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Price Volatility and Major Issues in Demand and Supply Management of Onion in Gujarat

S. S. Kalamkar and H. Sharma

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Foreword

India has made impressive strides on the agricultural front during the last six decades or so. Food grains production has increased more than five times from 50.82 million tons (mt) in 1950-51 to about 284.83 mt in 2017-18. After self sufficiency in food grains was met, the policy makers realized the need for diversification of agriculture to achieve higher growth rates as well as to adjust to the changing consumption pattern of the population which was experiencing due to urbanization and rising per capita incomes. India now ranks first in the world in milk production, second in fruits and vegetables and third in production of eggs. This increased production has brought in its wake new challenges to handle in terms of huge marketable surplus. Among the agricultural products, prices of onions are more volatile than those of the non-farm commodities due to low price and income elasticity and inherently unstable production. Additionally, market inefficiencies, weak supply chains and traders cartels in the market aggravate the problem. The spurt in food inflation in the recent past has brought to forefront some critical issues of price volatility and market inefficiency.

Onion is a politically-sensitive commodity and one of the closely monitored agricultural commodities produced in India. Therefore, this commodity is always in focus of the government. India is the second largest producer of onion in the world after China with an annual production of 24.34 million metric tons from an area of 1.305 million hectare (2016-17), accounting 22.43 per cent share in total world onion production in 2017. The country is also the major consumer of onion with an annual demand of 16.50-18.0 million metric tons. Though there is always a surplus production, fluctuating domestic and export demand often creates demand supply mismatch leading to spiral effect on the prices of onion. The prices sometimes fall below cost of production making it uneconomical for the farmers. Its significant position in the diets across all income groups and an important ingredient in many Indian recipe causes wide ranging effects of any significant price change. It is equally important for the poor as also the middle class. Thus the changes in prices cause all embracing stir among farmers and consumers. High price variability in case of primary products affects both producers as well as consumers through a spillover effect to the other sectors, thereby leading to high inflation in the economy. Thus it is major concern for the politicians, policy makers and experts.

The price spikes of onion in many ways cannot be explained fully by the fundamentals of demand-supply. High inflation of food commodities cannot always be attributed to risks, exogenous shocks and mismatch of demand and supply –it can also be caused by market inefficiencies, weak supply chains and

monopolies in the market. Some of the factors that affect extent of seasonality in prices include- extent of seasonal concentration in production, degree of perishability of the commodity, the cost of storage (including direct cost, losses in storage, risk involved), degree of seasonality in consumption, facility of storage available to farmers or with public agencies, restrictions imposed on traders in terms of stock limits.

Onion is the important vegetable crop grown in the state. It is generally grown as late kharif or rabi crop. It accounts for about 8.38% of total area under vegetable crops and 10.70 per cent of total vegetable production in the state during 2017-18. Though, state has shared hardly 4 per cent area and 2.3 per cent production of Country, the highest productivity level (26 tones/ha) was recorded as compared to all India average of 21.5 tones kg/ha. The top five major onion growing districts are Bhavnagar, Rajkot, Junagarh, Amreli and Jamnagar. Against this backdrop and given that market structure, degree of competition and efficiency at the various levels of the supply chain has impact on the final prices paid by the end consumers with respect to agriculture products; the study proposes to price volatility and major issues in demand and supply management of onion in Gujarat. Irrational speculative driven bubbles and hoardings by trader lobbies have sometimes been blamed for episodes of high price volatility in India, but with no clear implications in terms of which possible policies could effectively prevent repetition of such crisis. This study aims to find major issues/ factors affecting onion price volatility with specific focus on supply chain management and infrastructure in Gujarat. The study came out with useful policy suggestions.

I am thankful to authors and their research team for putting in a lot of efforts to complete this excellent piece of work. I also thank the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India for the unstinted cooperation and support. I hope this report will be useful for those who are interested in understanding the marketing and relationship between different prices of onion in Gujarat.

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Team Leader

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List of Abbreviations

ADF	Augmented Dickey-Fuller test
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agricultural Produce Marketing Committee
Approx.	Approximately
Av.	Average
C.I.	Cropping Intensity
CACP	Commission for Agricultural Costs and Prices
CoC	Cost of Cultivation
ECA	Essential Commodities Act
EP	Export Price
FAO	Food and Agriculture Organization
FAQ	Fair Average Quality
FCI	Food Corporation of India
FGD	Focus Group Discussion
FPO	Farmers Producer Organization
GCA	Gross Cropped Area
GIA	Gross Irrigated Area
GOG	Government of Gujarat
GOI	Government of India
GUJCOMASOL	Gujarat State Cooperative Marketing Federation Ltd.
ha	hectare
HH/hh	Household
I.I.	Irrigation Intensity
INR	Indian Rupees
JCI	Jute Corporation of India
kg	kilograms
L	Large land size holder

M	Medium land size holder
MEP	Minimum Export Price
mha	Million hectares
MIS	Market Intervention Scheme
MOA	Ministry of Agriculture
MOA & FW	Ministry of Agriculture & Farmers Welfare
MoFPI	Ministry of Food Processing Industries
MPCE	Monthly Per Capita Expenditure
MSP	Minimum Support Price
mt	Metric Tones
NABARD	National Bank for Agriculture and Rural Development, India
NAFED	National Agricultural Cooperative Marketing Federation of India Ltd.
NCA	Net Cropped Area
NGO	Non Government Organization
NHRDF	National Horticultural Research and Development Foundation
NIA	Net Irrigated Area
NIA	Net Irrigated Area
NIAM	National Institute on Agricultural Marketing
NSA	Net Sown Area
NSA	Net Sown Area
NSSO	National Sample Survey Organization
OBC	Other Backward Classes
PDS	Public Distribution System
PLW	Physiological Loss in Weight
PSS	Price Support Scheme
RKVY	Rashtriya Krishi Vikas Yojana
RP	Retail Price
S	Small land size holder

TE	Triennium Endings
TOP	Tomato, Onion and Potato
VPO	Value of Output
WP	Wholesale Price
Y	Yield

Price Volatility and Major Issues in Demand and Supply Management of Onion in Gujarat

S. S. Kalamkar and H. Sharma

1. Introduction

Onion is a crop of mass consumption round the year all over the world. Globally, 97.86 million tonnes of onions are produced (2017), while the vegetable ranks as first by harvested area (25.29 per cent). China, India, and the US are the world's leading onion producing countries, while around two third of global onion output comes from the ten top onion producing countries which includes. China, India, United States of America, Iran, Egypt, Russian Federation, Turkey, Bangladesh, Pakistan, Netherlands. About 5.2 million hectares of onions are harvested each year on a global scale and it is estimated that around 8 per cent of this harvest is internationally traded. Onions are used as spice, condiment and vegetable almost daily. Because of special pungency, onions have more value for seasoning a wide variety of dishes. Dehydrated flakes or powder are in great demand both in the domestic and export markets. In fact onion is third most eaten vegetable in the US, right after tomato and potato.

