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Behaviour of Price and Market
Arrivals of Brinjal in
Western Maharashtra

Enabling Informed Resource Allocation
Decision by Vegetable Growers of
Varanasi, Uttar Pradesh: Price Forecasting
using ARIMA

AGRO - ECONOMIC RESEARCH

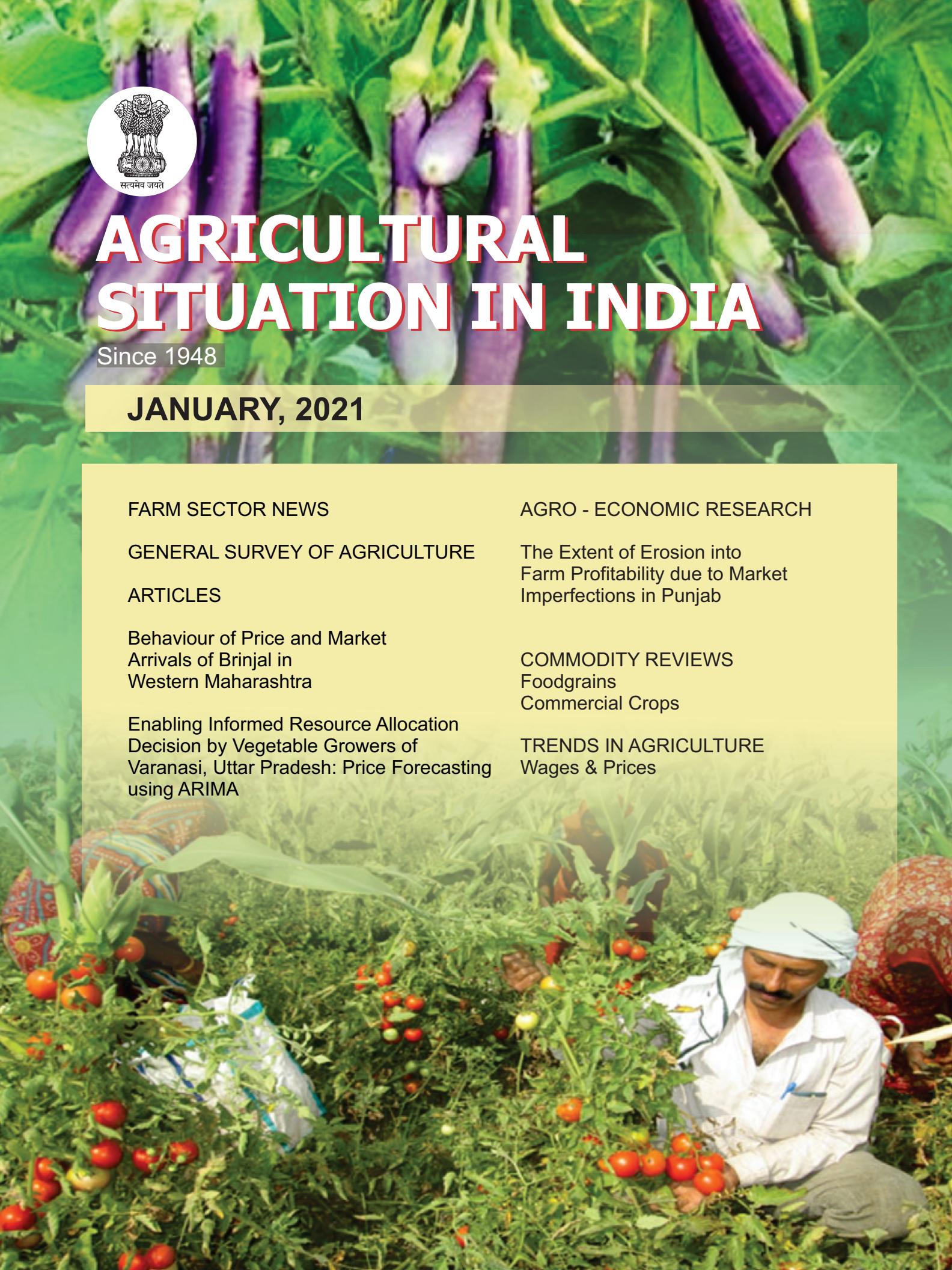
The Extent of Erosion into
Farm Profitability due to Market
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Soft copy of the journal is also available at:
eands.dacnet.nic.in/publication.htm

