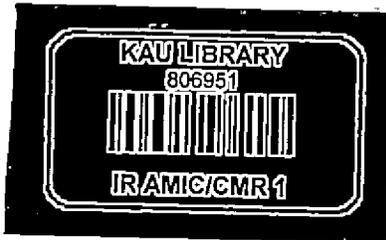




AMIC KAU Commodity Report – 1
(Funded by ICAR-NAIP)

BLACK PEPPER

K. Jayasree
Swapna Surendran
K. Satheesh Babu



Agricultural Market Intelligence Centre

Department of Agricultural Economics
Kerala Agricultural University
Vellanikkara, Trichur

2010-11

AMIC KAU Commodity Report – 1
Black Pepper



806951

1R AMIC KAU 1

K. Jayasree
Swapna Surendran
K. Satheesh Babu

March 2011

250 Copies

NAIP on Establishing and Networking of Agricultural Market Intelligence Centres
in India

Department of Agricultural Economics
College of Horticulture
Kerala Agricultural University
Vellanikkara, Thrissur 680 656
Kerala- India

Cover Designing:
Syamala Mohan

Typesetting and Printing at:
Chirayath Printers,
Mannuthy, Trichur – 680 651

PREFACE

The Agricultural Market Intelligence Centre (AMIC) of Kerala Agricultural University started functioning in the Department of Agricultural Economics, College of Horticulture on 12-10-2009 as a part of National Agricultural Innovation Project, Component-I, funded by Indian Council Agricultural Research. The major objectives of the Centre include providing price forecasts during main crop seasons for coconut, pepper and cardamom, making available product intelligence to all stakeholders, providing information on high price markets to producers, improving the dissemination of market intelligence, increasing the capacity to absorb and use such market intelligence by all stakeholders, developing commodity market outlook for selected commodities at state level and providing commodity market research reports.

The Centre has been in the forefront in giving various information output in the form of price forecasts, info-series, officers' training manual and technical reports. During its one and half years of existence, the Centre has published 12 Price Forecasts and 3 updates for the mandate crops for which 127 News Paper releases, 60 TV telecasts and 18 Radio broadcasts were made for maximum outreach to farming community. Apart from this, the forecasts and updates of the Centre were send to 13, 18,000 Green Card Mobile holders as voice SMS. So far, the Centre has released 3 info-series and has conducted 7 Officers' training and 15 Farmers' training involving 354 Officers and 925 farmers respectively since its inception.

The Centre is coming out with a Commodity Report on Black Pepper, the first in the series. It covers such areas like the history, importance of the crop in the national as well as global perspective, marketing aspects, marketing channels, consumer and trade preferences, price behaviour and export competitiveness.

We hope this would be of use to researchers, developmental agencies, trainers and extension personnel acting in the upliftment of pepper farmers.

K. Jayasree
Swapna Surendran
K. Satheesh Babu

EXECUTIVE SUMMARY

Black Pepper is the most traded spice in the world and aptly called the 'King of Spices'. Vietnam, India, Indonesia and Brazil are the major producers and exporters of black pepper. Till 1990s, India occupied the top position in the production and export of black pepper in the world till the emergence of Vietnam as the prime producer and exporter of pepper by the turn of last century. The report traces the history, importance of the crop in the national as well as global perspective, marketing aspects, marketing channels, consumer and trade preferences, price behaviour and export competitiveness. The analysis of price behaviour of black pepper indicated no price volatility, but the instability measured by the co-efficient of variation from January 1995 to December 2010 worked out to 43.84 per cent. The trend analysis showed a mixed trend with an increasing trend in pepper prices after November 2004. Pepper prices exhibited considerable seasonality with a buoyant phase from July to October, with the price reaching the peak level in August and the trough level in November to March. A price cycle of six years duration was identified which extended from July 1996 to July 2001. The co-integration study revealed that the domestic and international market at New York was well integrated. The trade competitiveness with respect to fob prices at Vietnam were not advantageous to Indian pepper, calling for cost effective production by increased productivity per unit area cultivated.

INTRODUCTION

Pepper is native to the warm humid tropics of coastal Malabar Coast of Peninsular India, and hence it thrives well in hot, humid, tropical climates. The plant tolerates a minimum temperature of 10 °C and a maximum of 40 °C, the optimum being 20-30 °C. It requires evenly distributed annual rainfall of about 2500 mm or more. It comes up well at sea level up to 600 m elevation. About 70 mm of rainfall within a period of 20 days may be sufficient for triggering of flushing and flowering process in the plant, but once the process is set on, there should be continuous rainfall until fruit development starts. Any dry spell within this critical period will result in substantial reduction of yield. Very long dry spells are unfavorable for the crop growth (Kerala Agricultural University, 2007).

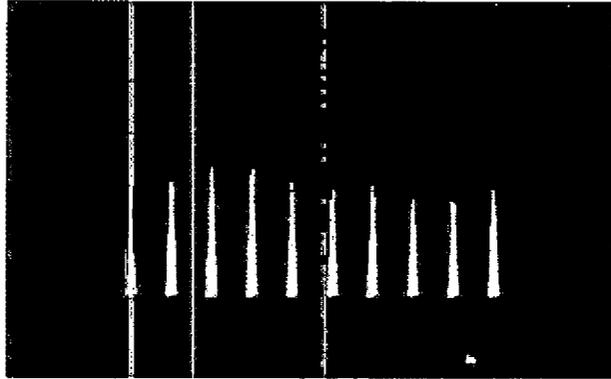
Soils rich in humus with a pH range of 5.5 – 6.0 with good drainage are preferred. The plant does not tolerate water stagnation in the soil, even for a very short period. Sites with slight to moderate slope are ideal for pepper cultivation, as they promote drainage. Slopes facing south are to be avoided as far as possible. When such slopes are to be used for cultivation, the young plants may be sufficiently protected from the scorching sun during the summer. Black pepper is a day neutral plant. However, it performs well under light shade. Hence, shade regulation of live standards is an important cultural practice in pepper cultivation. Otherwise, the yield will be reduced.