India is the second largest producer of onion in the world after China with an annual production of 24.34 million metric tonne from an area of 1.305 million hectare (2016-17), accounting 22.43 per cent share in total world onion production in 2017. The country is also the major consumer of onion with an annual demand of 16.50-18.0 million mt. Though, India holds premier positions in area and production, the productivity of onion (16.00 tons/ha) is very low compared to other countries. The inherent lower productivity in sub-tropical countries vis-à-vis European counties, shortage and high prices of quality seeds, high incidence of pests and diseases typical under tropical conditions, moisture stress or excess rains during critical growth stages are factors constraining yield.

Onion is one of the most important commercial and important vegetable grown in India which is next to Potato, which is used either in raw or dehydrated form to add flavor and taste to Indian cousin. Since onion has medicinal values, it is used in some pharmaceutical preparation also. Onion is consumed all over the country and is an important constituent of Indian daily diet. Onion is typically cultivated thrice a year and all three crops are available for export, with rabi having the longer shelf life. Out of total production of about 24 million tones of onion, two third of total production is rabi crop while 20 per cent is late kharif and rest is kharif crop. The diverse agro-climatic conditions enable to India to produce onion in one or the other part round the year. Onion is largely grown in the western, northern and southern parts both in rabi and kharif seasons. Its supply is available throughout the year albeit with different volumes. India produces all three varieties of onion, i.e. red, yellow and white. In the northern part of the

country, onion is usually grown in the winter (rabi) season. While in the southern and western states of Andhra Pradesh, Karnataka, Tamil Nadu, Gujarat and Maharashtra, it is grown in winter (rabi) as well as in the rainy (kharif) seasons. Currently, onion cultivation in kharif is gaining ground in the northern part of the country. The major onion producing states are Maharashtra, Madhya Pradesh, Karnataka, Bihar, Rajasthan, Andhra Pradesh, Haryana, West Bengal, Gujarat and Uttar Pradesh in the country. These States account for almost 90 per cent of the total onion production of the country.

Table 1: Season-wise Onion Production in India

Agriculture Year: July-June			Production in Lakh Tonnes		
Season	Transplanting	Harvesting Period	2013-14 to 2017-18	2017-18	2018-19*
Kharif	July - August	October-December	32 (15.24)	35 (15.09)	36 (15.25)
Late Kharif	October - November	January- March	42 (20.0)	46 (19.93)	47 (19.92)
Rabi	December - January	End of March to May	136 (64.76)	151 (65.09)	153 (64.83)
Total			210	232	236

Notes: *- first advance estimate; figures in parenthesis are percentage to total.
Source: GOI (2019).

The onions from India are famous for their strong flavor. India export its considerable quantity of onion to countries like Malaysia, Singapore, Sri Lanka, Bangladesh, Pakistan, Indonesia, UK, Gulf countries, etc. Our exports generally hover around 1.5-2.5 million tonnes per annum. As onions have no substitutes, demand for it is completely inelastic. It is also exported in the form of dehydrated onion, canned onion and onion pickle. Dehydrated onions are seen as a potential valued product in world trade and India is the second largest producer of dehydrated onions in the world.

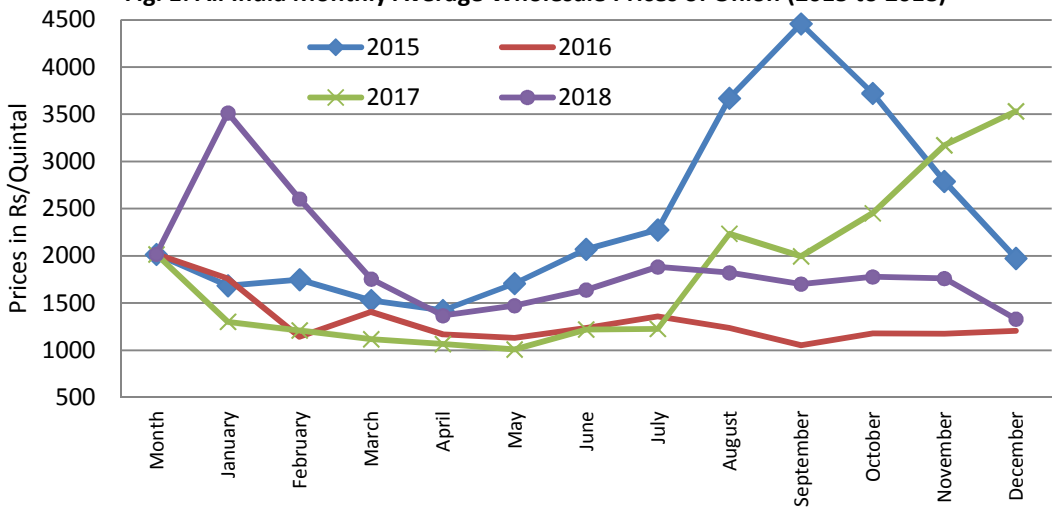
2. Onion Price Volatility

Onion is a politically-sensitive commodity which is one of the closely monitored agricultural commodities produced in India. Onion is the only vegetable that can bring down a government from power, as prices of onion have direct bearing on the common man's consumption basket. Therefore, this commodity is always in focus of the government. Though there is always a surplus production, fluctuating domestic and export demand often creates demand supply mismatch leading to spiral effect on the prices of onion. The prices sometimes fall below cost of production making it uneconomical for the farmers. Central Government uses Minimum Export Price (MEP) as a tool to ensure regulated exports so that there is an adequate supply of onion in the domestic market. State Governments with the support of Central Government also implement as and when require Market intervention Scheme (MIS) in view of possible glut in market. Month-wise arrival of onion during last five years indicates high fluctuation in arrival of onion in

markets across months that to year to year and monthwise arrival is not consistent.

Due to its highly volatile prices, during May 2014, Central Government brought onion under the Essential Commodities Act, 1955 imposing stock holding limits. Despite of same, wide variation in average wholesale prices of onion are recorded during last four years which is presented in Figure 1. The prices remained quite high in 2015, 2017 and 2018, especially during July to December. Average wholesale prices fell sharply in September 2016 below Rs. 1060/Qtl. After some improvement during remaining months of 2016 and beginning of 2017, the onion prices again crashed in May 2017 below Rs. 1010/-. The picture is more worrisome when we compare wholesale prices of onion across the states. During January 2018 prices were very high as compared to December 2018 and January 2019 and about 60 per cent deviation is recorded. This spiral effect of onion prices led to heavy losses to the farmers. While the middlemen take advantage of price movements, it affects farmers and consumers badly. The high fluctuation in prices of onion can be attributed to hoarding by traders with expectation of price rise, higher retailers' mark up, changes in MEP by Government and lack of proper forecasting system.

