Red Chilli

Red Chilli, considered a native of South America, is an indispensable spice in the food habits of most people in the world. The colour and pungency differentiates chillies from other spices. Apart from culinary purposes, chillies are also used in medicinal applications and beverages.

Red Chilli is fruit of plants belonging to Capsicum genus. Capsicum is derived from the Greek word "Kapsimo" meaning "to bite." Chilli is an indispensable spice used as basic ingredient in everyday cuisine all over the world. The chilli powder is made by crushing the dried chilli having chilli flakes and chilli pods.

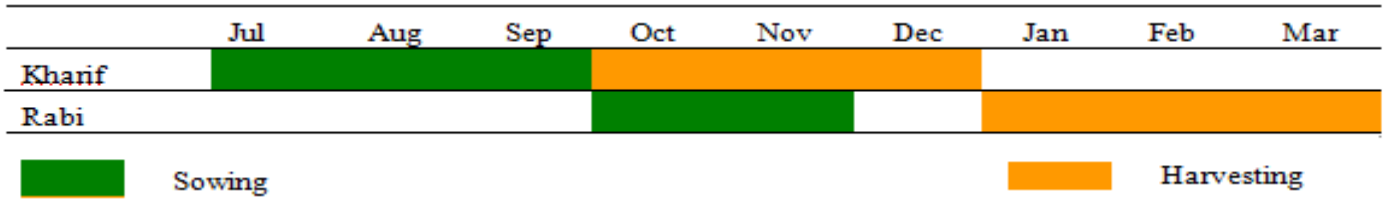
Red Chilli is produced across India. It is known by its quality which differs from state to state. Karnataka quality is known for its high oil contents, Gujarat quality is known for its sharp colour, Rajasthan quality is loved by pickles makers, Assam quality is famous for its hard taste and AP quality is preferred by non-vegetarian people. China is the only competitor for India in this commodity.

Pungency in chilli is due to the alkaloid "capsaicin" contained in the pericarp and placenta of fruits, it produces mild to intense spice when eaten. Capsaicin is a potent inhibitor of substance P, a neuropeptide associated with inflammatory processes. The hotter the chili pepper, the more capsaicin it contains. The hottest varieties include Naga Jalokia, habañero and Scotch bonnet peppers. Jalapeños are next in their heat and capsaicin content, followed by the milder varieties, including Spanish pimentos, and Anaheim and Hungarian cherry peppers. Capsaicin is being studied as an effective treatment for sensory nerve fiber disorders, including pain associated with arthritis, psoriasis, and diabetic neuropathy. When animals injected with a substance that causes inflammatory arthritis were fed a diet that contained capsaicin, they had delayed onset of arthritis, and also significantly reduced paw inflammation.

Crop Calendar

India is the largest producer and consumer of chillies in the world with a contribution of nearly 25 percent of the global output. The average production in India is estimated to be around slightly above one million tons per year.

Climatic conditions and global demand-supply are the major variables that make chillies hotter in terms of price. Since India is the largest producer and consumer of chillies, any decline in output would have an immediate impact on prices. The crop is available throughout the year in many parts of India. The major harvest season is between December-March with supply reaching peak levels in February-April. Planting is held mainly during August-October.



Zone-Wise Major Commercial Varieties

Chilli Plant is an annual sub-herb and the fruits vary in shape, size, colour and degree of pungency. Capsicum plants are herbaceous or semi-woody annuals or perennials. The leaves are ovate, tapering to a sharp point, measuring up to 15 cm, dark green on the upper surface and pale green on the lower surface. The flowers are small, white and borne singly or in clusters of 2 or 3 in the axils of the leaves. The fruits are of diverse shapes and sizes depending upon the variety. All the species in the genus have n=12 except C. ciliatum and C.scolnikianum which have n=13. genus Capsicum includes 22 wild species and three varieties as well as five domesticated species and their wild relatives. In general domesticated species have larger but fewer fruits than its wild counterparts though seed per plant are about the same.