Subscription

	Inland	Foreign
Single Copy :	₹ 40.00	£ 2.9 or \$ 4.5
Annual :	₹ 400.00	£ 29 or \$ 45

Available from

The Controller of Publications,
Ministry of Urban Development,
Dept. of Publications,
Publications Complex (Behind Old Secretariat),
Civil Lines, Delhi-110 054.
Phone : 23813761, 23813762, 23813764, 23813765
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January, 2021

No. 10

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Sowing and Harvesting Operations Normally in Progress during February, 2021.

This issue of 'Agricultural Situation in India' gives an insight into the farm sector initiatives and policies of the Government; price trends in agricultural commodities; two academic research articles, one on behaviour of price and market arrivals of brinjal in western Maharashtra; and second on enabling informed resource allocation decision by vegetable growers in Uttar Pradesh and an agro-economic research study on extent of erosion into farm profitability due to market imperfections in Punjab.

The major farm sector news covered in this edition are: Agriculture Minister reiterated Government's commitment to the welfare of farmers; All India Kisan Coordination Committee Members submit a memorandum to Agriculture Minister in favour of the Farm Acts; relaxation on conditions of import of onions into India to counter high market prices; Farmer Producer Organisations from across the country meet Agriculture Minister; Prime Minister releases the 7th instalment of financial benefit under PM Kisan Samman Nidhi; budget of Department of Agriculture & Farmers' Welfare increased by more than six times in the past six years; increase in MSP in range of 40-70% for all crops; inauguration of Agri India Hackathon: Building Smart India with Self-Reliant Agriculture.

So far as the agricultural scenario is concerned, the Wholesale Price Index (WPI) of pulses, vegetables, oilseeds and paddy increased by 13.04 percent, 12.24 percent, 8.29 percent and 0.68 percent, respectively, in November, 2020 as compared to that in November, 2019. The 2020 cumulative post monsoon season rainfall in the country has been one percent higher than the long period average during 1st October, 2020 to 30th December, 2020. Current live storage in 128 major water reservoirs in the country is 123.88 BCM as against 102.51 BCM of normal storage based on the average storage of last 10 years.

In the academic column's first article, authors intend to study the seasonal and cyclical variation in prices and arrivals of brinjal and to study the response of prices on arrival of brinjal. The study is based on the secondary data collected from three major APMC's namely Pune, Kolhapur and Nashik. To measure the seasonal variations in prices and arrivals, seasonal indices were calculated employing twelve months ratio to moving average method. To ascertain the response of the prices on the arrivals of brinjal, the simple linear regression analysis was fitted. The study concludes

that the prices of brinjal were higher from month of June to December. The lean period of arrival in brinjal is January to May while the peak is June to December. This variation affects the return to brinjal growers. To address this disparity and encourage the brinjal growers, an efficient market information network needs to be set up by the state government for timely & adequate market information leading to better prices.

In the second article, authors aim to develop an Auto Regressive Integrated Moving Average (ARIMA) model for forecasting prices of major vegetables as this may help the growers to decide when and where to sell their produce. The study is based on the data collected from agmarknet.nic.in of the Department of Agricultural Marketing and Inspection, Ministry of Agriculture. From the available time series data, an ARIMA model and Seasonal Auto Regressive Integrated Moving Average (SARIMA) model have been developed. Using the predicted prices, the growers can decide as to how much area to allocate across different commodities.