Fig. 1: All India Monthly Average Wholesale Prices of Onion (2015 to 2018)



The onion export brought under Canalization Scheme through National Agricultural Cooperative Marketing Federation of India Limited (NAFED) in 1974 by Government of India, which substantially increased export of quality produce and also the foreign exchange earnings. However, it was felt by NAFED and onion exporters that there is need to improve both production and quality of onion for export as well as to meet the domestic needs for which research and developmental programmes are to be undertaken. But spiralling price of onion is always a cause for concern. The prices rise sky high in years of deficit production and nose dip when there is glut. Wide price fluctuations make it a risky crop discouraging large scale adoption of input intensive production techniques and good management practices by farmers. Therefore, onion is generally referred as a high risk, high return crop for the farmers and traders. The high price variability

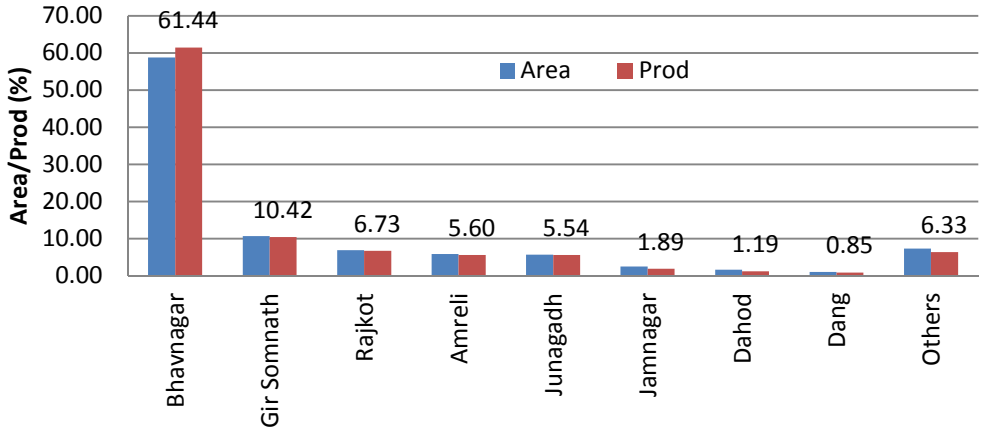
affects both producers and consumers through a spillover effect to the other sectors thereby leading to high inflation in the economy.

The Government of India has approved Operation Greens, the Central sector scheme aimed at the integrated development of value chain for three commodities, viz. tomato, onion and potato (TOP). It aimed at the stabilisation of the prices of these commodities, which have seen serious volatility in the past and reduction in post-harvest losses by way of farmgate infrastructure. TOP scheme also aim on value addition to increase the shelf life of the product, as well as enhance the value addition. Besides, emphasis would be on creation of a market intelligence network to collate real-time data on demand and supply in order to check the localised gluts of TOP crops. The government wants it to be implemented in a two-pronged strategy, the first being a short-term strategy focussed on price stabilisation and the second being a long-term one focussing on the development of integrated value chain development. The National Agricultural Cooperative Marketing Federation of India (NAFED) will be the nodal agency for the price stabilisation measures, which will create an e-platform for demand and supply management of TOP crops based on market intelligence inputs. Under the scheme, the clusters for onions includes Nashik in Maharashtra; Gadag and Dharwad in Karnataka, Bhavnagar and Amreli in Gujarat and Nalanda in Bihar.

3. Onion Production in Gujarat:

Gujarat has achieved considerable growth rate in horticulture during last five years because of serious efforts made by the State Government. The area and production of horticulture crop was 4.80 lakh ha and 43.03 lakh tons in 1994-95 which increased up to 16.87 lakh ha and 234.35 lakh tons respectively in 2017-18. It accounts for about 11.76 per cent of total area under vegetable crops and 11.84 per cent of total vegetable production in the state. The state of Gujarat is the eighth largest onion producing states in India, which accounts for about 2.3 percent of production of the country from area share around 4.0 percent. It was estimated that during the year 2017-18, total onion production in the state was 14.16 lakh tones and major onion producing district were Bhavnagar, Gir Somanath, Rajkot, Junagarh, Amrelai and Junagadh.

Fig . 2: Major Onion Producing districts in Gujarat (2017-18)



4. Need of the Study:

Against this backdrop and given that market structure, degree of competition and efficiency at the various levels of the supply chain has impact on the final prices paid by the end consumers with respect to agriculture products; the study proposes to price volatility and major issues in demand and supply management of onion in Gujarat. Irrational speculative driven bubbles and hoardings by trader lobbies have sometimes been blamed for episodes of high price volatility in India, but with no clear implications in terms of which possible policies could effectively prevent repetition of such crisis. This study aims to find major issues/ factors affecting onion price volatility with specific focus on supply chain management and infrastructure in Gujarat.

5. Data and Methodology:

The study has been carried out by utilizing both secondary as well as field survey data collected in Gujarat. The secondary level data has been collected from the various published sources and websites. The primary data survey were carried out from the one of the largest onion producing districts of Gujarat, i.e. Bhavnagar (Producer market, Map 1.1). Primary survey was carried out with a structured questionnaire for farmers and market intermediaries for the year 2017-18. Data were collected from 10 sample farmer households; 2 Trader, 2 Commission Agent, 2 warehouse owner and 1 Onion Processor. Besides data were also collected from 2 commission agent from Sevana APMC of Ahmadabad and 2 APMC Mahuva (Bhavnagar) and Sevana (Ahmadabad) this makes a total of 21 households (Table 1.4). A focus group discussion with the committee members of APMC and with market functionaries was also held in order to get a clear picture of market charges, market practices, etc. The co-integration analysis were carried out using monthly wholesale prices of five onion dominated markets i.e. Ahmadabad, Gondal, Rajkot, Mahuwa and Surat markets of Gujarat for the period from 2005 to 2017.

6. Evidences from Literature

The review of literature on price volatility, supply chain issue and state interventions indicate that onion prices prevailed in the markets is greatly influenced by production in the previous year, exported quantity in the previous year and export price in the current year, while pattern of harvesting and market arrivals have direct bearing on price behavior and its movements. Besides factors likes huge post-harvest losses, non-availability of proper storage structures and mall practices in trading were highly responsible for onion price fluctuation. It was observed that Farmers Market helped in increased farmer's share in consumer's rupee and providing fresh vegetables to consumers at relatively low prices. While share of the farmer in retail price was less than half the retail prices in traditional market, the balance being accounted by marketing costs and margins. The reduction in the length of the marketing channel and also encouragement of cooperative marketing is needed so that farmers can benefit from scale economies. As far as traditional chain is concerned, strengthening and