Sl. No.	State	Variety
I	**SOUTH ZONE**	
1	Andhra Pradesh	Jwala, X-235, G-1, G-2, G-3, G-4, G-5, LCA-205, 206, 235, Karakulu, Sannalu, Dippayerupu, Punasa, Maduru, Pottibudaga, Hybrid, Bharat, Aparna, Pottikayalu, Cullakayalu, Barak, Mota, Chapta, Desi Sindu, Kiran, Chikkaballapur (Lavangi), Sapota.
2.	Karnataka	Jwala, Bayadgi, G-1, G-2, G-3, G-4, G-5, Pusa Jwala
3.	Kerala	Jwala, Sadabahar, Champa, CO-1, Nandan, K-1
4.	Pondicherry	K-1, K-2, CO-1, CO-2
5.	Tamil Nadu	K-1, K-2, CO-1, CO-2, CO-3, PMK-1, PMK-2, Borma Wonder, Sannam, Palam
II	**NORTH ZONE**	
6.	Bihar	Rori, Moti Mirchi, Chittee
7.	Haryana	NP-46-A, Pusa Jwala, Pusa Summer
8.	Himachal Pradesh	Solan Yellow, Hot Portugal, Pachad Yellow, Sweet Banana, Hungarian Wax, Punjab Lal
9.	Jammu & Kashmir	NP-46-A, Ratna Red, California Wonder
10.	Punjab	CH-1, Sanauri
11.	Uttar Pradesh	NP-46, Jwala Pant C-1, Desh, Pahadi, Kalyanpur, Chaman and Chanchal.
III	**EAST ZONE**	
12.	Assam	NP64-Am Pusa Jwala, Surya Mukhi, Krishna, Balijuri
13.	Tripura	Jwala, Suryamukhi, Krisha, Balijwai
14.	West Bengal	Siti and Suti, Akashi, Kajari, Bow, Dhani, Bullet, Dhala.
IV	**WESTERN ZONE**	
15.	Goa	Cacana, harmal, Tanvati, Lavangi
16.	Gujarat	K-2, Pant C-1, Jawahar-218, NP-46-A, Jwala.
17.	Rajashtan	CH-1, NP-46-A, Jwala, Pant C-1, G-3, G-5
IV	**CENTRAL ZONE**	
18.	Madhya Pradesh	Pusa Jwala, Sona-21, Jawahar, Sadabahar, Agni.
19.	Maharashtra	Pathori, Bugayati, Dhobri, Black seed, Chaski, Bhiwapuri
20.	Orissa	Jwala, Deshi, Sadabahar.

Post-Harvest Management

Harvesting is done when the pods are well ripened and partially withered in the plant itself. The harvested pods are kept in heaps either indoor or in shade away from direct sun light for 2 or 3 days so as to develop uniform red colour and then dried in the sun by spreading them on clean dry polythene sheets, cemented / concrete drying yards etc. Pods are spread out in thin layers for uniform drying with frequent stirring to prevent mold growth and discolorations. The dried pods are heaped and covered by clean gunny bags / polythene sheets. The moisture content of dry pods are kept at 8- 10 %. Improved drying system could be used to ensure cleanliness and uniform colour of the product.

After removing the extraneous matters like plant parts, etc well dried pods should be packed in clean, dry gunny bags and stored ensuring protection from dampness. Dunnage should be provided to stack the packed bags to prevent moisture ingress from the floor. Care should be taken to stack the bags at 50 –60 cm away from the wall. Storing chillies for longer period may lead to deterioration. However, if cold storage facilities are used, the product may be stored for 8-10 months. Insects, rodents and other animals should be effectively prevented from getting access to the premises where chilli is stored.

Traditional Sun Drying

- Chillies on harvesting have moisture content of 65-80% depending on whether partially dried on the plant or harvested while still succulent, this must be reduced to 10% to prepare dried spice.
- Traditionally, this has been achieved by sun - drying of fruits immediately after harvesting without any special form of treatment.
- Sun drying even today is the most widely used method in the world.
- Immediately after harvesting of fresh fruits, they are heaped indoors for 2 or 3 days, so that the partially ripe fruits if any are ripen fully and whole produce develops a uniform red colour.
- The best temperature for ripening is 22-25°C and direct sun light should be avoided which can cause development of white patches

- Heaped fruits then spread out in the sun on hard dry ground or on concrete floors or even on the flat roofs of houses. Frequent stirrings are given during day time in order to get uniform drying and thereby no discolouration or mould growth.
- The drying fruits are heaped and covered by tarpaulins or gunny bags during nights and spread during day time.
- After 2 or 3 days, the larger pods are flattened by trampling or rolling to facilitate subsequent packing into bags for storage and transport.
- Drying by this procedure takes 5-15 days depending on prevailing weather.
- Out of 100 kg of fresh fruits, 25-35kg of dried fruits may be obtained.
- Fresh produce dried on open spaces like roadsides and remain exposed to weather for the entire drying period (5-15 days) may cause contamination with dust and dirt, damaged by rainfall animals, birds and insects. The losses may range 70-80% of total quantity due to this method.
- Traditional method of harvesting and sun drying involved poor handling of fruits results in bruising and splitting.
- Bruising causes discoloured spots on pods, splitting leads to an excessive amount of loose seeds in a consignment, and there is a considerable loss in weight and then in price.
- If the harvested fruits are not properly dried and protected from rain and pests, it will loose the colour, glossiness and pungency.