Agro-economic research section tries to draw attention to the extent of erosion in farm profitability due to market imperfections in state of Punjab. The research was carried by Agro-Economic Research Centre, Punjab Agricultural University, Ludhiana. The farm level primary data were collected from a sample of 300 famers representing different farm size categories and agro-climatic regions of state. The aim of the study is to analyze the prices received, input costs and government support structure among many other things. The study concludes that Punjab has achieved very high levels of productivity of crops, especially paddy and wheat for years. This has led to exploitation of resources resulting in soil deficiencies and reduction of groundwater table. This has increased costs leading to diminishing of profits. The study further states that along with price incentives, non-price incentives such as procurement system and market infrastructure for crops other than paddy and wheat need to be strengthened. Further, incomes of farmers may increase by taking various steps which inter-alia include, loans at low rate of interest, creation of non-farm employment, subsidizing agricultural inputs.

Promodita Sathish

Farm Sector News*

Government committed to the welfare of farmers and is always ready for dialogue -Narendra Singh Tomar

Shri Narendra Singh Tomar, Minister of Agriculture & Farmers Welfare; Shri Piyush Goyal, Minister of Railways & Commerce and Shri Som Prakash, Minister of State, Ministry of Commerce and Industries interacted with the representatives of farmers' organizations of Punjab on 1st December, 2020 at Vigyan Bhavan, New Delhi. The Ministers again explained the benefits of Farm Reform Acts to the representatives of the farmers' unions. Various issues related to Farm Reform Acts were discussed at length and talks were held in a cordial atmosphere.

The Agriculture Minister cordially welcomed the representatives of farmers' organizations of Punjab and emphasized that the government is fully committed towards the welfare of farmers and agriculture development is always on the top priority for the Government of India. During the deliberations, the Union Agriculture and Farmers' Welfare Minister proposed to constitute an expert committee to put forth the issues of farmers so as to resolve them with mutual consent, but the representative of the farmers' union suggested that all the representatives would attend further rounds of discussions with the government to resolve the matter amicably.

During the interaction, it was suggested by the government to the representatives of farmers' union to identify the specific issues related to Farm Reform Acts and share with the government.

It was assured that the Government of India is always committed to protect the interest of farmers and is always open for discussions for farmers' welfare.

Proposals have been given to allay fears of the Farmers Unions

Appealing to the farmers' union leaders to continue dialogue and to find an amicable solution, Union Minister for Agriculture and Farmers' Welfare, Rural Development and Panchayati Raj, Shri Narendra Singh Tomar along with Union Minister

for Consumer Affairs, Food and Public Distribution, Railways and Commerce, Shri Piyush Goyal outlined the various suggestions that have been given to farmers in a proposal to address their concerns about the farm acts. They were speaking to the media at a press conference in New Delhi on 10th December, 2020.

The Farmers Produce Trade and Commerce (Promotion and Facilitation) Act, 2020 and Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020 and the Essential Commodities Amendment Act, 2020 are the biggest agricultural reforms in the country so far. The reforms will provide farmers market freedom, encourage entrepreneurship, access to technology and they will transform agriculture.

The Ministers said that the Union Government is willing to give assurance on MSP and procurement. Government is willing to ensure a level playing field in transactions inside and outside the existing APMC Mandis. Government has said that farmers can approach civil courts in disputes besides the SDM and is willing to address concerns regarding penalty for stubble burning and in the proposed Electricity Amendment Bill. It has also assured that farmers land will be protected under the new farm acts.