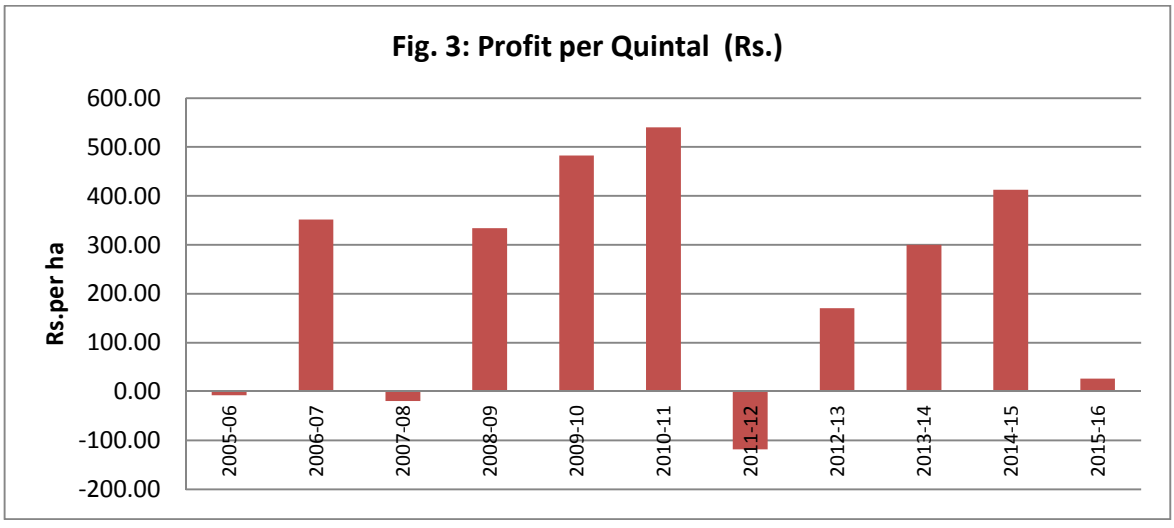
upgradation of infrastructure in regulated markets is necessary so as to reduce post harvest losses and benefit the producer and consumer. As part of market reforms, implementing market intelligence systems can help in discovering the right prices for producers as well as consumers. Proper planning for production, post-harvest management and marketing may help growers to get better prices for good quality produce.

7. Consumption of Onion

Historically, onion consumption per capita in India reached an all time high of 13.5 kg in 2013. Consumption of onion in India is subject to fluctuation on account of religious considerations. The monthwise per capita onion consumption as per NSSO survey indicate that consumption of onion during 2011-12 in rural area was relatively lower of 0.84 kg while in urban area, same was 0.95 kg. India produced enough onion, leaving a record surplus of about 2.92 MMT. Surplus onion was exported to a number of other countries. Gupta, et al (2015) estimated that onion consumption in the rural area was estimated to be 48.10 g/person/day while same was 50.97 g/person/day in urban side.

8. Cost of Cultivation and Income from Onion

Cost of cultivation of onion in Gujarat is estimated to be 125082.69 per hectare as C2 cost during 2015-16 while per quintal cost of production is estimated to be Rs. 722.97. Among various components of operational costs, cost of labour accounted for the highest share of 37.5 per cent in total cost of cultivation followed by seed (27 per cent). The cost of cultivation and production varies considerable across the years and thus negative profit per hectare and quintal of onion was observed during the year 2005-06, 2007-08 and 2011-12.



9. External Trade Scenario

India is a traditional exporter of fresh onions. Although there has been an increasing trend in the quantum and value of exports of onions from the country,

the exports are subject to wide fluctuations from year to year. This may be attributed to the fact that the exports of onions have not been free but are canalised through National Agricultural Cooperative Marketing Federation (NAFED) and now through some other agencies. Indian onions are famous for their pungency and are available round the year. Indian onion has two crop cycles, first harvesting starts in November to January and the second harvesting from January to May. There is a lot of demand of Indian Onion in the world, the country has exported 1588985.72 MT of fresh onion to the world for the worth of Rs. 3088.82 crores / 479.32 USD Millions during the year 2017-18. Major export destinations (2017-18) are Bangladesh, Malaysia, Sri Lanka, United Arab Emeritus and Nepal, which is not stable since last one and half decade period.

India mainly exports fresh onions to foreign countries followed by dehydrated onion. During 2017 (Jan-Sept), fresh onion export from India recorded USD 216.95 million which represented 70.29% of the total onion exports while it was USD 72.49 million (23.49%) for dehydrated onion. The varieties of onion in India that exports are Podisu onion, Red Onion, White Onion, Krishnapuram rose onion, Bangalore rose onion etc. The major onion varieties found in India are Agrifound Dark Red, Agrifound Light Red, NHRDF Red, Agrifound White, Agrifound Rose and Agrifound Red, Pusa Ratnar, Pusa Red, Pusa White Round. There are certain varieties of yellow onion which are suitable for export in European countries namely Tana F1, Arad-H, Suprex, Granex 55, HA 60 and Granex 429.

There are 23 states of India which are exporting onion to other countries. The major onion exporting states are Maharashtra, Gujarat, Tamil Nadu, Karnataka, West Bengal, Andhra Pradesh, Kerala, Delhi, Bihar and Jammu & Kashmir. Maharashtra and Gujarat together registered 80 per cent value of the onion export. Maharashtra (mainly Nashik) stood as largest onion exporter state in India and recorded USD 191.09 million in 2017 which represents 62% of the total's output. Gujarat and Tami Nadu recorded USD 56.41 million and USD 33.09 million from onion export. During Jan-Sept 2017, it is recorded that more than 1100 onion suppliers in India are supplying different varieties of onions to foreign countries. Jain Farm Fresh Foods Limited is one of the largest onion suppliers in India. It did onion export business worth of USD 20.46 million which represents approximately 7% of the total onion export value. The major onion exporters in India are Jain Farm Fresh Foods Ltd.; Sarah Exim Pvt. Ltd.; Pride Fresh Produce; Sanghar Exports and Oceanic Foods Limited. India is exporting onion to foreign countries from around 40 ports. JNPT is the biggest Indian port which departs the maximum number of onion shipments. India recorded 60% value of onion export from JNPT only in 2017 i.e. USD 186.37 million. JNPT is followed by Mundra Sea, Pipavav, Bhusawal ICD and Chennai Sea.

Onion can be processed to paste and dried products like powder, flakes and grits. There are about 75 onion dehydration units in Gujarat (86% in Mahuva, Bhavnagar) and one large export oriented dehydration unit at Jalgaon. India produces about 65,000 MT of dehydrated onion, of which 85 per cent is exported. The local demand for processed onion is limited but is on rise. In export market,

India competes with Turkey and China and they offer dehydrated onion at a very low rate ($1700 -2500 per MT) as against the Indian rate of $2600 per MT. Due to spiraling prices of onion, raw material prices go up, making onion processing unprofitable. During 2014-15, more than 75 per cent of onion dehydration units remained shut due to high raw material prices. Jain Irrigation Systems Ltd. has set up a modern dehydration unit at Jalgaon with full backward integration with farmers for producing processing quality white onion. The company has a total installed capacity of 14,000 MT/ annum, of which 9,500 MT/ annum is in Jalgaon. The company is connected to more than 6,000 farmers through contract farming for supply of onion in Maharashtra and Gujarat. Since the entire value chain of onion is addressed by the company, it has been able to become a market leader in dehydrated onion. As the domestic demand for dehydrated onion is very limited, growth of onion dehydration industry is moving at snail's pace.