Improved CFTRI Method of Sun - Drying:

CFTRI has developed a four - tier system of wire - mesh trays or a single tray of perforated Aluminium. It took 14 days in sun to dry fruits having a moisture content of 72 to 74% reducing it to about 6%, the traditional method of sun drying takes about 3 weeks to achieve a moisture level of 15-20%.

Post-Harvest Losses

The prime requisite for Capsicum species is harvesting them at the correct stage of maturity without much physical damage. Chilli like all other agricultural commodities invariably contains high moisture content (60-85%) at the time of harvest, which must be brought down to 8-12% moisture. It is estimated that about 10% of food grains produced in India, are lost in processing and storage. The majority of Chilli produced is dried upon open space. The major loss was due to driage, which amounted for 20-15% of total weight of the pods.

Harvesting and Post-Harvest Care

i) Harvesting should be done during early mornings, It should be avoided during rains or just after rains.

ii) While harvesting fruits, care should be taken to hold stalks firmly and fruit should be pulled upward gently, breaking the base of the stalk.

iii) For dry chillies, care should be taken that the fruit should not be ripened or over ripened.

iv) The harvesting should not be delayed as delayed harvesting gives poor quality produce.

v) The harvested fruits should be heaped indoor for 2-3 days, so that the partially ripe fruits, allows the whole produce to develop a uniform red colour.

Estimated Post-Harvest Losses of Chilli at Producer's level

S.No.	Causes	Losses (Percentage of total production
1.	Moisture	15-25%
2.	Spoilage in field	01-10%
3.	Farm to assembling	05-10%
4.	Assembling to distribution	2-5%

Source : Marketing of Chillies in India, 2002, D.M.I., Nagpur.

vi) The best temperature for ripening is 22-250 C and direct sunlight is to be avoided since this can result in development of white patches.

vii) The ripen pods should be dried in the sun spreading them on clean dry polythene sheets, cemented drying yard.

viii) The moisture content of dry pods should be kept at 8-10%

ix) Reverting solar dryer are used for drying helps in reducing of drying time.

x) Chillies should be stack at 50 to 60 cms. away from the wall.

xi) Periodic fumigations during storage with methyl bromide and phosphine is useful to control insects.

xii) The product should not be stored for longer period except in case of cold storage with moisture proof plastic liners (polythene bags) preferably between 0-100 C with 65 to 70 percent humidity.

xiii) If possible while transporting from field, plastic field crates in places of sacks may be used to avoid mechanical damage.

Grading

Grading is pre-requisite for development of the modern marketing, trade and economy of any commodity. The Indian chillies are graded mostly by farmers on the basis of colour and size, before they are brought in the market. The damaged discoloured and immature pods are removed depending on market demand. However, at traders level the other important quality parameter are moisture and stalks. Excess moisture add weight to the pods but give room to various fungi to grow. Similarly, if the stalk of the pods is broken, exposing the seeds entirely, the seeds may fall out. On the other hand in absence of optimum moisture the pods may break and let off the seeds. Thus the seed and pod ratio in a lot is also a valuable parameter of grade.

Apart from the apparent characters of colour, size, moisture and stalk of the pods, the following features also have weightage in grading chillies.

a) Seed and fruit (pod) ratio

b) Seed size and hardness

c) Thickness of the skin of the pod and

d) Pungency.

For different purposes, the varieties of chillies are chosen by the end user. End users are mainly of two types. Such as domestic retail users and industrial wholesale users. Industrial users who prepares Chilli powder gives preference for colour-pungency, fleshly skin and less seeds. Whereas, the domestic user prefer all varieties for different occasions. There are several local and conventional grades followed by the farmers, village merchants and itinerant merchants. The visual assessment of grades by seeing the lots/heaps and by picking hand full of pods and analyzing them to enable the traders to adequate and assess the prices both in open and closed auction.

