-23. In Kerala, the area showed a declining trend from 2018-19 (0.83 lakh ha) to 2021-22 (0.76 lakh ha) and thereafter an increasing trend in 2022-23 with an area of 0.82 lakh hectares.

The production of the crop in Karnataka exhibited an increasing trend from 2018-19 (21,000 tons) to 2021-22 (39,000 tons) and then a declining trend in 2022-23 (36,000 tons) (Table 3). Pepper production in Kerala also exhibited an increasing trend from 2018-19 (17,000 tons) to 2020-21 (22,000 tons) and then a declining trend with a production of

21,000 tons during 2021-22 as well as 2022-23. The production of black pepper in Tamil Nadu during 2018-19 and 2019-20 was 3000 tons and it decreased to 2000 tons during 2021-22 and 2022-23.

During 2018-19 to 2022-23, the average productivity of black pepper was maximum in Tamil Nadu (383 kg/ha) followed by Kerala (256 kg/ha) and Karnataka (200 kg/ha) (Fig, 1). From 2018-19 to 2022-23, the productivity of black pepper is showing an increasing trend in Kerala (205 kg/ha to 256 kg/ha) and Karnataka (142 kg/ha to 200 kg/ha) while in Tamil Nadu, it is showing a declining trend (539 kg/ha to 328 kg/ha).

Table 4 shows compound growth rates of distribution, production and productivity of black pepper in India and Kerala. The table clearly shows the acreage, productivity, and production of black pepper in India had positive and statistically significant growth rate of 2.63, 5.92 and 5.00 percent respectively per annum. A negative annual growth rate of -0.18 percent was seen in Kerala while production and productivity increased at a favorable and statistically significant rate of 4.32 percent and 5.00 percent annually.

Table 2: State wise area of black pepper cultivation from 2018-19 to 2022-23 (hectares)

States	2018-19	2019-20	2020-21	2021-22	2022-23
Karnataka	148379	160770	211497	190000	180000
Kerala	82761	83770	82124	76351	82000
Tamil Nadu	5571	6080	6576	6973	6098
Other states	7498	8528	9138	10638	9952
Total	244209	259148	309335	283962	278050

Source: <http://www.spicesboard.in/>

Table 3: State wise production of black pepper from 2018-19 to 2022- 23 (tons)

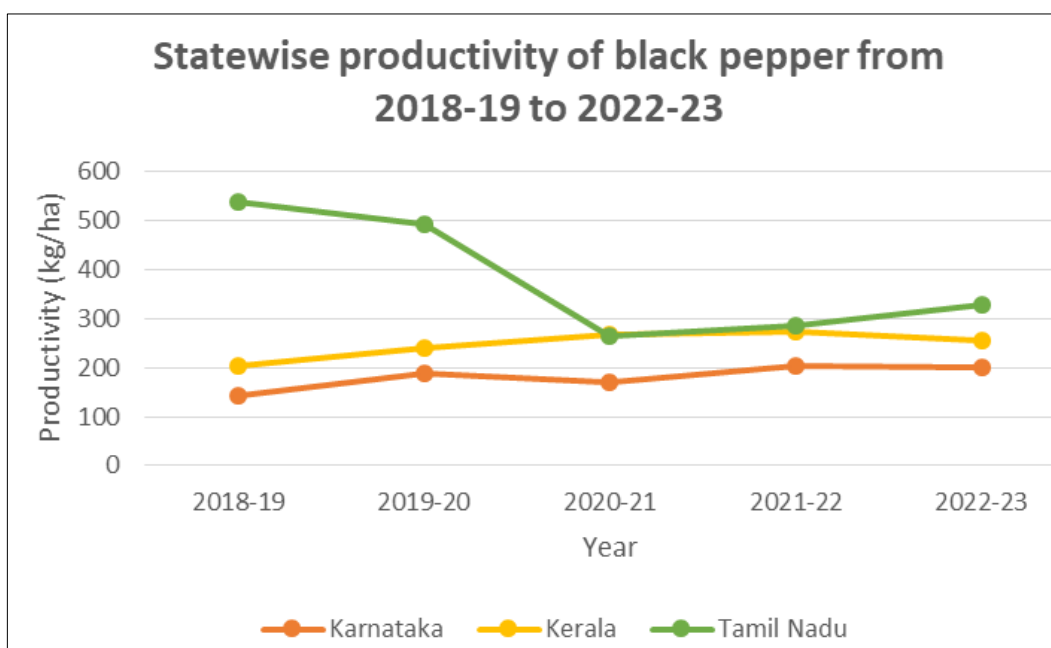
States	2018-19	2019-20	2020-21	2021-22	2022-23
Karnataka	21000	30000	36000	39000	36000
Kerala	17000	20000	22000	21000	21000
Tamil Nadu	3000	3000	1750	2000	2000
Other states	7000	8000	5250	8000	5000
Total	48000	61000	65000	70000	64000