GLOBAL SCENARIO

Pepper is being cultivated in developing countries across Asia and South America. Vietnam, India, Brazil, Thailand, China, Madagascar, Sri Lanka, Indonesia, Malaysia are the major producers and exporters of pepper with Vietnam leading in both world production as well world exports. Global annual pepper production is estimated to be in the range of 2.70-3.35 lakh tonnes. The major production share is contributed by Vietnam with an annual output of 80,000- 90,000 tonnes. Vietnam's sudden increase in production has resulted in massive global output to 3-3.5 lakh metric tonnes from 1.9-2 lakh metric tonnes in the late nineties (Fig 1.), making it the largest pepper producing member of the International Pepper Community (IPC).

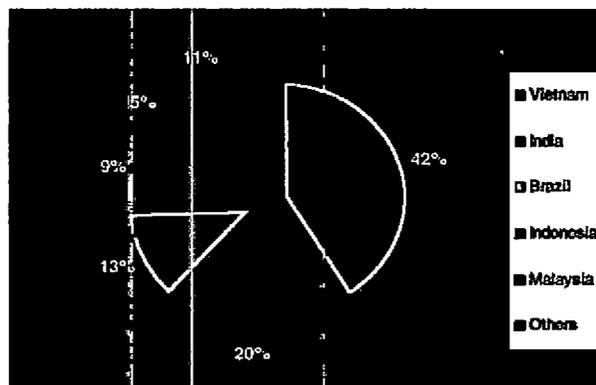
Global pepper production over the last ten years (2000-2009) is given in Fig 1.

Fig 1. Global pepper production over the last ten years



It indicates an increasing trend up to 2003 and thereafter a declining trend till 2009. The surge in production in 2003, accompanied by a price crisis was the major reason for decline in output in recent years. Further, the crop in the major producing countries such as Vietnam and India has been affected by poor maintenance, high incidence of diseases, and climate changes during past few years. According to the estimates of International Pepper Community, the global pepper production during 2010 is expected to increase by 3 per cent over the previous year to touch 2,90,742 tonnes (IPC, 2010). The percentage share of pepper production over the last five years is depicted in Fig 2.

Fig 2. Percentage share of pepper production over the last five years



Source: Spices Board (a), 2010

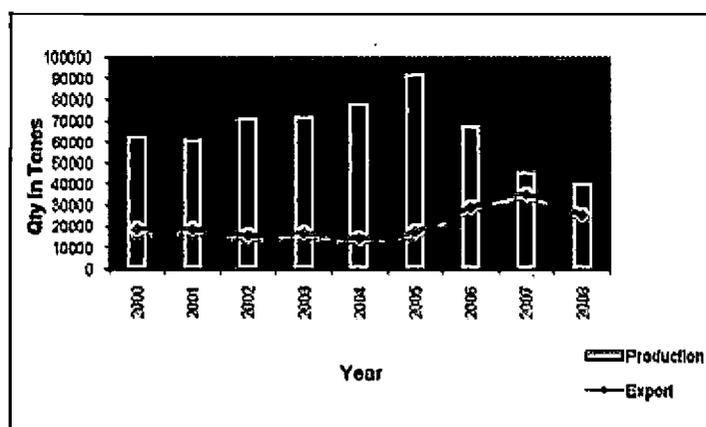
World exports of black pepper fluctuates around 1.5-2.5 lakhs tonnes per annum. Vietnam has been the world's largest pepper producer and exporter since 2001, with Germany, India and U.S. being the biggest buyers. In 2009, Vietnam exported around 106,533 mt of black pepper followed by Indonesia (39,150 mt) and Brazil (35,746 mt) (IPC, 2010). The estimated export of pepper from India during January 2010 is 1500 tonnes valued at 2595 lakh against 2100 tonnes valued at 3084 lakh in January 2009 (ISFEA, 2010).

INDIAN SCENARIO

India is the second largest producer of pepper in the world after Vietnam. The country itself is a very big consumer of spices so the quantity available for export is limited as compared to its competitors. India's main export is of Malabar grade black pepper. U.S., Italy, Germany, and Canada are the major importers of Indian pepper. Indian pepper of 'Malabar' grades command a premium in international market due to its superior quality.

India's pepper production and export over the last ten years is given in Fig 3. It shows that production increased from 62,440 MT in 2001 to 92,935 MT in 2005, afterwards showing a declining till 2008 (41,255 MT) whereas India could export 18476 mt of pepper in 2000, which increased to 25250 MT in 2008. According to the data released by the Spices Board of India, during the year 2009-10, India has exported a total quantity of 19,750 tonnes of pepper valued at Rs.313.93 crores as against 25,250 tonnes valued at Rs.413.74 crores of last year, registering a decline of 22 per cent in volume and 24 per cent in value. Export of pepper to major destinations like USA, EU etc. have declined during the year (Spices Board (b), 2010).

Fig 3. Indian Pepper Production and Export



The major pepper producing states in India are Kerala, Karnataka and Tamil Nadu. Kerala records the highest position in area and production of pepper followed by Karnataka and Tamil Nadu (Table 1). Other pepper producing states are Pondicherry and Andaman & Nicobar.

Table 1. Area, Production and Productivity of Black Pepper in in India

Sl. No	Stat	Area ('000 ha)		Production ('000 MT)		Productivity (Kg/ha)	
		2000-01	2008-09	2000-01	2008-09	2000-01	2008-09
1	Kerala	202.13	153.71	60.93	33.99	301	221
2	Karnataka	7.25	17.45	1.76	5.44	243	312
3	Tamil Nadu	4.05	4.62	0.89	1.06	220	230
4	Others	0.44	2.21	0.09	0.77	205	348
5	All India	213.87	177.99	63.67	41.26	298	232

Source; Directorate of Cocoa, Arecanut & Spices, Calicut

Table 2: Compound Growth Rate (%) of Area, Production and Productivity of Pepper in the Major Growing States

States	Area	Production	Productivity
Kerala	0.13	-1.47	-1.60
Karnataka	14.2	14.6	0.35
Tamil Nadu	2.04	2.53	0.49

During the period from 1997-98 to 2008-09, Karnataka witnessed the maximum growth in area under cultivation, followed by Tamil Nadu (Table 2). However, growth in productivity is not significant in these two states, while Kerala is experiencing declining productivity. Consequently, Karnataka leads the table with highest growth in production. The growth in production in Karnataka and Tamil Nadu was more due to growth in acreage than growth in productivity. On the other hand, decline in production in Kerala despite growth in area is on account of declining in productivity. This is an area of concern in view of growth in demand for black pepper in the domestic as well as international market.