Major Markets of Chilli Producing States

Chillies are brought to the regulated markets in different parts of the

States	Important markets
Andhra Pradesh	Guntur, Warangal, Khammam, Krishna, Prakasham, Hyderabad, Pundur Nizamabad, Cuddpah, Rajamundry, Nellore, Srikakulam, Vijaynagaram, , Paddapallim, Eluru, Tadepalligudem, Pittapuram, Jagital and Prakasam.
Assam	Silchar, Kamarup, Guwahati, Barapeta, Karbi
Goa	Maragoan, Ponda, Mapua, sattri, bicholim
Karnataka	Dharwad, Mysore, Hasan, Bangalore, Bellary, Ranibennur, Hubli, Gadag, Byadgi
Madhya Pradesh	Indore, Khargone, Jabalpur, Katni, chindwara, Khandwa, Gwalior, Morena, Bhind, Bhopal
Maharashtra	Nagpur, Nasik, Ahmednagar, Sholapur, Aurangabad Nanded Lasalgaon Amravati, Dhulia, Chandrapur, JalgaonAnjangaon, Morshi, Dandaichi, Chimur, Amainer, Achalpur and Sangli.
Punjab	Amristar, Nabha, Patiala, Sunam
Rajasthan	Jodhpur, Ajmer, Bhilwara, Pali, Sikar, Bharatpur, Swaimadhopur
Tamil Nadu	Coimbatore, Ramanathapuram, Tuticorin, Tirunelveli, Virudunagar, Kanayakumari, Salem, Trichi, Villupuram, Cuddalore Pollachi, Arialur, Madurai, Theni, Podukottai, Pattukottai, Tanjaur, Pollachi, Thindivaram, and Virudhachalam.
Uttar Pradesh	Orai, Jhansi, Ramnagar, Ujhani, Lucknow Bareily, Khurja.
West Bengal	Coochbehar, Haldibari, Dinhata, Mathabhanga, 24 paraganas Gonheta, Amalgora, Salboni, Sat Bankura, Maynaguri, Falakata Dhupguri Dinajpur and Jhargram.
Orissa	Bhubaneswar, Jagat Singhapur, Cuttack, Jaleswar and Baripada.
Gujrat	Dahod, Jhalod, Gonded, Banankanta, Rajkot

country mostly by primary producers. Unlike the other perishable commodities, dry chillies are sold in the market by many producers in a phased manner. The producers try to get the best advantage of the prices. They store the produce as long as they can and bring to the market when prices are favourable to them. Only during glut the producer-seller come to the market with entire produce and try to dispose off the lots as quickly as possible because storing and selling may result in further loss due to crash in prices. The other agencies selling the produce in the market yard are village merchants, itinerant merchants wholesalers commission agents and cooperatives. Only in Tamil Nadu it is reported that one per cent of the total arrivals in Thirunevelli and Kovipatti markets, chillies are brought by the local cooperative societies. The cooperatives were also active in Kozikode and Sangli markets of Kerala and Maharashtra States.

Warehousing

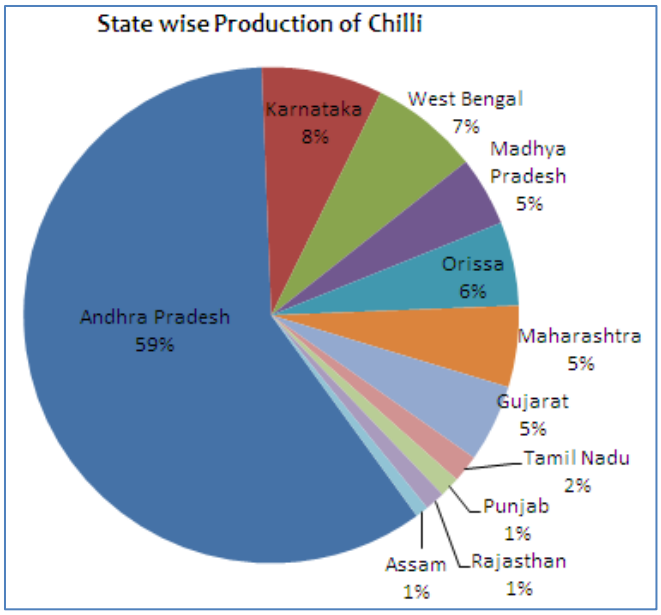
Storage is a very important component of marketing which has a direct impact on the prices. Adequate storage facilities will help in effectively distributing and marketing at all times and in all places. Storage function thus is responsible for balancing supply and demand situation.

In India, different states follow different methods of storage. In some states the chillies are stored in markets with the commission agents in their shops for 5 to 30 days. The farmer also stored chilli in the houses for about 5 to 15 days. The chillies are mostly stored in gunny bags by the producers, wholesaler and exporters for a period of 1 to 6 months depending upon the market conditions. In places like Orai chillies are stored by producers in earthen pots even for one year. In cities like Murshidabad & Jalpaiguri of West Bengal chillies are stored in Bamboo basket by the farmers in their own house.

The farm level storage capacity among the Chilli growers is not adequate in the country. Well maintained storage units in the market yards with low and uniform storage charges would encourage more farmers to store Chillies in the market places and improve their bargaining capacity.