The Union Ministers, Shri Tomar and Shri Goyal spoke about the various measures that the government has taken since its inception to improve the lot of farmers and towards strengthening the agriculture sector. They said the latest acts were reforms undertaken after many rounds of consultations with stakeholders. They give the farmers freedom to sell anywhere and strengthen farmers with a protective legal framework when dealing with private companies. The Agriculture Minister gave an example of a farmer from Maharashtra who got immediate payment from the trader after the grievance was successfully addressed under the new laws. They said when the Centre makes a law, it is for the whole country. The Central Government is well within its constitutional rights while making laws on agricultural trade. The budgetary allocations for agriculture have seen a significant rise from 2014-2020 and this shows the commitment of the government towards farmers and the rural sector. An allocation

*Source: www.pib.nic.in

of over ₹ 75000 crores has been made for just PM Kisan initiative under which farmers get ₹ 6000 per year of direct income support. ₹ 1 Lakh crores Agri Infrastructure has been set up for the development of farm gate infrastructure. Neem coated urea scheme was introduced by the government for reduced use of chemicals and improved soil health. The Modi Government announced MSP hikes based on the recommendations of the Swaminathan Commission and on the formula that farmers must get at least 1.5 times the cost of production. The government has also ensured greater procurement and greater payment to farmers. Under the PM Kisan Maandhan Yojna, farmers are given pension support. Farmer Producer Organisations (FPO's) bring farmers together and provide them with a greater say in their future. 10,000 such FPO's are being created.

All these initiatives are aimed towards the farmer whose welfare and whose income occupies the central place in the government's schemes for agriculture.

The All India Kisan Coordination Committee Members submit a memorandum to Agriculture Minister in favour of the farm acts

The office bearers from different states representing the All India Kisan Coordination Committee met Agriculture Minister Shri Narendra Singh Tomar at Krishi Bhavan on 14th December, 2020. Farmer leaders from Telangana, Maharashtra, Haryana, Tamil Nadu and Bihar spoke to the Agriculture Minister. All of them were convinced that the recent farm acts are for the benefit of farmers across India and would save farmers from the clutches of the middlemen who have exploited them over the years. They were of the opinion that the laws would ensure freedom of choice to farmers in sale and purchase of agri-produce and allow barrier-free trade and commerce outside premises of Agriculture Produce Marketing Committees. They further added that giving farmers the right to enter into agreements with the buyer would enable prior price determination and transfer the risk of market unpredictability from the farmer to the sponsor. These farm reforms, they felt, would also enable farmers to access modern technology, better seeds and other inputs, besides attracting private investment into the agriculture sector.

More than seven thousand NGOs work under the umbrella of the All India Kisan Coordination Committee and their members will all rise up to

support the recently enacted farm acts. This assurance was given to the Agriculture Minister by the All India Kisan Coordination Committee representatives. They expressed their gratitude to the Union Government for enacting these farm acts and urged not to give in to the demands of the agitators to roll them back. They also appealed that the government should continue to educate the people about the benefit of these laws through advertisements and through training programmes.

Agriculture Minister Shri Narendra Singh Tomar clarified that the intention and policy of the government are clear and farmers are already benefiting from the pro-farmer reforms which would help in increasing their incomes.

The Farm Acts have been welcomed in states across the country - Narendra Singh Tomar

Members of the Bharatiya Kisan Union (Kisan) from Uttar Pradesh met the Union Minister for Agriculture and Farmers' Welfare, Shri Narendra Singh Tomar, at Krishi Bhavan on 15th December, 2020. The leaders of the union welcomed the farm acts and said that the acts would be beneficial for farmers. However, they submitted a memorandum to the Minister with suggestions regarding the farm acts and Minimum Support Price (MSP).

Agriculture Minister Shri Narendra Singh Tomar thanked the union leaders for coming out in support of the farm acts. The Minister said that the farm acts have been welcomed in various states across the country. He further added that the government was willing to continue dialogue with genuine farm unions and was willing to find a solution with an open mind. He said that MSP was an administrative decision and would continue as it is.

The Bharatiya Kisan Union (Kisan) leaders suggested that farmers be given the option of going to civil courts in case of a dispute. They also suggested that the panchayat head should be accorded the same importance as the head of the mandi to safeguard the rights of the farmers in small towns and villages. In case of the Essential Commodities Act, they suggested that it should prevent hoarding and black marketing.