Pepper is commonly cultivated in Kerala as an intercrop in the homesteads along a wide array of other crops due to limitations on land availability. Cultivation of pepper as a pure crop is restricted to Idukki and Wayanad districts. Planting pepper in coffee and tea estates using adult shade trees as live standards is also common in these districts. Coorg, Sakaleshpura, Uttarakannada, Hassan, Chickmanglore, Udipi and Mangalore are the major production centres in Karnataka. Similarly, Kanyakumari and Nilgiris in

Tamil Nadu, Mahe in Pondicherry and Andaman & Nicobar Islands are other notable production centers.

VARIETIES

Over 75 cultivars of pepper are being cultivated in India. Karimunda is the most popular among the local cultivars. The other important cultivars are Kottanadan, Kuthiravally, Arakulam Munda, Balankotta, Narayakkodi, Aimpiriyan, Neelamundi and Kalluvally. Among them, Kottanadan has the highest oleoresin content (17.8%) followed by Aimpiriyan (15.7%). Malligesara and Uddagare are two prominent cultivars in Karnataka.

Improved cultivars of pepper released from the pepper research station at Panniyur under Kerala Agricultural University are Panniyur-1, Panniyur-2, Panniyur-3, Panniyur-4, Panniyur-5, Panniyur-6, and Panniyur-7, of which Panniyur-1 is less shade tolerant, and is to be grown in comparatively open areas. Panchami, Sreekara, IISR-Malabar Excel, IISR-Girimunda, IISR-Thevam, PLD-2, Pourami, Subhakara are some promising varieties released from the Indian Institute of Spices Research, Calicut.

PEPPER TRADE AND MARKETS

Pepper has been used as a spice in India since prehistoric times. There have been many uses of black pepper. It is extensively used in different types of cuisine all over the world. It has medicinal values, and is used in remedies of several traditional medications in India. The black pepper oil is also utilised in making perfumes.

Peppercorns were a much prized trade good during the pre historic times, and used as commodity money. Black peppercorns were used for mummification rituals by the Egyptians as early as in 1213 BCE. Black pepper was known in Greece at least as early as the 4th Century BCE. It was an expensive item that only the very rich could afford. Trade routes of the time were around the coastlines of the Arabian Sea. After Rome's conquest of Egypt in 30 BCE, open-ocean crossing of the Arabian Sea directly to Southern India's Malabar Coast was near routine. According to the Roman geographer Strabo, the Roman Empires sent a fleet of around 120 ships every year to India and back by taking advantage of the predictable monsoon winds. It is possible that black pepper was known in China in the 2nd century BCE, though textual references are available on "foreign pepper" (*hujiao*) in the 3rd century CE onwards. Marco Polo testifies to pepper's popularity in 13th-century China when he relates its consumption in the city of Kinsay (Zhejiang). Till the middle Ages, virtually all of the black pepper found in Europe, the Middle East and North Africa found its origin to India's Malabar region. By 16th century, pepper was also being grown in Java, Sumatra, Madagascar, Malaysia and elsewhere in Southeast Asia, but these pepper were either used locally or were traded mainly with China. Black pepper along with other spices from India and lands Farther East changed the course of world history. It was the efforts to monopolize the trade in spices that led to the European efforts to find a sea route to India, which consequently led to its European colonization. With

ships sailing directly to the Malabar Coast, black pepper became a major traded commodity. Pliny complains in his *Natural History*, believed to be compiled in Rome around 77 CE that “It is quite surprising that the use of pepper has come so much into fashion, seeing that in other substances which we use, it is sometimes their sweetness, and sometimes their appearance that has attracted our notice; whereas, pepper has nothing in it that can plead as a recommendation to either fruit or berry, its only desirable quality being a certain pungency; and yet it is for this that we import it all the way from India! There is no year in which India does not drain the Roman Empire of fifty million sesterces,”

The taste for pepper and its monetary value as a luxury item was evident to those who would see Rome fall. It is said that Attila, the Hun demanded a ransom of more than a ton of pepper from Rome when they besieged the city in 5th century A.D. After the fall of Rome, spice trade in Europe was taken over by the Arabs. By the end of the Dark Ages, the spice trade was firmly under the Islamic control. Vasco da Gamma’s trip to India by sea, first trip to India by way of the southern tip of Africa in 1498, led to a fierce European competition to take control of the spices trade in Malabar. The Treaty of Tordesillas in 1494 granted the Portuguese exclusive rights to black pepper trade of Indian origin. However, the Portuguese were unable to maintain their stranglehold on the spice trade for long. Between 1661 -1663, the Dutch and the English outwitted the Portuguese into capturing the pepper ports of Malabar. As pepper supplies to Europe increased, the price of pepper declined. Pepper, which constituted an exclusive luxury item of commodity for the rich in the early middle Ages, became an everyday culinary item among common people. During the 19th century, London emerged as the world’s most important spice center. When the fortunes of the East India Company were declining, the US cities of Salem and Boston became main spice trading centers in the world.