Source: http://www.spicesboard.in

Table 4: Area, production and productivity of black pepper in India and Kerala from 2018-19 to 2022- 23

Year	India			Kerala		
	Area (ha)	Production (t)	Productivity (kg/ha)	Area (ha)	Production (t)	Productivity (kg/ha)
2018-19	244209	48000	196.55	82761	17000	205
2019-20	259148	61000	235.39	83770	20000	239
2020-21	309335	65000	210.13	82124	22000	268
2021-22	283962	70000	246.51	76351	21000	275
2022-23	278050	64000	230.17	82000	21000	256
CAGR (%)	2.63**	5.92*	5.00*	-0.18**	4.32*	5.00**

Note ** = 5% level of significance, * = 1% level of significance and NS = non- significant



Source: <http://www.spicesboard.in/>

Fig 1: State wise productivity of black pepper from 2018-19 to 2022-23

Cultivation of black pepper in Kerala

Table 5 displays the district wise acreage, production, and productivity of the crop in Kerala. Of all the districts in Kerala, Idukki has the highest area, production and productivity and is the significant contributor to the state's overall production (as much as 59.52 per cent) with 51.12 per cent of area planted with the crop. However, even Idukki's productivity during 2019-20 (480 kg/ha) is less than that of Tamil Nadu (493 kg/ha) which is to be taken into account during development of plans for enhancing the state's crop performance. Despite the fact that Idukki is the main

production region, majority of the homesteads in the state raise the crop as an intercrop (Regeena, 2014) [7]. Since 2004-2005, the state's acreage planted with pepper has been steadily decreasing. The area decreased by 64.73 percent from 2.376 lakh ha in 2004-05 to 0.838 lakh ha in 2019-20 (Table 6). Additionally, production has decreased throughout this time from 74,980 tons to 34,550 tons, a decrease of 54 per cent. Incidence of pests and diseases was identified as a key factor contributing to the decreased trend in production (Yogesh and Mokshapathy, 2013; Jacob and Job, 2015) [9, 3] and due to predominance of senile plantations [8]. Since pepper

is the most traded spice in Kerala and a significant foreign exchange earner for the state exchequer, the downward trend in production caused by a decline in area is extremely concerning and has substantial financial implications for the state of Kerala. During 2019-20, there is a marked difference in productivity of pepper reported by spices board (239 kg/ha) and Department of Economics and Statistics, Government of Kerala (412 kg/ha).

In Kerala, mainly black pepper is cultivated as rainfed crop. It is not generally irrigated except the young vines or when it is

grown in tea and coffee plantations. In order to increase the productivity of this rainfed crop, spatial and temporal variation in the weather, especially rainfall and temperature, is a major concern (Kandiannan *et. al.*, 2014) [4]. Despite being a rainfed crop, irrigation in the summer can boost the yield by roughly 50 per cent. Contrastingly, majority of spice-growing farmers in Kerala being small and marginal, for them, making a significant investment in drip irrigation is still a difficult challenge (Hema *et. al.*, 2007) [1].

Table 5: District wise black pepper area, production and productivity in Kerala (2019-20)

Sl. No.	Name of district	Area (ha)	Production (tons)	Productivity (kg/ha)
1	Thiruvananthapuram	1942	604	311
2	Kollam	2846	849	298
3	Pathanamthitta	1617	520	322
4	Alappuzha	690	133	193
5	Kottayam	3023	1009	334
6	Idukki	42822	20560	480
7	Ernakulam	1895	426	225
8	Thrissur	1741	462	265
9	Palakkad	2674	1002	375
10	Malappuram	2674	550	206
11	Kozhikode	3432	880	256
12	Wayanad	10307	3694	358
13	Kannur	4742	2140	451
14	Kasargod	3360	1716	511
	State total	83765	34545	412

Source: <https://www.ecostat.kerala.gov.in/>

Table 6: Trends in Area, production and productivity of black pepper in Kerala

Year	Area (lakh ha)	Production ('000 t)	Productivity (kg/ha)
1970-71	1.175	25.03	213
1974-75	1.184	27.00	230
1980-81	1.081	28.52	264
1984-85	1.058	17.35	164
1990-91	1.685	46.80	277
1994-95	1.867	59.26	317
2000-01	2.021	60.93	301
2004-05	2.376	74.98	315
2009-10	1.715	42.46	248
2014-15	0.854	40.69	263
2019-20	0.838	34.55	412

Source: Farm Guide 2012, 2013, www.ecostat.kerala.gov.in

Status of black pepper export from India and trade partners

According to Table 7, the total quantity of pepper exported increased from 16840 kg in 2017-18 to 21882 kg in 2021-22. The value of export showed a declining trend from 2017-18 (82078 lakhs) to 2020-21 (57069 lakhs) and then an increasing trend in 2021-22 (75393 lakhs). India is a significant pepper consumer as well, and when production declines, the surplus that is available for export also decreases, which might cause a decline in both the volume and the value of exports.