Domestic Scenario

India is not only the largest producer but also the largest consumer of chilli in the world. Chillies are the most common spice cultivated in India. Chilli is a universal spice of India. It is cultivated in all the States and Union Territories of the country. India contributes about 36 per cent to the total world production. In India, Chillies are grown in almost all the state throughout the country. Andhra Pradesh is the largest producer of Chilli in India and contributes about 35 per cent to the total area under Chilli, followed by Karnataka (14 per cent), Orissa (11 per cent), West Bengal (9 per cent) Tamil Nadu (8 per cent) and other states contributing nearly 23 per cent to the total area under Chilli.



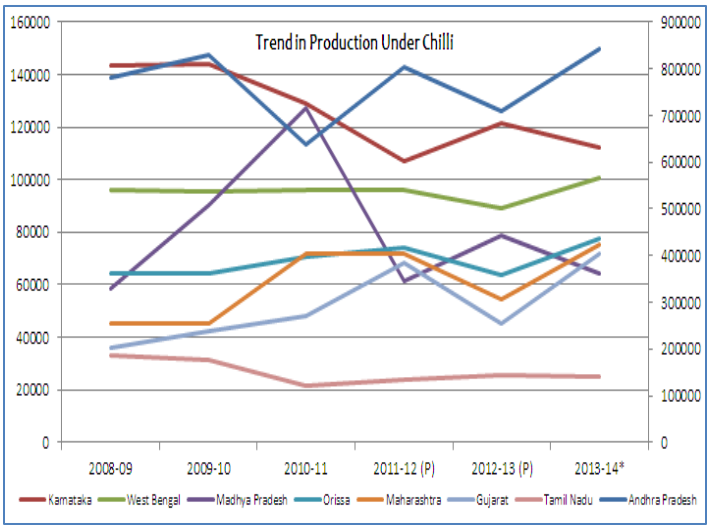
The production of Chilli in India is dominated by Andhra Pradesh which contributes nearly 59 per cent to the total production. Karnataka is the second largest producer contributing 8 per cent to the total production followed by West Bengal (7 per cent), Orissa (6 per cent), Maharashtra (5 per cent), Madhya Pradesh (5 per cent) and others about 10 per cent during 2013-14. The major chilly growing districts in Andhra Pradesh are Guntur, Warangal, Khammam, Krishna and Prakasham. Guntur is the biggest chilli producing region, contributing 30 per cent to the total production of AP with annual Source (Spice Board, India) turnover of around Rs.800 crore. Area and Production of Chilli in this area decides the prices

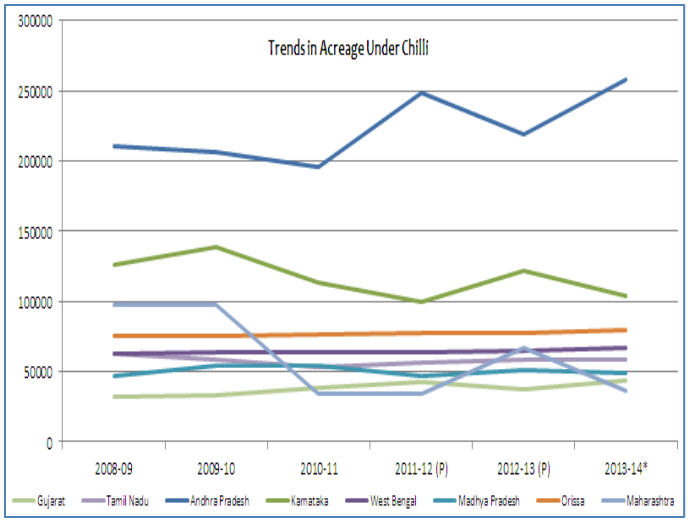
at National level. Chilli production in India is moving northwards on increasing demand from diversified sectors and changing consumption patterns. Dry chilli production rose by nearly 8.9 per cent from 13.81 lakh MT in 2008-09to 15.15 lakh MT in 2013 - 14. Rising export demand coupled with higher price realization in the domestic market have motivated farmers to bring more area under chilli cultivation.