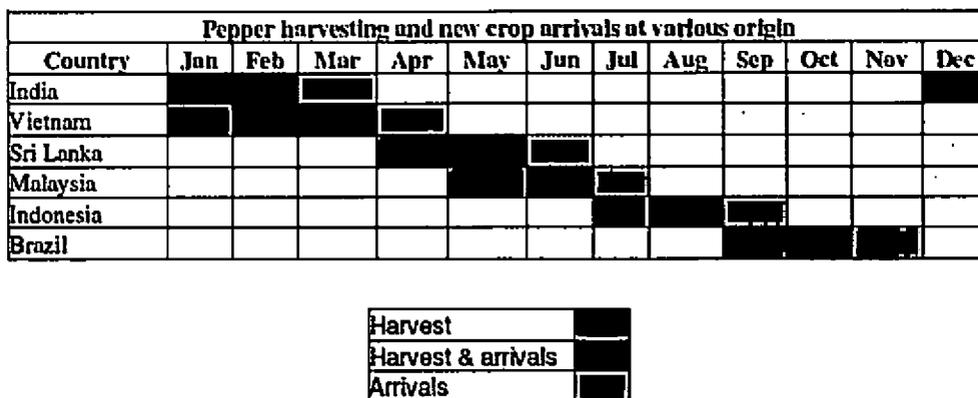
PEPPER MARKETING

Black pepper flowers during May – June. The crop will be ready for harvest in six to eight months from flowering. Pepper harvesting seasons vary from country to country, depending on climate. In India, harvesting season starts from December and ends in February. The harvest season extends from November to January in the plains and January to March in the hills. When one or two berries in the spike turn bright orange or purple, it is time for harvest. Harvesting is done by hand picking of the spikes from the vines. The berries are usually separated from the spikes physically and dried in the sun till the moisture level comes down to 10-12 per cent. Properly dried pepper is packed in clean gunny bags and if stored properly can be held for 2 -3 years without any deterioration in quality.

The market arrival of pepper also varies according to the harvest period. In India, the arrivals are more in the month of March. Harvesting commences in Vietnam during January, and peak arrivals are by March (Fig 4.). In Indonesia, July and August is the harvesting season and market is more active in September. Harvesting starts in Brazil

from September and continues till October. Thus, Vietnam exerts more influence in the global market during the first half of the season while production in Indonesia and Brazil influences the second half of the season.

Fig 4. Global harvesting calendar



Source: Brazilian Pepper Trade Board

Though any taluk level commodity market in Kerala transacts in black pepper, the major secondary markets are Aluva, Angamaly, Perumbavoor, Kattappana, Kumily, Thodupuzha, Kozhikode, Thrissur, and Kannur. Kochi is the terminal market for black pepper. The major market centres in Karnataka are furnished in Table 3.

Table 3: Major Black Pepper markets in Kerala and Karnataka

States	Markets
Kerala	Nedumangad, Adoor, Alleppey, Pala, Aluva, Angamaly, Perumbavoor, Kattappana, Nedumkandam, Kumily, Thodupuzha, Adimaly, Pulpally, Mananthavadi, Sulthan Batherry, Kozhikode, Vadakara, Manjeri, Thrissur, Wadakkanchery, Kecheri, Kannur, Tellicherry, Kuthuparambu, Kanjangad, Kochi,
Karnataka	Chickmanglore, Karkala, Mangalore, Koppa, Moodigere, Puttur, Sirsi, Yellapuri, Bangalore, Madikeri, Sagar, Sakaleshpura, Siddapur, Sulya

CONSUMER AND TRADE PREFERENCES

Black Pepper has varying uses as a food condiment, preservative and as an important ingredient in Ayurvedic, Chinese and Unani and other traditional medicines. Piperine, the pungent principle in pepper oleoresin helps to enhance bioavailability and therefore used in pharmaceuticals. The major functional properties of pepper are analgesic, anti-pyretic, anti-oxidant and anti-microbial.

In the international market, consumer preference of black pepper differs from country to country. The Government of India enforced the grading of black pepper based on the varying needs of the buyers. The AGMARK grades have been formulated on the basis of size, extraneous matter, pinhead and light berry contents and other physical characters such as moisture level (Table 4 and 5). The general characteristics stipulate that black pepper shall be dried mature berries of *Piper nigrum* L. grown in South India, having an unbroken pericarp, brown to black in colour with wrinkled surface; free from mould growth living or dead insects, insect fragments and rodent contamination; free from added colouring matter and quoting of mineral oil; and shall comply with restrictions with regards to aflatoxin, metallic contaminants, insecticide and pesticide residue, poisonous metals, naturally occurring contaminants and microbial load as specified by the Prevention of Food Adulteration Rules, 1955 for domestic trade and Codex Alimentarius Commission for export trade. It may be marked "Malabar" with a minimum bulk density of 550 gm/litre.

Table 4. Agmark grade specifications of Ungarbled Black Pepper in India

Grade	Moisture Content (Max.% Wt)	Light Berries (Max.% Wt)	Extraneous matter (Max.% Wt)
MUG Grade 1	12.00	7.00	2.00
MUG Grade 2	12.00	10.00	2.00
MUG Grade 3	12.00	15.00	3.00
MUG Grade 4	12.00	20.00	4.00

Table 5. Agmark grade specifications of Garbled Black Pepper in India

Grade	Moisture Content (Max.% Wt)	Light Berries (Max.% Wt)	Extraneous matter (Max.% Wt)
MG Grade 1	11.00	2.00	0.50
MG Grade 2	11.00	5.00	0.50

The export specifications for spices are furnished in Table 6.