During the period from 2017-18 to 2021-22, the share of pepper in total exports decreased from 1.64 to 1.43 percent and their value decreased from 4.50 to 2.47 percent. To counter the reduction in production and the rise in pricing exporters purchase products from less expensive sources to re-export. However, this could harm our pepper industry because there are possibilities of poor quality produce getting mixed with our pepper which is renowned for its excellent quality. In terms of both quantity and value, the USA is our primary export market, followed by the UK (Table 8).

Table 7: Share of pepper in total spice exports (Quantity in tons and value in Rs lakhs)

	2017-18		2018-19		2019-20		2020-21		2021-22	
	Qty (t)	Value (Rs lakhs)	Qty (t)	Value (Rs lakhs)	Qty (t)	Value (Rs lakhs)	Qty (t)	Value (Rs lakhs)	Qty (t)	Value (Rs lakhs)
Pepper	16840	82078	13540	56,868	17000	57371	19980	57069	21882	75393
Total	1028060	1798016	1100250	1950581	1208400	2206279	1758985	3097332	1531154	3057644
% share	1.64	4.56	1.23	2.92	1.41	2.60	1.14	1.84	1.43	2.47

Source: <http://www.spicesboard.in/>

Table 8: Country wise pepper exports from India (Quantity in tons and value in Rs lakhs)

	2017-18		2018-19		2019-20		2020-21		2021-22	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value
U.S.A	6377	31083	3965	15251	6681	19904	6548	18376	8382	27785
Sweden	834	5019	737	3400	1152	4621	1026	4016	1206	5200
U.K.	2250	8978	1375	5670	1574	4956	1421	4622	1255	5168
Germany	917	6716	775	4278	676	3577	755	3838	925	5024
Canada	731	3565	630	3168	616	2566	1176	3645	1242	4325
Netherlands	372	2249	258	1462	256	1501	656	2561	798	3590
U.A.E	232	1130	242	1027	184	718	703	1563	1125	3127
Others	5128	23339	5557	22611	5862	19529	7696	18447	6948	21175
Total	16840	82078	13540	56868	17000	57371	19980	57069	21882	75393

Source: <http://www.spicesboard.in/>

Pepper trade in India and abroad through marketing channels

The farmers, middlemen, domestic market, market terminal, exporters and assembling market are all part of the marketing channel. Presently, producers have a variety of options for selling their goods. The most common marketing strategy is purchasing product directly from farmers through local retailers and wholesalers and then sells it to exporters. Exporters are this network's final link. Commission agents are connected to private sector operations who collect the produce from growers and sell it to retail dealers at a price based on supply and demand.

Conclusion and subsequent strategy

Right now due to the high market prices, farmers are buying planting materials of black pepper in all production centers. However, good quality planting materials of high yielding varieties are limited. In general, farmers have a tendency to plant when prices are high and ignore the crop when prices are low. In Kerala, the bulk of the crop are produced as intercrops in home gardens. Majority of the crops are old, senile, and unproductive, and they need to be replaced. While starting new planting, it must be assured that varieties suitable to open areas (Panniyur 1 and 3) must be planted in places where ample sunlight is available and shade tolerant varieties (Eg. Panniyur 2 and Panniyur 5) are to be planted in shaded areas. Drought resistant varieties have also been released from Pepper Research Station, Panniyur (eg. Panniyur 8, Panniyur 9 and Panniyur 10). Proper irrigation during summer months can boost the yield of the crop. In home gardens, the crop frequently goes unattended until it is harvested without the required fertilization. Since the vines are trailed on big trees, it is difficult and expensive to harvest a large portion of the crop. In order to assure greater yield, farmers must receive training in scientific crop management techniques. Dead standards can also be used for the cultivation of black pepper. In order to increase overall production and productivity, it will be helpful to ensure the planting of improved high yielding varieties depending upon the availability of sunlight, proper and scientific crop management, ensuring prophylactic measures for pest and disease management, promoting good agricultural practices, and a more regulated system of planting with standards of uniform height. Proper awareness to farmers on post-harvest treatment and value addition can also help to get higher crop returns.

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