



Research Paper

Performance of production and trade of onion in India

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ABSTRACT : Onion is an important vegetable crop grown and consumed widely across the world. India is the second largest producer of onion, in the world next only to China but the productivity of onion in India is very low *i.e.* 14.21 tons/ ha. Keeping this in view the present study is undertaken to analyze growth in area and production, seasonal indices of arrivals and prices, trend in export of major onion growing counties and trade direction of Indian onion. The study was based on secondary data collected from various sources such as APEDA, Directorate of Economics and Statistics. Compound growth rate and Markov chain analysis were carried out. Results of the study revealed that, in India among the states Bihar is having highest significant growth rate in area under cultivation of onion followed by Gujarat (12.75%). Among the major onion exporting counties China is showing the highest growth rate (19.37%) in export over last 21 years followed by India (9.68%). China showing highest export growth rate it may become competitive exporter in the international market. Trade direction analysis revealed that Malaysia was one of the most stable markets among the major importers of onion from India as reflected by high probability of retention of 0.5141, followed by UAE (39.67%), Hence, India may have to maintain a good trade relation with these countries.

KEY WORDS : Instability, Export, Trade direction, Arrival, Markov chain

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INTRODUCTION :

Onion is an important vegetable crop grown and consumed widely across the world. As a culinary ingredient it adds to the taste and flavour in a wide range of food preparations and it is also used as a salad. Thus there is a steady increase in the demand for onion across the world. India is the second largest producer of onion, in the world next only to China but the productivity of onion in India is very low *i.e.* 14.21 tons/ ha as compared to China and other countries like, Egypt, Netherlands and

Iran etc. India is a world leader in onion farming with 6.7 million acres cultivated area in the year 2011 (FAO, 2012). China is the leading producer of onion constituting about 27 per cent of the world total production. Top ten countries including China and India, (mostly Asian countries) constitute more than 60 per cent of the total world production. Due to lower yields, though India has the highest area under onion, it stands second in the production of onion in the world. Hence, there is a lot of potential for increasing the production of onion by improving the yields. India is also the largest exporter of

onion and hence, it is crucial to improve the yields for enhancing the export level, so that it helps in earning foreign exchange for the exchequer of the country.

Indian scenario :

There is a sizeable increase in acreage and production of onion in India. In terms of area, there is an increase from 768 thousand ha in 2006-07 to 1064 thousand ha in 2011-12, while in terms of production it has increased from 10,847.00 to 15,118.00 thousand tons (Gummagolmath, 2013). Onion is mainly grown in ten States *viz.*, Maharashtra, Gujarat, Rajasthan, Uttar Pradesh, Orissa, Karnataka, Tamil Nadu, Haryana, Bihar and Andhra Pradesh and together they account 95 per cent of the crops total area. The states Maharashtra, Gujarat, Rajasthan and Karnataka account for more than half of the cultivated area. Maharashtra share 20.13 per cent, Uttar Pradesh share 12.54 per cent of the total onion area respectively in the country. Among the major onion growing states Maharashtra and Gujarat observed consistent increase in area under onion cultivation. With this background the present study has been taken up with following objectives :

- To analyse the growth rate in area and production of major onion producing states in India
- To document the trend in arrivals and prices of onion in the major consuming markets of India
- To know the trade direction of Indian onion and to predict the export quantity

MATERIALS AND METHODS :

Nature and sources of data :

The study was based on secondary data collected from various sources. To know the growth trend of area and production of major onion growing states in the country, data was collected from Directorate of Economics and Statistics and Indiastat for 12 year from 2001-02 to 2012-13. To analyze the growth of major onion exporting countries, data were collected from Agriculture Product Export Development Authority (APEDA) for 22 years from 1991-92 to 2012-13 and compound growth rate was calculated. Seasonal indices of prices and arrivals of onion in major consuming markets in India were documented from the NCAER report. To know the trade directions of Indian onion Markov chain technique was used. For this data on major onion importers of Indian onion were collected from APEDA for 2001-

02 to 2012-13.

Analytical tools and techniques :

To fulfill the specific objectives of the study, based on the nature and extent of availability of data, the following analytical tools and techniques have been adopted to draw meaningful interpretation and inferences.