10. Seasonal Behaviour in Prices of Onion

Monthly seasonal indices were calculated in order to ascertain the long run seasonal variations in arrivals and prices of onion. The results revealed the existence of seasonality in all the markets. Higher indices of market arrivals of onion were noticed immediately after harvest in the selected markets arrivals reached peak during April (262.72) in Mahuva which decrease to 6.05 in October and relatively shoot up in March. In Gondal market the peak indices was found in February (172.41) followed by March (169.77). Ahmadabad market showed lowest arrivals in September (75.87) while it peaked during March (116.30). Surat market witnessed the lowest arrivals in October (70.12) and highest during May (135.19). Arrivals reached a peak during December (151.90) in Rajkot market while they were the lowest in August (69.87). The higher market arrival indices were observed (more than 100) in the months of to December to April and lower arrival indices was found during July to October (less than 100).

The pattern of market prices showed slight differences among the selected markets. The price index in Mahuva market was the highest in the month of December (127.76) and relatively higher during the months of August to January. Gondal market witnessed peak price during October (152.81). The indices in other months varied from 57.18 to 121.95. A peak of 135.56 in index was observed during December in Ahmadabad market followed by October (134.96) and November (133.0). However, the price index of other months was between in 61.54 to 143.61. Surat market witnessed highest price index of 143.61 in October month. The market prices of onion in Rajkot found to be the highest in October (157.13). The lowest index was seen in May (60.19). Price index was between in 67.04 to 136.80 during other period. Price indices were more than 100 in the months of August to January. Lower indices were observed during May. The majority of the produce was sold soon after the harvest probably for want of cash or lack of storage facilities. However, farmers who are financially sound can store for longer time to look forward for advantageous period and higher prices. To analyze the arrivals pattern of onion during different months of the year and their impact on price, seasonal indices were computed adopting 12 months moving averages. Onion crop were sown in the month of October to December. It comes

to harvest during Feb to April. Thus, fluctuation in the monthly indices of onion arrivals was more than the monthly indices of prices in selected market during the study period. The price movement also demonstrates significant seasonal fluctuations in the selected markets. As a short term fluctuations, one will notice a general finding that the price is low when the arrivals were large and the price being high when the arrivals were low.

11. Status and Potential of Onion Infrastructure

Lack of adequate and appropriate storage facility is one the major constraint which enforces distress sale on farmers. The present storage capacities are either in adequate or unscientific. As a result of glut situation the price variability has been too high in the recent past. To improve the situation, GOI desired to create appropriate storage structures for onion, both at farm level as well as at market places. It drew a capital subsidy programme for the infrastructure development in which NABARD has been playing a pivotal role. The present storage capacity for onion is about 4.6 lakh tonnes. This is quite inadequate compared to our total production. Even most of the structures available are traditional and unscientific. If 40 per cent of the stocks are earmarked for scientific storage the potential for new storage structures is about 12.6 lakh tonnes. However, it has been projected by the Expert Committee on Cold Storage and Onion Storage that about 1.5 lakh tonnes on-farm capacity in production areas and 3.0 lakh tonnes capacity at APMCs and other market places are required in next 5 years. Thus, there remains a vast potential to be tapped.

12. Post Harvest Losses:

The total storage losses in onion in different storage structures in ranges between 3.46 per cent to 13.75 percent, while in cold storage, losses were only 5 per cent after 4 month of storage from may and October. While the storage losses in ambient storage conditions during the same period were 34 per cent. The weight loss, i.e. moisture loss and shrinkage were around 5 per cent and 21 per cent in cold storage and ambient store respectively. There was no diseases infection and sprouting in the cold stored onion, while around 11 per cent rotting and 2 per cent sprouting was notices in ambient storage. Higher infection of black mould was also found in ambient stored bulbs.

Post harvest loss in onion cultivation is believed to be very high, reportedly as much as 25 to 30 percent. Physical injury during and after harvest, greening of onion due to exposure to sunlight, sprouting and injuries during storage due to ammonia, controlled-atmosphere storage, and freezing also cause postharvest losses. Postharvest diseases on onion such as bacterial soft rot, black mould, bulb rot, neck rot, and smudge, cause significant losses in the quantity and quality of onions during storage.

13. Cold Storages Facility

The present storage capacity for onion is quite inadequate and inefficient in preventing post harvest losses. The structures available are traditional and

unscientific. Onion cold storage system is used in many countries of the world to store Indian onion. As Gujarat ranks second in Onion production and increasing area under onion require additional Onion cold storage facility to prevent post harvest losses, which is currently around 20-25 per cent of production and in value terms approximately INR 300 to 350 million every year. The cold chain industry in Gujarat is growing rapidly and now there are 625 cold storages with capacity of 23.2 lakh metric tonnes of which about two third of utilization was recorded by horticultural produce followed by animal husbandry and processed food (Table 4.8). Mahuva APMC in Bhavanagar district of Gujarat has constructed cold storage from the APEDA's grant in which 1200 tonnes of dehydrated onions can be stored.

As per State Department of Horticulture of Government of Gujarat, about 500 on farm structures of 25 to 35 mt ech has been created with support of MIDH have been created. Storage facilities are established by processors as well as traders, farmers and cooperatives. It is estimated that 1.5 lakh mt storage is available for open market. There is the highest storage gap is recorded in Maharashtra followed by in Karnataka and Gujarat state .

14. Findings from Field Survey Data

14.1. Farmer Households

- The demographic profile of the selected sample households indicate that all the respondents were male and average age of respondent of selected farmers was around 42 years.
- Data indicate that on an average per household owned land holding size was 3.21 ha with all area under irrigation. The category wise average land holding of small, medium and large category sample households was estimated to be 1.46, 3.36, and 6.40 hectare, respectively. On an average, per household 1.12 ha land was under onion cultivation, which accounts for about 35 per cent of total cultivated area. Across the selected land size groups, medium size holders put up relatively larger share of area under onion followed by small and large land holders group. Thus, it indicates that selected farm households had put around one third of total cultivated land under onion cultivation. There are number of reasons for cultivation of onion crop as it is short duration crop, best suitable land for onion cultivation, better price gain in onion crop other than competitive crops and number of onion processing also high.
- About 50 per cent selected farmers had market as a major source of planting material and had homemade seedlings used with good quality of planting material. All the respondents from large farmers group has used homemade planting material and did not face any difficulty in getting of these materials. Only 20 per cent farmers had received training or information about marketing practices of onion crops. About 80 per cent selected household have received price information from commission agent, AMPC and wholesaler for deciding production and marketing of

Onion produces and about 90 per cent households had sold their produce immediate after harvest due to perishable crop, lack of storage facility and hot climate condition in these producing area of Gujarat