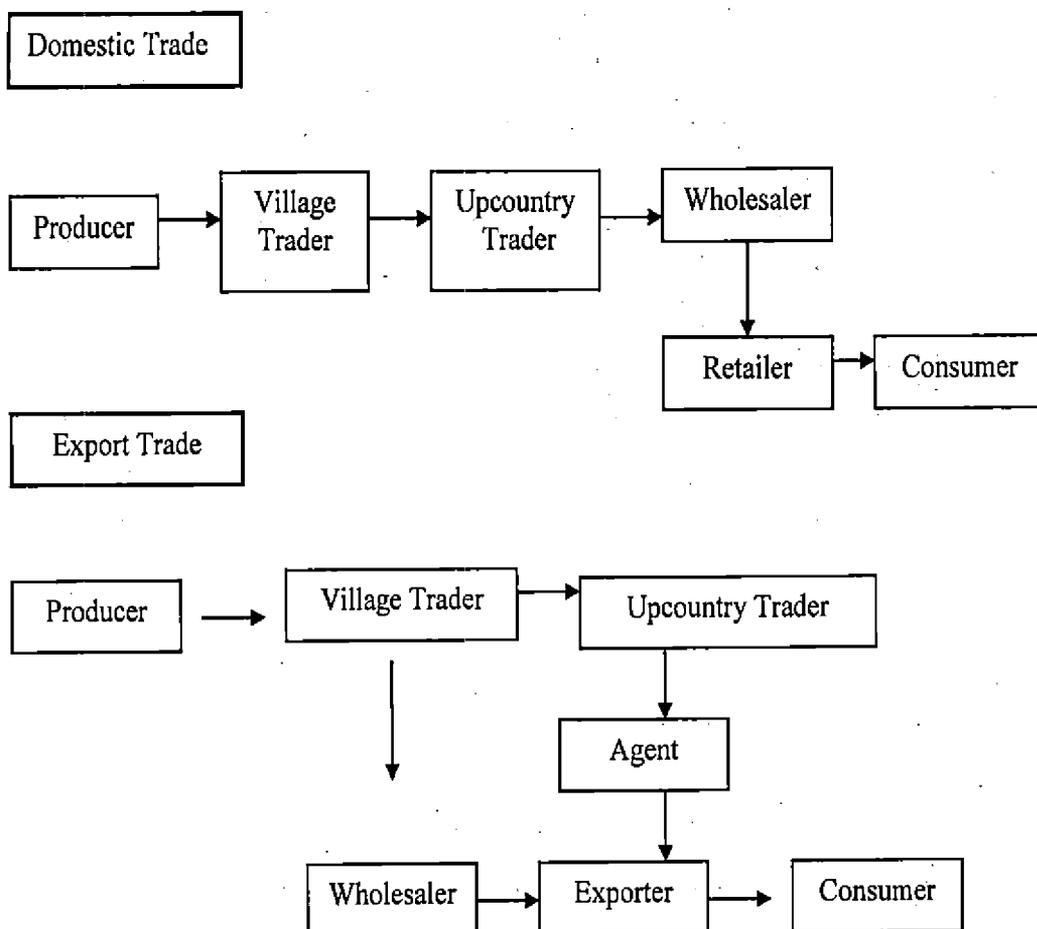
Table 6. Export Specifications for Spices

Subject	Particulars
Extraneous matter	Herbs 2%, Spices 1%
Sampling	(For routine sampling) Square root of units/lots to a maximum of 10 samples. (For arbitration purposes) Square root of all containers. e.g. 1 lot of pepper may = 400 bags, therefore square root = 20 samples.
Foreign Matter	Maximum 2%
Packaging	Should be agreed between buyer and seller. If made of jute and sisal, they should conform to the standards set by CAOBISCO. However, these materials are not favoured by the industry, as they are a source of product contamination, with loose fibres from the sacking entering the product.
Heavy Metals	Shall comply with national/ EU legislation. Pesticides
	Shall be utilized in accordance with manufacturers recommendations and good agricultural practice and comply with existing national and/or EU legislation.
Treatments	Use of any EC approved fumigants in accordance with manufacturers' instructions, to be indicated on accompanying documents. (Irradiation should but be used unless agreed between buyer and seller.
Microbiology	Salmonella absent in (at least) 25 g. Yeast & Moulds 105/g target, 106/g absolute maximum E Coli. 102/g target, 103/g absolute maximum Other requirements to be agreed between buyer and seller.
Off Odours	Shall be free from off odour or taste.
Infestation	Should be free in practical terms from live and / or dead insects, insect fragments and rodent contamination visible to the naked eye (corrected in necessary for abnormal vision).
Aflatoxins	Should be grown, harvested, handled and stored in such a manner as to prevent the occurrence of aflatoxins or minimize the risk of occurrence. If found, levels should comply with existing national and/or EU legislation.
Documents	Should provide: - details of any treatments the product has undergone; name of product; weight; country of origin; lot identification/batch number; year of harvest.

MARKETING CHANNEL

According to Cundiff *et al.*, 1982, marketing or trade channel is the path of movement of a commodity from the primary producer to the ultimate consumer or industrial user. The first link in the marketing of black pepper from the farm gate is the village trader, whose area of operation is mostly co terminus with the local primary market. They pass on the produce to the up country traders, who form the second intermediary. The third intermediary in the marketing channel is the wholesaler, who procures the produce from the up country traders. They assemble the produce, clean it and repack it before it is passed on to the retailer for domestic trade or terminal markets, where it is sold to the export houses for international trade. Thus, the export houses link the domestic market and the overseas market. Cochin, Tuticorin and Mangalore ports are the main terminal markets in the South.

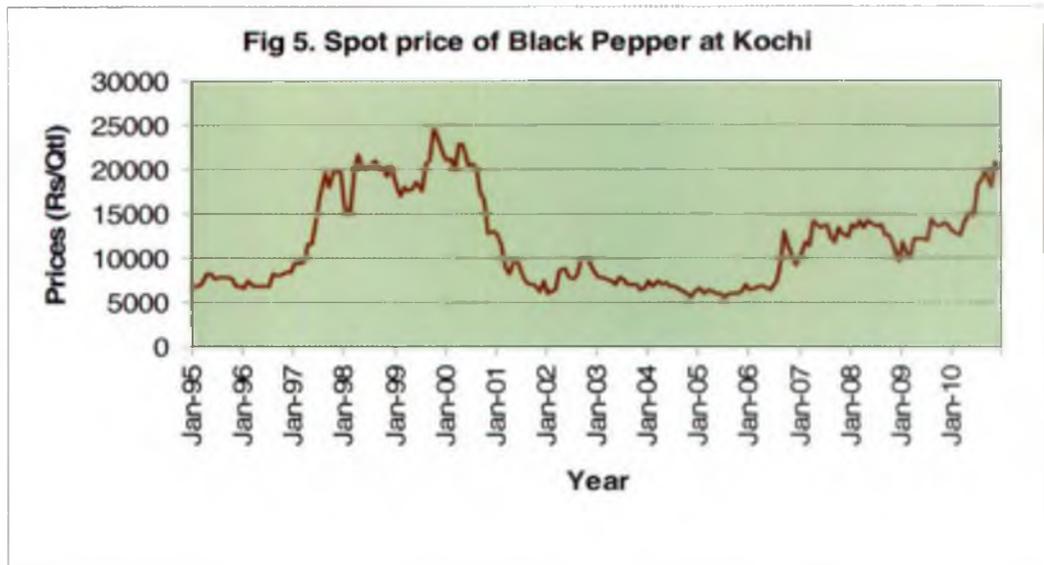
The main marketing channels for black pepper for domestic as well as foreign trade are indicated below:



The corporate houses are into pepper trade and investment on a large scale of late. They operate through brokers or commission agents, who procure the produce from the producers.