The Union leaders also suggested that electricity rates for irrigation should be reduced and electricity

should be available for longer hours in the state of Uttar Pradesh. They also proposed that standards for crops should be decided at the procurement centres so that farmers do not face any problem in selling the produce.

Relaxation on conditions of import of onions into India to counter high market prices

In the light of public concern over high prices of onion in the market, the Department of Agriculture and Farmers' Welfare has decided to extend the relaxation from the condition of fumigation and additional declaration on Phytosanitary Certificate as per the Plant Quarantine Order, 2003, for imports up to 31st January, 2021. The relaxation will be subject to certain conditions.

Consignments of imported onions which arrive at Indian ports without fumigation and such endorsement on the PSC, would be fumigated in India by the importer through an accredited treatment provider. The consignment would be inspected thoroughly by quarantine officials and released only if found free from pests and diseases of concern to India. Further, if smut or dry rot is intercepted during inspection, the particular container will be rejected and deported. In case of stem and bulbs nematode or onion maggot being detected, these should be eliminated through fumigation and the consignments released without additional inspection fee.

The conditions also stipulate that an undertaking should be obtained from importers that the onions will be used only for consumption and not for propagation. In addition, such consignments of onion for consumption will not be subjected to the four times additional inspection fee for non compliance of conditions of import under the PQ Order, 2003.

Farmer Producer Organisations from across the country met Agriculture Minister

Union Minister for Agriculture and Farmers Welfare Shri Narendra Singh Tomar met members of Farmer Producer Organisations of Federation of Indian FPOs and Aggregators (FIFA) representing 15 states and around 500 FPOs at Krishi Bhawan on 17th December, 2020. They expressed their support for the recent agricultural reforms by the Government of India. They thanked the minister for the enabling environment which these acts have created to scale business of FPOs to benefit the small and marginal

farmers. They narrated their experiences in which they described how small farmers have benefitted from the recent reforms and farm acts.

The recent agricultural reforms, which can support FPOs to setup their own markets to enhance the incomes of farmers are –: the Farmers' Produce Trade and Commerce (Promotion & Facilitation) Act, 2020; the Farmers (Empowerment & Protection) Agreement on Price Assurance and Farm Services Act, 2020; Liberalization of control orders under the Essential Commodities Act; Agriculture Infrastructure Fund (AIF) and operational guidelines for promotion of 10000 FPOs.

These reforms in agriculture sector will lead to increased volume of production of horticulture crops and value-added commodities; institutional credit to strengthen small farmers and Farmer Producer Organizations (FPOs) will boost the agro-logic infrastructure in a major way; will develop backward and forward linkages to meet demand of all consumption zones of India; will lead to One Nation One Market and will make the FPO movement a mass movement.

NAFED (National Agricultural Cooperative Marketing Federation of India Ltd.) has been designated as one of the National Implementing Agencies for formation and promotion of 10000 FPOs Programme of the Ministry of Agriculture and Farmers Welfare. NAFED has acquired FIFA to provide market linkage support to the FPOs for their produce and create markets in partnership with the FPOs under the brand of NAFED e-Kisan Mandi (NeKM) which will be connected to the National Digital Marketing platform being created by NAFED.

50 NeKMs will be created in 2021 in the following states

• Haryana	3
• Punjab	2
• Rajasthan	3
• Madhya Pradesh	3
• Gujarat	5
• Maharashtra	8
• Karnataka	3
• Tamil Nadu	4
• Andhra Pradesh	3
• Telangana	1
• Jharkhand	2

• Bihar	2
• Chhattisgarh	1
• Odisha	2
• Uttar Pradesh	4
• J&K	1
• North-East	3

The time has come for Brand India to establish itself in the agricultural markets of the world- Prime Minister

The Prime Minister, Shri Narendra Modi on 25th December, 2020 released the 7th instalment of financial benefit under PM Kisan Samman Nidhi through video conference. PM also interacted with farmers from Arunachal Pradesh, Odisha, Haryana, Tamil Nadu, Uttar Pradesh, Maharashtra and Madhya Pradesh. Farmers narrated their experiences about how they have benefitted since the introduction of the farm acts.