- About 436.5 quintals of onion were sold by selected household during the year 2017-18 which was 36 per cent more than previous year. The highest average quantity of onion was sold by large land holding size group house (540 quintals) followed by medium (481.25 quintals) and small farmers (288.25 quintals). In the case of season wise trade, the highest share of 80.81 per cent onion was traded in rabi season followed by sale in early rabi (9.26) and summer (7.64) season. About 80 per cent selected household has immediately sold after harvest due to lack of storage facility and perishable nature of product.
- All the onion producer respondents had sold onion in local markets of Mahuva and Bhavnagar district. On an average 36 kilometer distance was travelled for marketing onion by spending average time of around 1.27 hours by road. About Rs. 496 per ton cost was incurred by respondent famers on transportation of produce.
- On an average 80 per cent respondents had sold their onion produce in local market and rest sold within the state. The average operational cost incurred by the household (including loading and unloading) was estimated to be Rs. 89.58 per quintal. The cost was relatively higher in case of large land size group and the lowest was in case of small land holders which may be due to average distance travelled in sale of the onion produce. The major reason for preferred by respondent farmers these market were to get better price, low cost of transportation and near to village.
- About 10 percent of the farmers had storage facilities, which capacity of 25 tonnes of onion store. The onion crop is perishable crop and has 1-2 months of self life. During the months of June-July, almost all selected respondents required storage facility with a capacity of 25 tonnes. Around 5-10 per cent loss occurs during storage of onion. Almost selected respondent farmers cited few reasons behind not having farmer own onion storage unit such as due to high cost storage construction, small farmer, no space available, high labor cost and Weight loss and spoilage.
- As far as the farmers awareness about market charges are concerned, it was found that none of the respondent was not aware about the market charge prescribed by rule (such as Commission, Hamali/ Handling, weight men and market fees) and also were whether they were charged than prescribed rate. But all the respondents told that expense of unloading the market is too much (Table 5.8).
- During the discussion with farmers and field visits to selected study area, it was noted that majors problem faced in marketing of onion produce were high transportation cost, high marketing cost and lack Infrastructure facility like market sub-yard and storage facility. Few suggestions given by the respondents for the improvement of marketing facility and its benefits were creating warehouse facility at village level, APMC should provide market

agent at village level and Market sub yard facility at village level to reduce marketing costs and reduce waste of time and production of onion.

- About 90 percent of selected farmer households had opined that they did not see any cartel and collusive behaviour of traders and commission agents in the market. Only one fourth of total middle land size group farmers had reported collusion among traders and commission agent
- At the time of sowing, farmers had expected price of Rs. 2500 per quintal while at the time before harvesting and after harvesting, expected rate was Rs. 2558.33 and Rs. 3125.0 per quintal, but actual price received by the onion farmer was less than expectation at any time, i.e. Rs. 2366.25 per quintal only.
- About 60 per cent of onion growers were satisfied with the existing production, marketing, storage and processing infrastructure however they have faced some problems. In case of onion production, it was reported that the most of respondents had faced the problem of low productivity, attack of pest–diseases, and quality of product. While marketing of produce, onion growers had faced with low price for produce, high labour and marketing cost. Lack of storage facility, high wastage of produce and reduction of weight during storage were infrastructure related problems were encounter by the respondents. In case of processing of onion produce, problems faced were high cost of processing, low value while after processing also export related problems were faced by onion grower.
- The selected farmers were asked to give their suggestions on various aspects of onion cultivation, marketing and export. The suggestions given by the farmers are given below.

    1. Export of onion should be promoted by keeping in view the increase in its demand and prices.
    2. Proper and sound storage facility for onion should be created by the Government, as onion is semi-perishable commodity.
    3. Adequate number of processing/dehydration units needs to be created/installed to increase the onion demand in market.
    4. Awareness about use of dried/dehydrated onion among the consumer needs to be increased though consumer awareness programme.
    5. Appropriate policy decision and arrangement should be made for remunerative prices to onion growing farmers in order to safeguard their interest in production of onion; otherwise farmers will divert to the other crop.
    6. Advance information of weather should be made available to the farmers by the nearby Meteorology department of Agricultural University.
    7. Inadequate facilities at market and inappropriate steps at APMC level for efficient marketing of produce are the major difficulties for farmers to sell out their produce.

8. The number of available regulated markets are inefficient to handle the buffer produce of onion.
9. The minimum support price for onion should be declared for onion crop as well (as market intervention scheme for onion was not declared in near past).
10. There is a need to arrange and maintain cold storage of adequate capacity at some selected village / taluka level.
11. Government should develop proper and sound marketing system.

14.2 Market Functionaries

Traders

- On an average, mainly three varieties of onion, viz. local, red and white onion arrivals is reported in the regulated market. It was also found that trader had on an average 36 years of experience in onion trading. The trader and Trader cum Commission agent licenses availed from APMC/Marketing Dept/Board. It shows that on an average about 8000 tons average quantity of onion is marketed annually and 5800 tons quantity of onion was traded previous year. The maximum quantity was traded during the rabi season 55.62 per cent and followed by early rabi season (28.13), summer season (10.63) and kharif season (5.62). Out of total quantity traded, only 100 MT onion was stored by the traders for emergency demand.
- Marketing strategy encompasses selecting and analyzing the target and creating and maintaining an appropriate marketing mix that satisfies the target consumers. The targeted purchasers and consumers of onion in selected market of the State are given in Table 5.18. In the selected markets, out of total procured quantity of onion, 90 per cent onion was procured from local market of Mahuva area and rest of 10 per cent was purchased within the state (Bhavnagar and Rajkot) and out of state (Nasik, Maharashtra) procured by traders. The average maximum transportation cost rupees of Rs. 3.5 per kg for procure from outside of state followed by Rs. 3.0 per kg within state and Rs 1.5 per kg onion procure from local market. The traders have then targeted to local area. This happens due to availability of onion at low cost. The road was the major mode of transportation for procurement and sale of onion by trader in Mahuva market. As far as onion sale by the traders is concerned, overall 85 per cent of the traders had sold the product outside the state; whereas only 5 per cent of them had sold within the state. Transportation cost incurred by trader for trading outside the state was estimated to be about Rs. 3.0 to 5.5 per kg. The major targeted consumers markets were in the states of Delhi, Punjab, Haryana, Rajasthan, Assam, Bihar and Bengal.
- Most of traders preferred to purchase onion from local market because onion produce is generally available at low price with good quality. Most of

the traders had preferred to sale their produce with in state due to good prices and less storable product.

- On an average, operation cost of per ton of onion procurement varied from Rs. 200/- to 850/- which includes transportation, loading and unloading, rent for storage, fees, monitoring and administering. In the process of trading, operational cost was borne by the buyer.
- Selected traders had expected high trade margin on total value to trade and also received high percentage of margin after trading of onion produce.
- Traders have faced major problems of lack of efficient transportation facility and high transportation cost. The respondents were asked to share their suggestions to solve these problems and they suggested that marketing facility should be made available by government at subsidize rate which includes transport facility, charges for loading and unloading of produce.
- Though onion is predominantly a winter crop, it is grown in all the three seasons depending upon the availability of irrigation facilities. The bulk of the onion is produced in the winter season which arrives in the market during April-May. However, the consumption of onion is spread throughout the year and there is steady demand for onion bulbs all the year round. Onion trader had 5 own storages with 3000 ton storage capacity and they require 2 more storage on rent with 1000 ton capacity at peak season. During the peak season, the product is sold within 15 days while 3-4 days in lean season.
- Onion is a seasonal crop, semi perishable in nature and has comparatively low storage ability and bulbs are usually stored until the harvest of next season crop or for longer period due to seasonal glut in the market. Significant losses in quality and quantity of onion occur during storage. Storage of onion bulbs has therefore, become a serious problem in the state. Onion is grown mostly during rabi crop and huge quantity of arrivals is reported in the market in the month of Feb to April. Rabi onion has shelf life of about 2-6 months while traders generally store onion for 2-5 months period during this period. While Kharif onion which has shelf life of about 1-3 months and about 20 to 40 per cent total produce get loss during the storage period.
- Open auction method was followed by all the traders in selected Mahuva onion market.