Compound growth rate analysis :

For computing compound growth rate of area and production of onion in India, the exponential function of the following form was used.

$$Y = a b^t e^{U_t} \quad (1)$$

where,

Y = Area / Production, a = Intercept, b = Regression co-efficient (' a ' and ' b ' are the parameters to be estimated)

U_t = Disturbance term in year ' t '

The equation (1) was transformed into log linear form and written as;

$$\log Y = \log a + t \log b + U_t \quad (2)$$

Eq. (2) was estimated by using Ordinary Least Squares (OLS) technique.

Compound growth rate (g) was then computed

$$g = (b - 1) 100 \quad (3)$$

where,

g = Compound growth rate in per cent per annum

b = Antilog of $\log b$

The standard error of the growth rate was estimated and tested for its significance with ' t ' statistic.

Markov chain :

The trade directions of Indian onion exports were analyzed using the first order Markov chain approach (Krishnadas, 2010). Central to Markov chain analysis is the estimation of the transitional probability matrix P . The elements P_{ij} of the matrix P indicates the probability that export will switch from country i to country j with the passage of time. In the context of the current application, from 1991-92 to 2012-13; six major importing countries of onion were considered. The average exports to a particular country was considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as

$$E_{jt} = \sum E_{it-1} * P_{ij} + e_{jt} \quad i=1 \quad (4)$$

where,

E_{jt} = Exports from India to j^{th} country during the year t .

Eit-1 = Exports to i^{th} country during the period t-1
 P_{ij} = Probability that the exports will shift from i^{th} country to j^{th} country

e_{jt} = The error term which is statistically independent to Eit-1

t = Number of years considered for the analysis

r = Number of importing countries

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix, have the following properties.

$$0 < P_{ij} < 1$$

$$\sum P_{ij} = 1, \text{ for all } i$$

Thus, the expected export shares of each country during period 't' were obtained by multiplying the export to these countries in the previous period (t-1) with the transitional probability matrix.

Seasonal indices :

To measure the seasonal variations in prices of onion seasonal indices were calculated employing monthly averaging method and expressed in percentages. In the first step, 12 months moving total were generated. These totals were divided by 12 to compute 12 months moving average. Then a series of centered moving averages were worked out. For calculating the seasonal indices, 10 years data was considered. Keeping in view of recent spurt in the price of onion, the seasonality of arrivals and prices were analyzed for different markets for a period from 2002-03 to 2012-13. The seasonal indices were calculated by adopting the following steps:

In the first step, monthly averages for the study period were computed. In the second step, overall average was computed for the whole length of the study period. Then the monthly average values were converted into seasonal indices by computing the ratio of monthly

average values by the overall average value and expressed in percentage.

$$SI_i = \text{Average}_i / \text{Overall average}$$

where,

$$SI_i = \text{Seasonal index for } i^{\text{th}} \text{ month}$$

$$\text{Average}_i = \text{Average value for } i^{\text{th}} \text{ month}$$

RESULTS AND DATA ANALYSIS :

The results of the analyses of data have been presented in the following heads.

Production trend of top onion producing states in India (2001-02 to 2012-13) :

Major onion producing states in India were Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Madhya Pradesh, Bihar, Rajasthan, Haryana and U.P. The growth trend in area and production of these states is shown in the Table 1. The table revealed Bihar (16.04) is having the highest significant growth rate in area under cultivation of onion followed by Madhya Pradesh (13.14 %), Gujarat (12.75%), Maharashtra (11.10%), Rajasthan (8.20 %), Haryana (5.15 %), A.P. (4.82 %) and Karnataka (4.38%). In case of production again Bihar (36.09) is showing highest growth trend followed by Karnataka (19.92%), M.P. (18.74%), Maharashtra (14.42%), Rajasthan (11.80%), Haryana (8.10%) and U.P. (5.72%). For over all India, the growth in area and production found to be 5.37 and 7.29 per cent, respectively.