PRICE BEHAVIOUR

Pepper price variations are influenced by many factors. Domestic production and carry over stock, production and carry over stocks in other origins like Vietnam, Indonesia and Brazil, changes in consumption pattern, and export- import policies are the major determinants. The spot prices of ungarbled Malabar pepper at Kochi market during the last 15 years is depicted in Fig 5.



The analysis of secular trend was carried out by using the domestic price at Kochi market for a period of 15 years from January 1995 to December 2010 by assuming a multiplicative model of the following form:

$$Y (P) = T * C * S * I$$

where, Y (P) = Monthly average price of Pepper

T = Secular trend

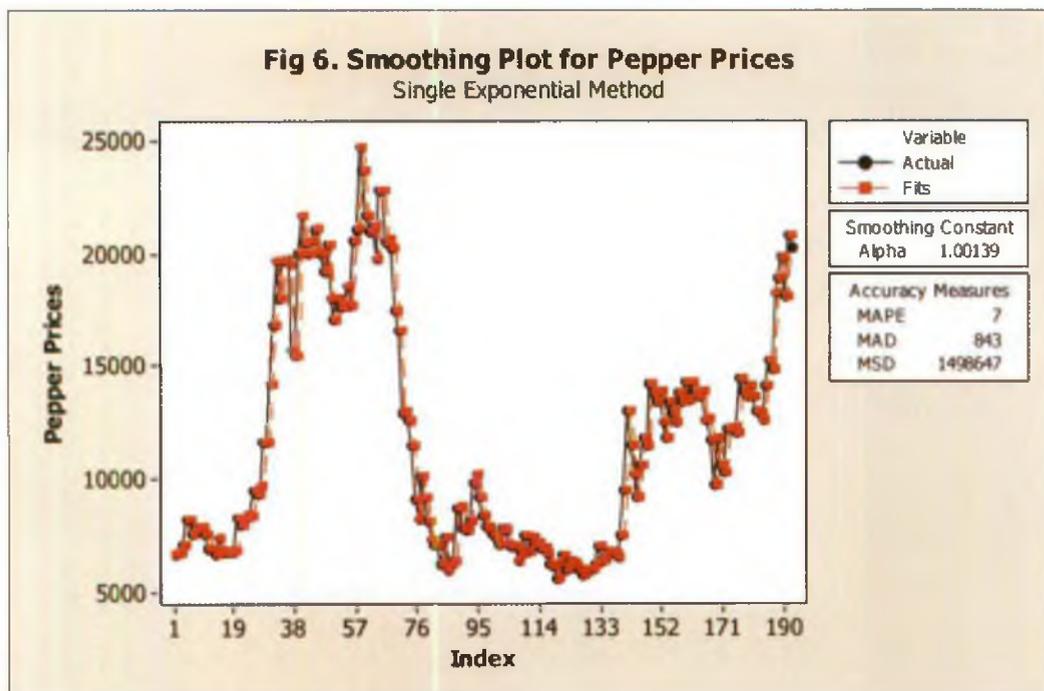
C = Cyclical movement

S = Seasonal index, and

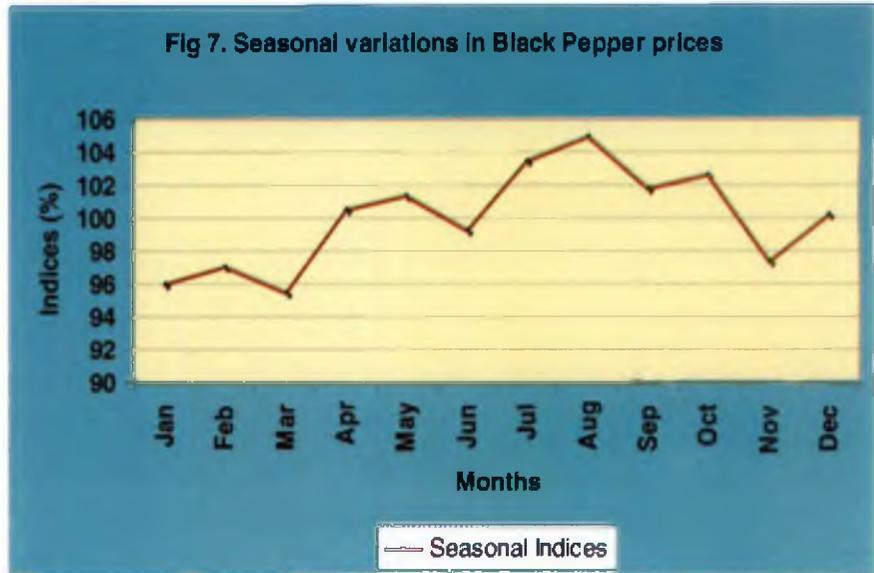
I = Irregular movement



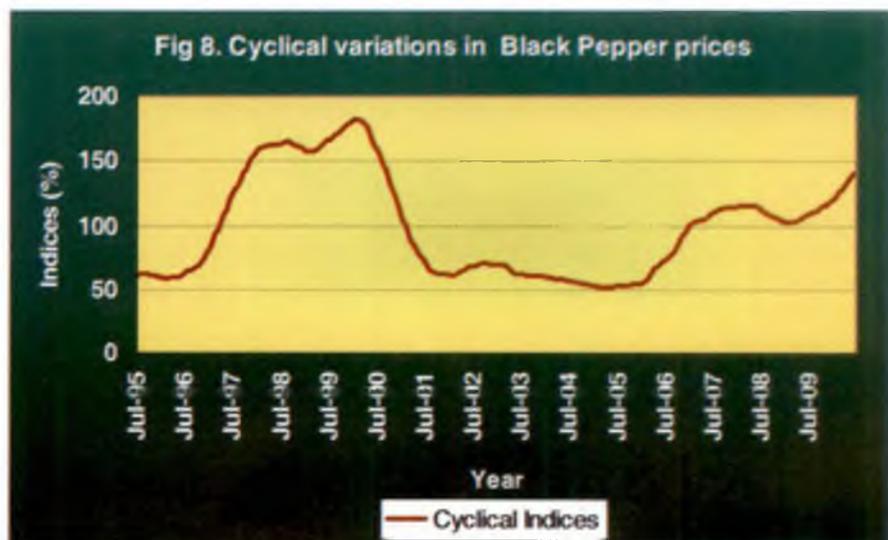
As the trend analysis using functional forms like linear, quadratic, cubic, compound, growth, logarithmic, sigmoid, exponential, inverse, power and logistic forms did not yield a satisfactory fit in terms of R^2 values and standard errors, trend lines were fitted with single exponential smoothing as plotted in the Fig 6. This fit had a mean absolute percentage error (MAPE) value of 7 per cent. As is evident, the price of ungarbled pepper in Kochi market exhibited no specific trend. The prices were increasing steadily to reach the peak price of Rs.247/Kg in October 1999, and declined thereafter. It reached the trough price of Rs.56/Kg in November 2004. It is showing an increasing trend thereafter.



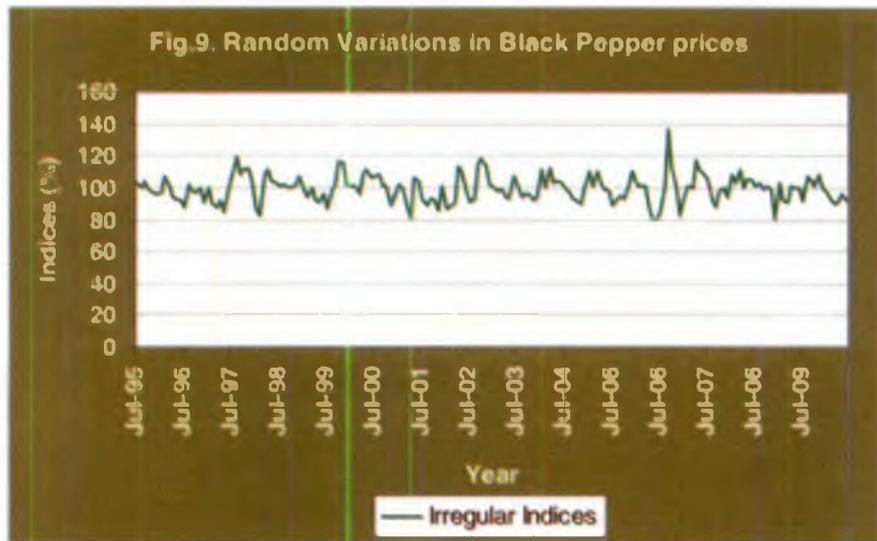
The price of pepper exhibited considerable seasonality. The buoyant phase for ungarbled pepper in Kochi market was observed during July to October, with the peak price in August (Fig 7). This being the period of South West monsoon, market arrivals will be low. The trough price occurs from November to March, synchronizing with the harvest months.



Price cycles represent deviations in price levels from the average trend due to business sequences of boom and recession that appear in an economy. Cyclical movements are of longer duration, usually extending to a few years and are of different periodicity. From the analysis of price data under reference, a price cycle of six years, extending from July 1996 to July 2001 is visible (Fig 8.).