Commission Agent

- The average years of experience of commission agents in these markets varied from 30 to 34 years. Apart from these, it also comes out from the table that most of commission agents owning shops had extended trading and storage area along with a separate space for a small office. In Vasana APMC, all respondents were awarded licenses as a Commission agent,

whereas in Mahuva APMC, about half of the respondents were Trader and Commission agents.

- Average onion transaction is higher during rabi season which was about 25 mt followed by in early rabi (13.75 Metric tons), kharif (7.0 Metric tons) and Summer (5.00 Metric tons) season in the selected market. The average quantities transacted by commission agent were significantly higher in Ahmadabad APMC as compared to AMPC Mahuva, indicating either there is greater hold on market transactions or over-reported figures. Out of total quantity traded, only 17.5 mt of onion was stored by commission agent for emergency demand.
- Most of commission agents have reported that they adjusted their purchase and sale pattern in times of very high or low prices. The commission agents at Vasana APMC as well as at Ahmadabad APMC were well equipped with information and were connected with other markets. Quantities transacted by commission agent of Vasana were quite high in volumes which was sold in outside the state while the commission agents of Mahuva market had traded the onion within the state.
- With respect to purchase of onion, it was observed that most of respondents' preferred local market due to relatively lower prices and availability of quality onion while preference for within state and outside the state market as per their choice for local onion requirement in the selected market. The choices of place for sale of onion by commission agent was for sale within state and out of state for high price received, while local market was preferred due to perishability of commodity and better price.
- On an average 3 per cent of total traded volume as a operational cost of onion incurred by commission agent which including transportation, loading and unloading, rent for storage, fees, monitoring and administering.
- High price fluctuation and lack of storage facility are the major problems faced by the commission agents during marketing and transport of produce. The respondents were asked to share their suggestions to solve these problems and they suggested that market intelligence and storage facility at major onion market need to be created/enhanced.
- During the peak season, the product is disposed within 2-3 days while it takes 3 to 5 days in the lean season. None of trader had onion storage facility. Despite of same, due to high perishablilty of product, they don't require any storage facility.
- Among the various types of trading mechanism followed during the purchase and sale Onion, mutual agreement and open auction method was followed by all commission agents in both selected onion market.

Processor

- On account of rapid urbanization, hectic schedules and rising working population, the demand for onion powder is witnessing a tremendous growth, particularly in India. In order to save time, consumers are not

willing to indulge in difficult cooking procedures such as chopping onions. Apart from this, food processing represents one of the largest sectors in India which is bolstering the demand for onion powder. Rising consumer awareness about the improved shelf life of dehydrated foods has contributed to the growing adoption of dry onions among consumers, especially within developing economies. Onion dehydration industry of the state is the biggest in the country and it comprises 80 per cent of the total dehydration units which process nearly one lakh tonnes of onion. High initial investment in onion processing industry and high uncertainty in production enhanced the risk in this business.

- The details of onion processing unit in Mahuva market indicate that processor had purcahsed only three variety of onion for processing and on an average about 75 MT of onion is processed annually. About 50 mt of onions were purchased in previous year and in which about 60 percent was purchased in Rabi season followed by early Rabi (20 per cent) season. The processor had onion storage and only 30 percent of the total quantity of purchase is stored by processor for emergency demand.
- About 90 per cent of onion was purchased from local market and while rest of quantity was procured from outside the state.
- One of the prime reasons behind high volatility in onion prices stems from a lack of storage facilities that have not kept pace with rising production. Also, the traditional storage practices incur losses as high as 40 per cent. Processor has storage facility and the storage capacity is 250 meters. The current facility of onion storage is not enough for the processor because of huge market arrives in the month of December to May and it requires high storage facilities with high storage capacity. Onion is perishable crop and it has only 3 to 5 month shelf life while processor stores in only 3 months. There is no difficulty faced in obtaining processor licenses by the processor.
- The market structure of onion is unilaterally dictated by the traders, not farmers. Minimal role of farmers in price discovery due to low size of average farm holdings, unfavorable weather conditions and price risk were cited as major reasons for the situation.
- Processor had faced problems regarding marketing and storage of onion. The area of market yard and auction place is very small and all functionaries of marketing face problem in peak arrival. The majority of the respondents had suggested to increase the infrastructure facility likes market yard, auction place and storage facility in Mahuva market to overcome problems in marketing of onion.

Warehouses

- Onion is stored in ambient storage condition in state where the storage losses are very high. These losses are comprises of physiological loss in weight (PLW) i.e. moisture losses and shrinkage, rotting and sprouting. The storability of onion is influenced by several factors such as varieties, cultural practices, pre-harvest treatments and post harvest handing

practices. The storage environment during the period of storage plays an important role in the storage life and losses during the storage.

- All type of onion varieties have been stored and on an average 50 MT onions annually purchase by stockiest. Stockiest, nearly 30 Onion warehouse have capacity of 75 MT. The warehouse is located in Mahuwa city of Bhavnagar District. About 35 million tonnes of onion procure was done during the last one year, which purchased 57.14 per cent Rabi seasons and 42.86 per cent in the early Rabi season.
- In selected markets, out of the total procured quantity, 80 per cent onion was procured from local market of Mahuva area and rest 20 per cent was from other places within the state (Bhavnagar and Rajkot). The stockiest have then targeted to local area. This happens due to availability of onion high at low cost. The road is major mode of transportation for procure and sold of onion stockiest in Mahuva market. As far as onion sold by the traders is concerned, overall 100 per cent of the traders sold the product to outside the state. About Rs. 3.0 to 5.5/ kg transportation cost incurred by stokiest for trading outside the state. The major targeted consumers markets Delhi, Punjab, Haryana and Rajasthan.
- Average years of work experience of onion storage in these markets was 45 years and it worked as trader cum warehouse owner. The respondent has 30 warehouses with about 70 Metric tons of storage capacity and enough storage capacity in warehouse. They have lease out the storage to traders for three months. Onion has only 3-4 month shelf life but they store the onions in the warehouse for 3 months. In temporary storage structures onion is generally stored for one to three months while in semi-permanent and permanent structures, onions can be stored for 3 to 5 months depending upon the market rates. As for as the storage losses are concerned, the losses were high in temporary type structures despite of lesser period of storage. There was no difficulty faced in obtaining warehouse licenses by the traders. The owner of the warehouse has no loan facility provide for people who have onion in storage.
- Storage is an important marketing function, which involves holding and preserving goods from the time they are produced until they are needed for consumption. On an average of Rs. 50 to 70 per quintal charged on the storage of onions for a period of one to two months. Most of onion stored in warehouse by the traders and big farmers.