State wise Area and Production of Chilli **(Area in Hectare, Production in MT)**

	2008-09		2009-10		2010-11		2011-12 (P)		2012-13 (P)		2013-14*	
Major State	**Area**	**Production**	**Area**	**Production**	**Area**	**Production**	**Area**	**Production**	**Area**	**Production**	**Area**	**Production**
Andhra Pradesh	210792	781671	206541	830990	195471	638298	248264	804204	219002	710131	257918	841450
Karnataka	125965	143481	138711	144044	113849	128806	100076	107037	121726	121650	103967	111994
West Bengal	63249	96002	63450	95765	63618	96216	64018	96300	64687	89321	66507	100760
Madhya Pradesh	47332	58455	54414	90569	54414	127435	46803	61277	51621	78502	48623	64114
Orissa	75510	64300	75530	64320	76010	70390	77130	74030	77365	63464	80129	77459
Maharashtra	97200	45400	97200	45400	34604	71749	34646	71751	67056	54460	35993	75074
Gujarat	31810	36215	32854	42305	38970	48051	42435	68534	37151	45349	44085	71708
Tamil Nadu	62617	32924	58476	31230	53626	21690	56442	24141	58793	25565	58637	25259
Punjab	10414	17256	10524	17492	10555	17912	10562	17979	10696	16419	10973	18812
Rajasthan	15157	19976	13812	13649	13381	14425	12214	17705	13878	15284	12689	18525
Assam	17010	10862	17111	11727	18808	12237	16820	11386	17740	10741	17474	11914
Others	45840	74989	41076	82861	43122	51982	84511	93871	54568	70592	87797	98219
Total	802896	1381531	809699	1470352	716428	1299191	793921	1448215	794283	1301478	824792	1515288

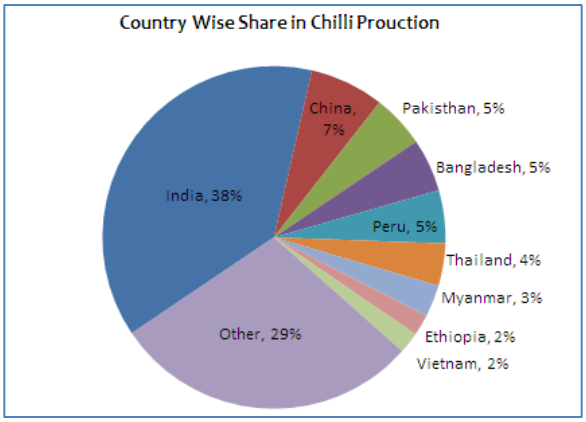
Source: Spice Board of India





Global Scenario

Major chilli growing countries are – India, China, Indonesia, Korea, Pakistan, Turkey and Sri Lanka in Asia; Nigeria, Ghana, Tunisia and Egypt in Africa; Mexico, United States of America in North – Central America; Yugoslavia, Spain, Romania, Bulgaria, Italy and Hungary in Europe and Argentina and Peru in South America. India is the world leader in chilli production followed by China and Pakistan. This shows that the bulk share of chilli production is in Asian countries, though it is produced throughout the world. The top 5 chilli producing countries,



India, China, Pakistan ,Bangladesh and Peru accounted for more than 60 per cent of the world production in 2012-13, The lion's share is taken by India with 38 per cent share in global production, followed by China (7 per cent), Pakistan (5 per cent) Bangladesh (5 per cent) and Peru (5 per cent). India, the largest producer of chillies, is having annual chilli production of around 15.15 lakh MT, China with a production of around 4.5 lakh MT and Pakistan producing 3 lakh MT of chilli are other major producer of chillies.

India is the largest exporter of chillies, meeting nearly half of the world's consumption demand. Apart from India, China also exports to an extent of about 19 percent of total chilli exports in the world. Peru contributes for nearly 9 per cent, while Spain in the fourth largest exporter in the world .Rest of exports is scattered across a number of countries each contributing in minor quantities.

Top Five Importers and Exporters of Chilli

Importers	%	Exporters	%
U.S.	24	India	50
Malaysia	12	China	19
Sri Lanka	9	Peru	9
Spain	8	Spain	7
Germany	4	Mexico	2

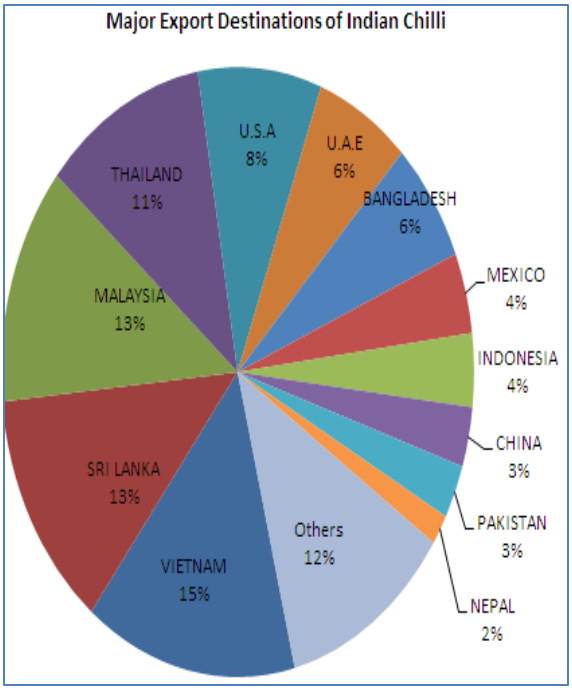
Source: FAOSTAT

Major importers include the U.S. with about 24 per cent followed by Malaysia with 12 per cent and Sri Lanka with 9 per cent of total imports in the world. Interestingly, Spain is not only fourth largest exporter but also the fourth largest importers as well.