The foregoing analysis with respect to area and production of onion revealed that, apart from local demand, the exports of onion from India have grown to a considerable extent in the recent decade. Increase in local

Table 1 : Production trend of top onion producing states in India (2001-02 to 2012-13)

States	Area		Production	
	CGR	SE	CGR	SE
Maharashtra	11.10**	0.013	14.42**	0.017
Karnataka	4.38 **	0.008	19.92**	0.038
Gujarat	12.75**	0.038	2.74	0.032
Andhra Pradesh	4.82**	0.006	6.08**	0.009
Madhya Pradesh	13.14**	0.007	18.74**	0.014
Bihar	16.04**	0.025	36.09**	0.053
Rajasthan	8.20**	0.011	11.8**	0.018
Haryana	5.15**	0.01	8.104**	0.009
Uttar Pradesh	0.52	0.007	5.72**	0.009
India	5.37**	0.004	7.29**	0.006

Source: Indiatat; 2013

* and ** indicate significance of values at P=0.05 and 0.01, respectively

demand coupled with increase in exports and good price, there was a many fold increase in both area and production of onion. But the onion crop has suffered from fluctuations in the price due to intermittent production failures and lack of proper market intelligence. Hence, a detailed analysis of factors responsible for the price behaviour of onion becomes imperative.

Seasonal indices of arrivals and prices of onion in major consuming markets in India :

Onion is grown in both *Rabi* and *Kharif* season and it can be stored for longer period compared to other vegetables except potato. Hence, the arrivals of onion are persisting throughout the year across country (Table 2 and 3). The highest arrivals were found during April-July in Jaipur market and the prices were lowest for the

corresponding months. The value of arrivals started declining from September onwards and the trend continued upto the month of February. Similarly the prices started increasing from the same month and were maximum during October-January. This trend indicates that, with the increase in the arrivals, the prices declined and is in conformity with the law of supply and demand. It is also interesting to note that, since onion is grown in *Rabi* season in Rajasthan, the arrivals were maximum during March-July. Most of the requirement for rest of the period in a year in Jaipur market is met by western part of the country. Major arrivals to this market are from Nasik, Lasalgaon and Pimpalgaon.

The arrivals started increasing from March and were found to be the highest during June-July and November-December in Delhi market. Surprisingly the

Table 2 : Seasonal indices of arrivals of onion in major consuming markets in India

Months	Markets							
	Ahmedabad	Bangalore	Chennai	Delhi	Jaipur	Kolkata	Mumbai	Pune
January	108.85	79.44	105.51	83.07	84.61	98.31	114.05	123.46
February	103.56	61.10	100.97	81.43	75.89	122.95	108.79	163.38
March	109.00	65.91	105.01	109.76	89.93	94.70	120.93	158.99
April	127.59	67.30	88.05	100.33	103.95	70.45	102.23	113.53
May	80.63	71.72	101.21	103.45	103.55	106.35	88.79	105.49
June	89.24	64.55	104.41	113.29	154.23	99.32	94.56	86.49
July	93.16	64.44	109.57	103.63	128.90	118.75	97.08	79.99
August	86.58	78.37	88.33	89.04	115.08	109.58	81.89	72.89
Sept.	83.34	126.29	103.54	83.00	97.65	97.74	90.20	65.96
October	88.07	221.61	88.94	88.54	79.84	95.87	90.68	69.79
November	111.01	176.69	102.96	131.69	75.49	84.85	100.35	74.26
December	118.98	122.57	101.78	112.77	63.97	101.15	110.43	85.76

Source: Anonymous, 2013(a) NHRDF data base; 2013-14

Table 3 : Seasonal indices of prices on onion in major consuming markets in India (2002-2013)

Months	Markets							
	Ahmedabad	Bangalore	Chennai	Delhi	Jaipur	Kolkata	Mumbai	Pune
January	123.19	122.09	130.47	123.12	129.32	118.70	117.71	120.77
February	89.48	94.87	94.47	97.54	120.02	90.46	83.18	79.80
March	70.87	69.33	73.45	76.87	80.08	62.75	67.27	61.16
April	58.83	63.24	69.82	68.43	67.74	59.82	60.22	55.18
May	57.66	65.54	65.97	62.58	57.27	63.21	61.84	58.47
June	73.09	79.43	78.81	69.25	60.74	74.84	75.56	78.33
July	85.45	91.85	86.49	85.66	75.33	86.86	86.87	89.64
August	102.58	106.04	96.01	104.76	94.05	101.67	99.22	103.11
Sept.	114.31	104.03	98.60	119.74	124.29	115.10	115.09	114.32
October	127.40	120.37	120.44	140.77	148.55	135.40	135.00	132.16
November	144.26	142.49	140.56	126.49	132.91	143.05	150.81	150.04
December	152.89	140.72	144.91	124.81	127.70	148.13	147.23	157.02