Speaking on the occasion, the Prime Minister said ₹ 18000 crores have been deposited directly in the bank account of 9 crore farmer families in the country at the click of a button today. He added ever since this scheme started, more than 1 lakh 10 thousand crore rupees have reached the account of farmers.

The Prime Minister expressed regret that more than 70 lakh farmers of West Bengal have not been able to get this benefit. He said over 23 lakh farmers of Bengal have applied online to take advantage of this scheme. But the state government has stopped the verification process. He said the parties which do not speak in the interest of farmers in West Bengal, come to Delhi and talk about the farmer. He said these parties are missing APMC-mandis nowadays, but these parties repeatedly forget that there are no APMC-mandis in Kerala and these people never agitate in Kerala.

The Prime Minister said the government worked at aiming to reduce the input cost of the farmers. He listed some farmer-centric initiatives of the government like Soil Health Card, Neem Coating of Urea and scheme for distribution of solar pumps which helped in reducing the input cost for the farmers. He added the government tried to ensure that the farmers have a better crop insurance cover. Today, crores of farmers are getting the benefit of the PM crop insurance scheme.

The Prime Minister said the government tried to ensure that the country's farmers get a fair price for their crops. He said the government fixed one and a half times the production cost as MSP for the farmers as per the recommendations of the long-standing Swaminathan Committee report.

He added that the government aimed to open new markets for the farmers to sell their produce. He said the government added more than a thousand agricultural mandis of the country online and produce worth more than ₹ 1 lakh crores has been traded. He said the government worked towards forming groups of small farmers so that they can work as a collective force in their region. Today, a campaign is underway to form more than 10000 Farmers Producer Organizations - FPOs in the country and they are given financial help.

The Prime Minister said that the farmers are getting a pucca house, toilet and clean piped drinking water. They have benefited greatly from the free electricity connection, free gas connection. Free treatment up to ₹ 5 lakh under Ayushman Bharat scheme has reduced the major concern of health of farmers.

The Prime Minister said through agricultural reforms, better options were provided to the farmers. After these laws, farmers can sell their produce to whomever they want. They can sell their produce wherever they get the right price. He said after the new laws, farmers can sell their produce at MSP or export or sell it to the merchant, or sell it in another state, or sell it through FPO or be part of the value chain of biscuits, chips, jam, other consumer products.

The Prime Minister said that the time has come for Brand India to establish itself in the agricultural markets of the world. He thanked all the farmers across the country who have fully supported and welcomed the agricultural reforms and assured that he will not let them down. He said people mainly from the rural areas, participated in the recently held local body elections in Assam, Rajasthan, Jammu and Kashmir and in a way, rejected all the parties that misled farmers.

In his introductory address, Agriculture Minister Shri Narendra Singh Tomar highlighted that former Prime Minister Shri Atal Bihari Vajpayee had laid the foundation of good governance and reforms

in the agriculture sector which were taken forward by the Modi Government and since 2014, a number of reforms and initiatives have been introduced in the agriculture and rural sector. Under the leadership of PM Modi the budgetary allocation for agriculture increased, MSP increased, procurement increased and the process of formation of 10 thousand FPO's began.

Shri Tomar said that except for West Bengal all other states have been covered under the PM Kisan Samman Nidhi. Even during covid and lockdown, money has reached the farmers. He said that there are some doubts about the new farm acts in the minds of farmers from Punjab and the government is willing to clear doubts and misgivings and has invited them for dialogue.