The random effect is the residual effect left after the trend, seasonal, and cyclical effects have been removed from the original observations. The indices of irregular variations have been worked out to capture the random effect (Fig 9.). It showed that pepper prices were subjected to high irregular variations during the period under consideration. They represent random effects such as demand and supply shocks on account of climatic deviations, or due to speculative factors



It may be noted that pepper prices were subjected to considerable price fluctuations. The instability of prices based on coefficient of variation works out to 43.84 per cent. However, price volatility measured by the ARCH-GARCH Model indicates that though pepper prices were highly unstable, it was not subjected to price volatility (Table 7).

Table 7. ARCH-GARCH Modeling in pepper prices

	Coefficient	Std. Error	z-Statistic	Prob.
Variance Equation				
C	1.08E+08	1.01E+08	1.064466	0.2871
ARCH(1)	1.056432	1.335122	0.791263	0.4288
GARCH(1)	-0.739280	0.627596	-1.177955	0.2388
R-squared	-5.230980	Mean dependent var		11785.83
Adjusted R-squared	-5.296916	S.D. dependent var		5166.574
S.E. of regression	12964.82	Akaike info criterion		21.53413
Sum squared resid	3.18E+10	Schwarz criterion		21.58503
Log likelihood	-2064.277	Durbin-Watson stat		0.009057

MARKET INTEGRATION

Black pepper being an export oriented crop, market integration study was conducted on pepper spot prices at Kochi with International Price at the New York market using the co integration method as suggested by Johansen, 1991 (Jayasree *et al*, 2010). The results of Johansen's co integration tests are presented Table 8. The co integration equation was found to be significant at one percent level, indicating that the two series were highly integrated. L.R. test indicated that at most one co integrating equation, viz. New York price Kochi price was significant at 1 % level. The co integrating equation was:

$$\text{Kochi Price} = 618.53 + 3.422497 \text{ New York Price} \\ (\text{SE: } 0.1451)$$

Table 8. Johansen's Co integration Test

Market	ADF	5 % Likelihood Ratio	1% Critical Value	Hypothesized Critical Value	No. of CE(s)
Domestic (Kochi)	-1.74	22.44613	15.41	20.04	None **
International (New York)	-1.34	2.383357	3.76	6.65	At most 1

** denotes rejection of the null hypothesis at 1% significance level

The pair wise Granger Causality Test was significant at 1 % level (Table 9), which was indicative of mutual influence exerted by the markets on each other. This is understandable because Kochi has been a reference market for spices in general, and for pepper in particular from time immemorial, while New York is the largest commercial centre in the world.