Indian Export

Exports of chilliles from India have increased during past 10 years and on average they stood at about 2.2 lakh MT per years. Chilli is exported either as dried chillies or in powdered from.

Though Indian exports are showing satisfactory trends, nowadays India is facing a very tough competition in the international export market as price of the Indian chilli powder is considered too high for the market and other competitive countries are providing chilli at very competitive rates to the major importing countries. If the country is able to meet the strict quality demands of the international market, the exports can be further improved. Steps have to be taken by the government encouraging the exporters to maintain the Indian dominance in the world market.

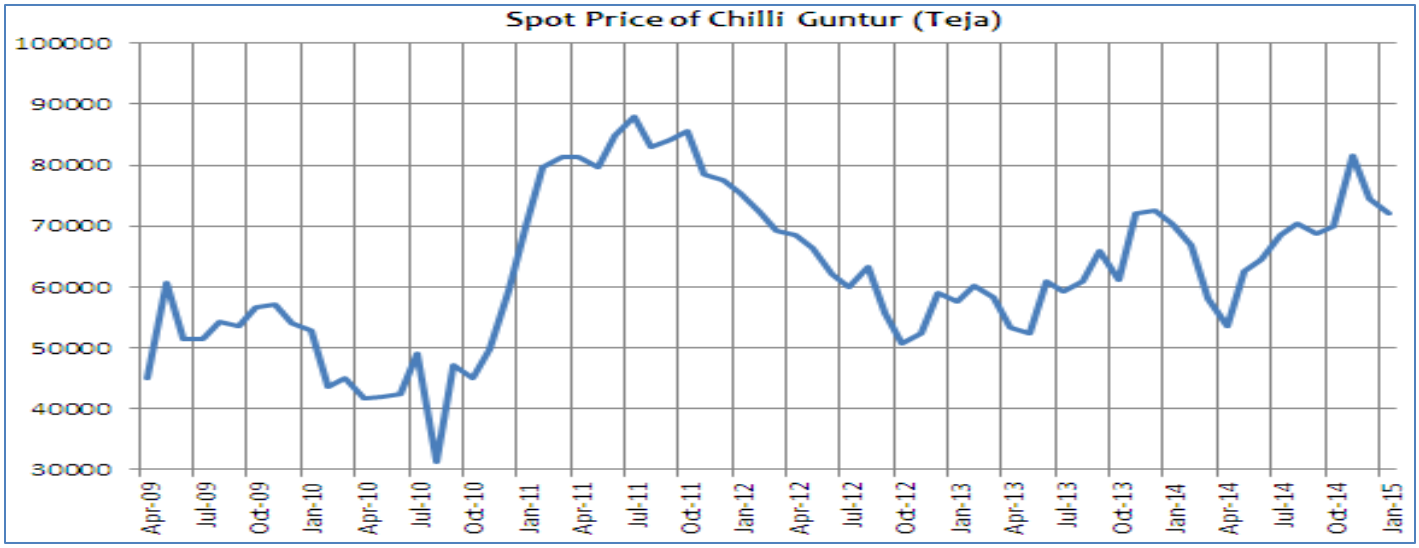


Major Country-Wise Export of Chilli from India (Mt)