Budget of Department of Agriculture & Farmers' Welfare has gone up more than six times in the past six years: Hardeep S. Puri

Union Minister Shri Hardeep Puri has stated that the budget of the Department of Agriculture & Farmers' Welfare has gone up more than six times in the past six years. He added that Prime Minister Shri Narendra Modi has implemented the recommendations of the Swaminathan Committee to increase MSP to 1.5 times the cost of production. He highlighted that the amount spent on procurement at MSP went up by 85 percent in 2014-19 compared to 2009-14. MSP has risen in the range of 40-70 percent for all major crops in 2020-21 in comparison to 2013-14. He further said that this year, procurement of paddy at MSP in Punjab has been 25 percent more than last year and 20 percent more than even the procurement target for this year. He informed that over ₹ 110000 crores has been transferred directly to the accounts of farmers through the PM Kisan Yojana and ₹ 87000 crores paid as crop insurance to farmers against a premium of merely ₹ 17450 crores till date.

Union Minister further informed that in 1950, the Indian agriculture sector contributed around 52 percent to the nation's gross domestic product (GDP), while employing nearly 70 percent of our entire population. He added that as of 2019, the sector still employed nearly 42 percent of our total population but contributed only 16 percent to the GDP, while experiencing a year-on-year growth rate of just 2 percent.

Referring to a 2018 study by the National Bank

for Agriculture and Rural Development, Shri Puri said that 52.5 percent of all agricultural households were indebted with an average debt of \$1470 (around ₹ 1.08 lakh). He added that 30 percent of our agriculture production continues to get wasted due to a lack of proper cold chain infrastructure. He further said that these factors make up for a quintessentially inefficient supply chain and as a result, consumers do not have a choice of products, wastage is high and prices are highly volatile. He added that at the same time, the Indian farmer is subjected to the vagaries of climate change, markets, middlemen and lack of essential infrastructure.

Shri Puri highlighted that leading agriculture economists have also recommended these reforms, allowing our farmers to sell their produce in the open market. He added that some Indian states have also adopted and implemented these reforms on their own over the years – for example, Bihar, where the agriculture growth average is 6 per cent compared to the national average of just 2 percent.

Shri Puri stressed that the government has repeatedly requested the farmers to talk and help resolve any of their concerns. He added that states will be allowed to impose taxes on the mandis and even though the government has made time-bound dispute resolution mechanisms, the government has also agreed to give access to civil courts in case of disputes.

Government Increased MSP in range of 40-70% for all crops

Union Minister Shri Hardeep S Puri has said that the government has not only implemented the recommendations of the Swaminathan Committee to increase MSP to 1.5 times of the cost of production but it increased MSP in the range of 40-70% in case of all crops and expenditure of procurement at MSP increased by 85% in 2014-19 from 2009-14. He added that the budget of the Department of Agriculture has gone up six times in as many years. Shri Puri informed that MSP is an administrative mechanism and added that the laws specifically provide layers of protection for our farmers, giving them legal safeguards to counter any unwarranted claims of corporates. He further said that the government has clearly stated in the laws that such acquisition or leasing of land of our farmers will not be allowed in any case. He said that our farmers are the stewards

of land, soil and forests and land is truly like their mother. They have dedicated their lives, blood and sweat to its care. He emphasized that the government would not allow anyone to come and take their land from them.

Shri Hardeep S. Puri said that the Amul co-operative success has shown that despite the fragmented small scale producer system that might be present in a sector, people can come together to create a raging success story. He added that today, Amul is not just producing milk, but much of its revenue comes from processed foods exported worldwide. This is the kind of success story we want for our farmers through these reforms. He added that the government has created 10000 Farmer Producer Organizations which bring small and marginal farmers together and give them access to social capital, information and negotiating power.

Shri Puri informed that the Prime Minister launched the 100th Kisan Rail from Maharashtra to Bengal where farmers can send their 50-100 kgs produce in cold chain coaches. He added that ₹ 1 lakh crore Agri- Infrastructure Fund has been created so that there is access to capital to build essential infrastructure space like warehouses, cold stores, sorting, grading and packaging units, rural marketing platforms, e-marketing units, etc. The Kisan Samman Nidhi (₹ 110000 crores have already been paid under this) supports our farmers and alleviates subsistence issues while protecting their dignity, which used to cause severe distress to our small and marginal farmers. He further said that the crop insurance mechanism, the Pradhan Mantri Kisan Fasal Bima Yojana has paid ₹ 87000 crores as insurance to farmers against a premium of ₹ 17450 crores.