Source: Anonymous, 2013(a)

market prices were the highest during higher arrivals (November – December). The values of arrivals started declining marginally from August until October and were low during January and February. However, the prices were higher during August to January, despite increase in the values of arrivals in the corresponding period except for January month. This phenomenon reveals that, with the increase in the prices, arrival from other markets of the country started flowing into Delhi market as there was huge demand for onion due to large mass of consumption. Moreover, Delhi market was also a largest centre for dispatch of produce to other parts of country, mainly to northern States. Most of the requirement for Delhi market is met by all parts of the country including southern States. Interestingly, Delhi Market was also a Terminal market, as substantial quantity of produce from Delhi flows back to many parts of the country.

A peculiar situation could be observed from the trend in arrivals and prices of onion in Bangalore market and continued to increase during November-December. The quantum of arrivals started increasing from September and touched peak during October. Similarly, prices started increasing during the August month and the trend continued upto January. From February onwards, both prices and arrivals started declining. This situation was noticed mainly due to entry of more number of traders for purchase during higher arrivals from different parts of country and subsequently they supplied the onion to

other markets across the country. At the same time, the exporters also became active during this period as they could get best quality produce during harvesting season. Another probable reason might be the increasing trends in the prices attracted farmers to bring more and more produce into the market. More arrivals coupled with large scale purchases led to rise in the price contrary to law of demand. However, the onion from Bangalore do not flow to Delhi market as it feeds markets in West Bengal, Orissa and some parts of Andhra Pradesh. Large quantities of onion was also exported to Sri Lanka and gulf countries. Similar trends were noticed for Mumbai and Ahmedabad markets. While in the case of Pune, Chennai and Kolkata markets, the trends in arrivals and prices behaved as per the law of demand and supply.

Export trend of top six onion exporting countries (1991-92 to 2012-13) :

Among the countries Netherland, India, China, Egypt, USA and Mexico were the major exporters of onion in the world. Export growth rate of these countries were presented in Table 4. China was showing the highest growth rate (19.37%) in export over the last 21 years followed by India (9.68%), Egypt (7.76%), Netherland (5.50%) and Mexico (2.74%). Since China showing the highest export growth rate it may become competitive exporter in the international market in future if the same trend continues. In the case of price trend Egyptian onion

Table 4 : Export trend of top six onion exporting countries (1991-92 to 2012-13)

Rank	Countries	Quantity		Prices	
		CGR (%)	SE	CGR	SE
1	Netherland	5.5**	0.005	1.48	0.008
2	India	9.68**	0.012	2.86**	0.006
3	China	19.37**	0.015	1.64	0.009
4	Egypt	7.76**	0.013	4.60*	0.020
5	USA	2.26**	0.006	3.00**	0.006
6	Mexico	2.74**	0.005	2.23**	0.005

Source: Anonymous, 2013(b)

Note: ** indicates significance of value at P=0.01

Table 5 : Trade direction of Indian onion export (2001-02 to 2012-13)

Countries	Malaysia	Bangladesh	UAE	Sri Lanka	Singapore	Others
Malaysia	0.5141	0.1187	0.0886	0.0000	0.0599	0.2188
Bangladesh	0.2877	0.3026	0.1075	0.0589	0.0456	0.1976
UAE	0.2163	0.2777	0.3967	0.0000	0.0000	0.1093
Sri Lanka	0.0000	0.1350	0.0000	0.3584	0.0000	0.5065
Singapore	0.0000	0.0000	0.0000	0.6126	0.0573	0.3301
Others	0.2470	0.0533	0.0000	0.0000	0.3254	0.3743

prices were market at the highest growth rate (4.60%) followed by USA (3.00%), India (2.86 %) and Mexico (2.23%).