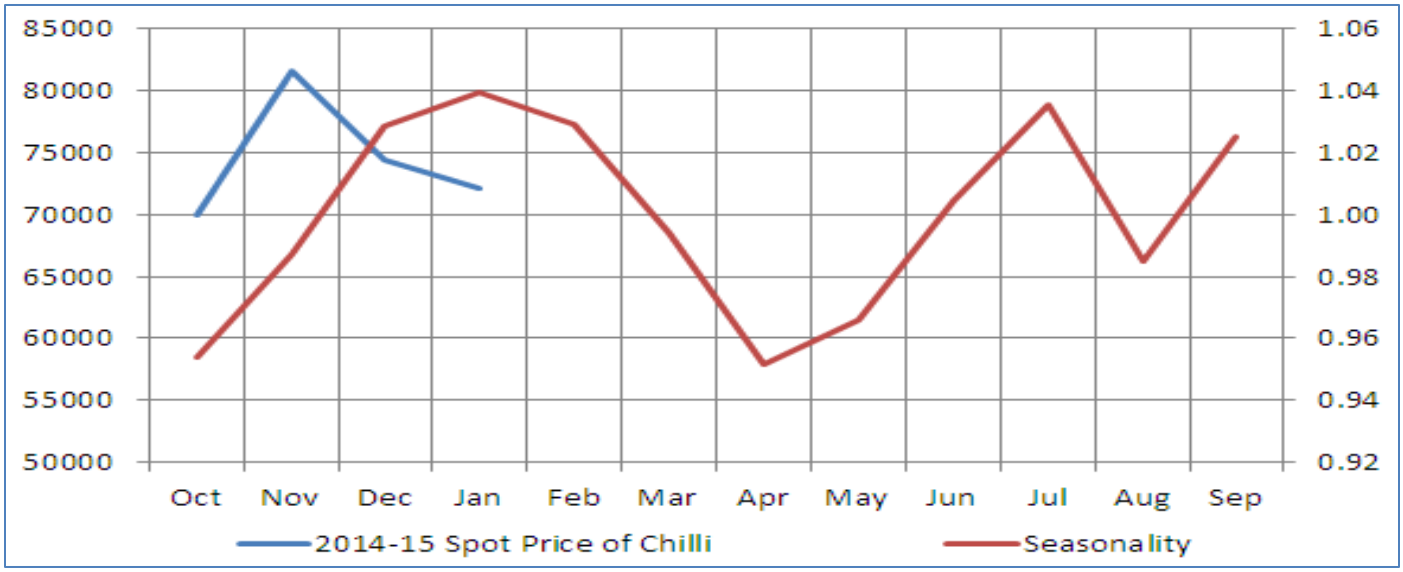
Country	2009-10	2010-11	2011-12	2012-13(P)
Vietnam	4036.35	3382.62	3751.02	43658.64
Sri Lanka	34787.98	34072.20	44666.20	38635.45
Malaysia	45545.28	48248.35	35447.39	38187.62
Thailand	7605.20	2600.96	11974.78	33591.81
U.S.A	17744.23	17362.49	13528.00	25405.88
U.A.E	23232.12	20702.72	21040.89	19545.43
Bangladesh	28172.58	32741.61	17365.98	19392.92
Mexico	2256.10	8499.62	5300.01	12869.30
Indonesia	10267.45	10242.14	21297.31	11730.85
China	1768.53	6771.36	13633.21	9537.81
Pakistan	160.42	25712.02	24137.75	8544.15
Nepal	4567.99	2196.99	290.15	4832.11
Others	23855.83	27466.96	28567.12	35068.24
Total	204000.06	240000.04	240999.81	301000.21

Source: Spice Board of India

Price Trend Analysis



In Indian subcontinent, chillies are produced throughout the year. Two crops are produced in the year in each dry and wet season in the country. The dry season extends from mid- March to August in which the rainfall level is much lower than other parts of the year. On the other hand, wet season starts from August and harvesting of the crop takes place in December and chillies start reaching the major markets in February and March.



As compared to seasonality index of chilli which has constructed by taking last five year monthly average prices of Guntur market with the prices prevailed in the same market during the year 2013-14 has wide differences in the price movements starting from October to September. Seasonality index has fluctuated at very narrow range as compared to 2013-14 prices it's mainly because of the factors such as sowing area, output estimates, stock figures domestic and export demand. So far, the price movement in 2014 has been in line with the seasonality and if the current trend remains intact, we can see a good upsurge in the prices in the coming months from April 2015.

Technical View

Explanation: Marginal divergence is seen in the (Moving Average Convergence - Divergence) MACD curves for the duration of 7 days and 21 days. The lower 7 day moving average is intersecting the 21 days moving average from the upper side and is approaching the mean level, which is denoting that the reversal of price movement can be expected shortly. The RSI (14 days) is indicating the underlying strength in the market. The Parabolic SAR refers to a price and time based trading system (Showed in dotted blue line). SAR stands for "stop and reverse." SAR trails price as the trend extends over time. The indicator is below prices when prices are rising and above prices when prices are falling. In the case of Chilli, the SAR is below the price for the past 5 weeks indicating the underlying strength in the prices.

Technical Recommendation: The market is expected to find strong support at the levels of 6400 on the downside and has good potential of testing 9800 and 11000 on the higher side (Time Horizon: Till Middle of August 2015).

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