Table 9. Pair wise Granger Causality Test

Null Hypothesis:	F-Statistic	Probability
New York does not Granger Cause Kochi	8.57632	0.00029
Kochi does not Granger Cause New York	7.86936	0.00056

It is clearly revealed that the domestic pepper market was well integrated with the New York market. As expected in the current scenario of well developed market infrastructure like transport, communication facilities, it is only logical that both markets influenced each other.

EXPORT COMPETITIVENESS

The trade competitiveness of the commodity was evaluated using the Nominal Protection Coefficient (NPC) as suggested by workers like Appleyard, 1987; Gulati *et al*; 1994 and Datta, 2001. Nominal protection coefficient was estimated under exportable hypothesis against the competitive prices offered by Vietnam, the closest competitor for Indian black pepper as:

$$NPC = P_d / P_b$$

where,

NPC = Nominal Protection Coefficient of the commodity under consideration

P_d = fob price of Indian Pepper in US \$/MT

P_b = fob price of Vietnam Pepper in US \$/MT

The export competitiveness of Indian pepper have been worked out and presented in Table 10. It may be noted that the NPC in all the years under consideration are above one, indicating that Indian pepper is not globally price competitive vis-a vis Vietnam pepper.

Table 10. Export competitiveness of Indian Pepper

Year	Indian FOB price (US \$ / MT)	Vietnam FOB price (US \$ / MT)	NPC
2005-06	1650	1190	1.39
2006-07	2346	2055	1.14
2007-08	3552	NA	-
2008-09	2953	2767	1.07
2009-10	2885	2517	1.15
2010-11	4281	3753	1.14

There are many reasons for this state of affair. Pepper is grown at a spacing of 2 m x 2 m in Vietnam, which helps the farmers to accommodate about 2500 pepper vines per hectare. Pepper is mostly grown exclusively as a pure crop on concrete or wooden pillars (Plate 1). This results in low labour cost for farm operations, especially for harvesting at a manageable height. The high density planting enables higher productivity from vines on a per unit cultivated area. For example, an average pepper plantation in Gia Lai

Province, the largest pepper growing tract in Vietnam provides a crop yield of 2000 – 2500 Kg per hectare, corresponding to 267 Kg per hectare in India.

Plate 1. Pepper plantation in Idukki district



Plate 2. High density pepper plantation in Gia Lai Province Vietnam



As compared to this, pepper is mostly grown in India as an intercrop in coconut, arecanut, coffee or tea plantations on live standards. This restricts the freedom of accommodating more plants per unit area, and entails higher labour cost on operations like harvesting. Most of the vines are old or senile, requiring immediate replanting.

CONCLUSION

Black Pepper is aptly called the king of spices. India is a leading producer, consumer and exporter of black pepper in the world. The area under pepper and its production has been declining in India during the last few years due to instability in output price, high wage rates, shortage of labour, high incidence of diseases, declining crop productivity, increasing cost of production, coupled with less relative profitability vis-a vis competing crops. Though the prices were subjected to high instability, there was no empirical evidence of price volatility. As expected, pepper prices were subjected to a pronounced seasonality where by the harvest period coupled with a subdued price period, while the off season synchronized with a buoyant phase. Being an export oriented crop, the domestic prices were co-integrated with the New York prices. The commodity did not enjoy any export competitiveness with Vietnam, the main competing country. Long term measures such as cost effective production through improvements in productivity, phasing out of old and senile vines with improved genotypes and modernization post harvest handling only will sustain our trade advantages in future.

806951



References

- Appleyard, D., (1987). *Comparative Advantage of Agricultural Production Systems and its Policy Implications in Pakistan*. Economic and Social Development Paper No.68. Food and Agricultural Organization (FAO), Rome, Italy, 103 p.
- Brazilian Pepper Trade Board (2010), *Statistics*. Available at <http://www.peppertrade.com.br/IPC352007.htm>. (28-06-2010)
- Cundiff, W.E., Still, R.R., and Govoni, A.P.N., (1982). *Fundamentals of Modern Marketing*. Prentice Hall of India, pp.202.
- Datta, S.K., (2001). How to judge global competitiveness of Indian Agri-business: Methodological Issues and Lessons to India. in: *Implications of the WTO Agreements for Indian Agriculture* (eds.) Datta, S.K. and Deodhar, S.Y.. Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, India: 571-629.
- Gulati, A., Sharma, A., Sharma, K., Das, S. and Chhabra, V., (1994). *Export Competitiveness of Selected Agricultural Commodities*. National Council of Applied Economic Research, New Delhi, India, 140 p.
- Indian Spice and Foodstuff Exporters Association (2010), *Statistics*. Available at <http://www.sfeaindia.net/satastic.htm> (24-06-2010)
- International Pepper Community (2010), *Community News*. Available at <http://www.ipcnet.org/index.php?.act=&p=news> (21-06-2010).
- Jayasree, K., Swapna Surendran, Satheesh Babu, K., and Jesy Thomas, K. (2010). Global Competitiveness and market Integration of Indian Pepper. *Indian Journal of Arecanut, Spices & Medicinal Plants*. **12** (1): 3- 6.
- Johansen, Soren, (1991). Estimation and Hypothesis Testing of Co integration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, **59**, 1551-1580.
- Kerala Agricultural University, (2007). Package of Practices, Recommendations (Crops-2007). Directorate of Extension, Mannuthy: 116-124
- Spices Board (a) (2010), *Monthly Export Statistics*. Ministry of Commerce, Government of India. Data available at <http://www.indianspices.com/php/monthly-export.php> (10-06-2010).
- Spices Board (b) (2010), World Spice Congress 2010, *WSC Proceedings*. Available at http://www.spicesboard.org/wsc10_speech.htm (19-10-2010).