Trade direction of Indian onion export (2001-02 to 2012-13) :

The row elements in the transitional probability matrix provide the information on the extent of loss in trade, on account of competing countries. The columns element indicates the probability of gains in volume of trade from other competing countries and the diagonal element indicates probability of retention of the previous year's trade volume by the respective country. The transitional probability matrix was obtained for the study period by using the actual proportion of exports to different importing countries. This matrix explained the changing direction of Indian fresh onion trade among importing countries which was necessary for taking the proper decision in view of their expected changes.

Probability transitional matrix is presented in the Table 5. Major importers of India onion were Malaysia, Bangladesh, UAE, Sri Lanka and Singapore. Among these countries Malaysia was one of the most stable markets among the major importers of onion from India as reflected by high probability of retention of 0.5141, *i.e.*, the probability that Malaysia retains the export share over the study was 51.41 per cent. Thus, Malaysia was most reliable and loyal market for Indian onion. Malaysia lost its share to Bangladesh (11.87%), UAE (8.86 %) and Singapore (5.99%). Bangladesh retained its share to the extent of 30.26 per cent and lost its highest share to Malaysia 28.77 per cent. UAE lost its share to Malaysia 21.63 per cent and retained its share of 39.67 per cent. Singapore lost its major share to Sri Lanka (61.26 %).

Projected rate of export of onion from India (Quantity in MT) :

Projected rate of export of India onion to major importing countries is presented in the Table 6. During 2013-14, Malaysia will import 456072 MT of onion from India followed by Bangladesh (212494.90 MT), Singapore (199253.50), Sri Lanka (191540.80 MT) and UAE (123607.7 MT). In the coming years if same trend follows, Malaysia will be the major importer of Indian onions. By 2016-17 onion export from India will increase to 428393.8 MT, 196715.7 MT, 101798.8 MT, 216028.4 MT, 212080.4 MT and 511854.0 MT to Malaysia, Bangladesh, UAE, Sri Lanka, Singapore and other states, respectively. This export rate will going to decrease by 2021-22. Malaysia will import 421272.8 MT, Bangladesh will going to import 193054.3 MT, UAE will going to import 96564.4 MT, Sri Lanka will going to import 222620.7 MT and Singapore will import 214925.5 MT. This show there will be reduction in demand for Indian onion in the international market or else Indian onion export may divert to other countries as revealed from the projected data as other countries import showed increasing trend from 457618.1 MT from 2012-13 to 518433.8 MT during 2021-22.

Conclusion :

India is a potential producer of onion. Its growth rate in area and production is significant. India is the leading exporter of onion in the world. Indian onion is largely demanded by Malaysia, UAE, Bangladesh, Sri Lanka and Singapore. On the other hand the study revealed that India could not retain its market share to Bangladesh and Singapore. It is therefore important to take measures to retain the market share in the country where we are likely to loose the market share. India has

Table 6 : Projected rate of export of onion from India (Quantity in MT)

Sr. No.	Years	Malaysia	Bangladesh	UAE	Sri Lanka Dsr	Singapore	others
1.	2012-13	478147.4	231138.7	142133.7	162436.5	195396.7	457618.1
2.	2013-14	456072.8	212494.9	123607.7	191540.8	199253.5	483901.5
3.	2014-15	441845.9	204420.6	112298.0	203237.2	205854.4	499215
4.	2015-16	433545.5	199544.5	105682.8	210997.5	209995.2	507105.7
5.	2016-17	428393.8	196715.7	101798.8	216028.4	212080.4	511854.0
6.	2017-18	425264.4	195102.4	99497.4	218942.5	213307.4	514757.2
7.	2018-19	423410.7	194152.1	98133.7	220643.5	214061.4	516469.8
8.	2019-20	422312.5	193586.9	97326.4	221659.1	214507.5	517479
9.	2020-21	421660.0	193252.3	96848.04	222263.2	214769.8	518078.1
10.	2021-22	421272.8	193054.3	96564.4	222620.7	214925.5	518433.8

to maintain good trade relation with these countries and retain the market share. The efficiency at production level needs to be increased in order to make the product price competitive. Projected exports showed that there may be reduction of onion export to Malaysia, Bangladesh, UAE, Sri Lanka and Singapore. Therefore country should take necessary arrangements measures to divert its trade direction to other countries.

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