15 Policy Recommendations:

- The price spikes of onion in many ways cannot be explained fully by the fundamentals of demand-supply. High inflation of food commodities cannot always be attributed to risks, exogenous shocks and mismatch of demand and supply, it can also be caused by market inefficiencies, weak supply chains and monopolies in the market. States Government must act against hoarders. Central government must reduce transportation bottleneck by making available railway wagons/racks for transport of onions. Besides,

there is a need to create regional storages to cater need of the region as per requirement.

- The available regulated markets are inefficient to handle the buffer produce of onion. Also inadequate facilities at market and inappropriate steps at APMC level for efficient marketing of produce are the major difficulties for farmers to sell out their produce. Therefore, the appropriate policy decision and arrangement should be made for remunerative prices to onion growing farmers in order to safeguard their interest in production of onion. NAFED or any other notified procurement agency/ies should procure onion at least 5 per cent of produce from open market and should store it.
- Though, India holds premier positions in area and production, the productivity of onion is very low compared to other countries. There is need to increase productivity by making them available quality seed (suitable to soil and weather condition) to farmer at reasonable rate by the concern State Agricultural University/State Seed Corporation.
- There is a poor post-harvest management at farm level. The total storage losses in onion in different storage structures estimated to be about 15 percent. Effective crop planning and creation of post-harvest management infrastructure for onion will go a long way to solve the issues related to onion supply chain. Efforts will have to be made to improve the present post-harvest processing and storage systems and educating the farmers and traders in handling/processing the produce hygienically and efficiently.
- It was observed in the study that most of the onion crop is sold in APMC and farmers preferred this channel because they were familiar with the system which was practiced over the years and they received timely payments. Marketing infrastructure in the Mahua market was very good, whereas at other places, infrastructure up-gradation is required as per requirement.
- Marketing information is needed by farmers in planning production and marketing, and equally needed by other market participants in arriving at optimal trading decisions. Therefore, agricultural marketing extension system needs to be strengthened.
- Onion dry product needs to be promoted in the market. The adequate number of processing/dehydration units needs to be created/installed to increase the onion demand in market. The awareness about use of dried/dehydrated onion among the consumer needs to be made though consumer awareness programme.
- The advance information on weather should be made available to the farmers by the nearby Meteorology department of Agricultural University. Also crop insurance facility should be provided to the farmers.
- Farmers suggested that in case price of onion falls to unduly levels, the government must step in and purchase the produce to avoid distress sales. Market Intervention Scheme should be implemented in time as and when

prices drastically fall below the minimum level. On Pilot basis, Government support scheme with minimum assured purchase price to farmers for any future date purchase declared in advance can be attempted so that farmer can keep stock it.

- The difference in freight charges at different port should be removed. Proper storage facility at port on minimal rate should be provided. The loan arrangement at subsidies rate on the basis of quantum of export should be provided to the exporters. Also insurance facility should be provided to exporters in order to cover the loss due to cancellation of order and delay in delivery in respective countries.
- A visit was made to Mahua APMC and discussions were held with concerned market functionaries. It was quite clear from the discussions that some traders also stored onions in anticipation of higher prices. After making purchases from farmers, they sometimes stored the onions instead of immediate sales. These commission agents also indicated that they stored onions. However, when an attempt was made to find out the quantity stored by them, they were very reluctant to disclose the quantity stored and only complained of transport bottlenecks because of which they were forced to store.
- The discussion with market functionaries and stakeholders reveal that even the media plays a role in causing sudden rise or downfall in prices by publishing certain news for which they are paid. For example, there may be sudden news of very high auction prices in upcountry markets which immediately lead to spiraling of prices in urban centres. In reality only one transaction may have been at very high price, but the media hypes it up, and wholesalers and retailers jack up the prices. Conversely, the media may talk about falling demand for onions and low prices prevailing in several markets. This acts as a downward pressure on prices and onion growers may have to make distress sales.
- Meeting with traders revealed that it is mostly the retailers who charge higher prices than warranted to the consumers. There is no regulation on prices charged by retailers and at times their rates are exorbitant, especially when the produce is in short supply.
- A meeting with wholesalers and exporters revealed that there are several bottlenecks in onion trade, transportation is major one. Another major problem facing traders is the export ban which is sometimes imposed when onion prices show an upward trend. Exporters lose their credibility in export markets as irregular suppliers in international markets. Added to this is the practice of fixing Minimum Export Prices (MEP) for onions. At times the MEP is fixed at very high levels and exporters actually sell at prices below MEP though the L/C (letter of credit) is prepared at MEP. Therefore the profit realized by exporters shows an inflated figure leading to higher tax liability. Also fixation of MEP makes exporters reluctant to export which sometimes leads to excess supplies in domestic markets, leading to fall in prices. Farmers also loose when prices show downward trend. In view of

these difficulties, export ban on onions coupled with fixation of MEP must be discouraged.

- A large number of exporters meet their export requirements from APMCs in Bhavnagar, Junagarh. However, their produce is often not cleared at port for 3 to 4 days. They therefore refrain from entering the local markets till their export commitments are dispatched. Since supply is choked up, exporters do not enter the market till their consignments are dispatched leading to price fall. Hence, if export orders are timely dispatched, it is possible that volume of exports may increase which will benefit farmers.
- Farmers normally store onions in onion meda/chawls (temporary storage structure) to benefit from lean season rise in prices. However, this method of storage leads to deterioration in quality, spoilage and shrinkage. Often storing of onions leads to losses of 30-40 percent. Traders therefore stated that storing of onions in meda/chawls is a very rudimentary method of storage and there is urgent need for technology such as well designed cold storage which will enable the crop to remain in the same condition without spoilage or shrinkage. This will help to even out supplies throughout the year and also lead to better production planning of the crop and more stability in prices.
- Onion cooperatives and FPOs must be encouraged to form and work in study area because presence of cooperatives would help the farmers to receive better prices and help to prevent collusion amongst traders not to bid beyond a certain price and also discipline prices.
- Besides, Farmer Producers Organization should be promoted to create required storages structures with support of subsidy. Government should assign the work, provide resolving fund or help for pledge loan and compensate interests.
- Sprouting of onion during storage in high humidity and low light conditions is a major constraint leading to huge losses to the farmers/ traders. Irradiation, a cold preservation method is highly effective in controlling sprouting of onion. Govt. of India had approved irradiation of onion, potato and spices in 1994 for internal marketing and consumption. Department of Atomic Energy (DAE) has set up two 500 kg/hr capacity demonstration plants at Lasalgaon and Navi Mumbai. Commercial units have also been set up in Karnataka and Rajasthan. More such facilities need to be created to arrest large spoilage of onion in the country.
- There is a dearth of cold chain infrastructure for onion. It should be stored at low temperature ($2^{O}C$) and 75-80 per cent RH condition. Onion requires special type of cold storage having facility for maintaining desired humidity during storage, drying of onion after off-loading at 20-$25^{O}C$ to avoid sweating (moisture accumulation on the surface) leading to faster decay. Onion can also be stored for a long period without any spoilage under ultra-low oxygen controlled atmosphere (CA) storages.