Shri Puri said that Punjab and Haryana account for around 30% of the national food production and around 70% of our MSP procurement happens from these states. He added that a 2018 study by the National Bank for Agriculture and Rural Development showed that 52.5 percent of all agricultural households were indebted, with an average debt of \$1,470. He added that 30% of the crops produced continue to get wasted due to a lack of proper cold chain infrastructure required to safeguard the perishable produce. Additionally, the agriculture sector remains immensely fragmented due to many intermediaries, who often have huge margins. He further said that our hard-working

farmers can turn our agriculture intensive states into the granaries of the world. He reiterated that the agricultural reform laws intend to create the right ecosystem to support them, guide them and make them Atmanirbhar.

Agri India Hackathon: Building Smart India with Self-Reliant Agriculture

Union Minister of Agriculture & Farmers' Welfare, Shri Narendra Singh Tomar inaugurated the **Virtual Agri-hackathon 2020** organised by the Department of Agriculture and Cooperation and Farmers' Welfare in association with IARI, Pusa, New Delhi on 31st December, 2020. Speaking on the occasion, Union Agriculture Minister Shri Narendra Singh Tomar said that besides the hard-work of the farmers, the research of scientists has led to self-sufficiency in foodgrains. Agri India Hackathon is the largest virtual gathering to create dialogues and accelerate innovations.

The 2-month long event is the first of its kind & the largest virtual event in the history of Indian agriculture. It will bring together the most important stakeholders from industry & government alongside India's young bright minds, creative startups and smart innovators who will build new, fast and frugal solutions to tackle the big questions we're facing today.

With the launch, the application of the hackathon was made live on *MyGov.in* and will remain open till 20th January, 2021. The hackathon will happen in 3 elimination rounds and the final 24 winners will get a cash prize of ₹ 1,00,000 along with incubation support, tech & business mentoring and various other benefits. The hackathon will accept innovations & ideas on farm mechanization, precision agriculture, supply chain & food technology, waste to wealth, green energy, etc.

Union Minister of Agriculture & Farmers' Welfare, Shri Narendra Singh Tomar said "*In the light of Prime Minister's vision to introduce new-age technology and innovations in agriculture, the Agri India Hackathon is being organised. It is a proud moment for all of us where young minds will discuss, collaborate, and create some of the best ideas & solutions which will guide us for years to come. Agriculture is the backbone of our country and plans are afoot to strengthen this backbone with youth engagement, employment generation, technology & digitization*"

Union Minister of State for Agriculture, Shri Parshottam Rupala stressed on the Ministry's plan to encourage youth engagement with agriculture and farmers and scope to develop new innovations. He further said that new technology and the energy of youth will bring a revolutionary change in the sector. Union Minister of State for Agriculture, Shri Kailash Choudhary said: "*This event is very crucial from the standpoint of new technology and value addition in agriculture. It will help us achieve our dream of doubling the farmer's income which in turn will create many growth opportunities for the entire country.*"

Following the launch, Agri India Hackathon will also host speaker sessions called Agri India Meets spread across 2 months with more than 40 speakers who will discuss the present & future of agriculture.

Rewards for the winners: 24 best innovations from different focus areas will be awarded a cash prize of ₹ 1,00,000 each. The winning innovations will get an exclusive preference for incubation support, pre-seed & seed-stage funding of 5 lakhs & 25 lakhs, respectively, at any one of the 29 RABIs, along with the opportunity of field trial and access to technology validation.

The applications of the Agri India Hackathon will close on January 20. Apply at: <https://innovateindia.mygov.in/agriindhackathon/>

MSP Operations during Kharif Marketing Season 2020-21

In the ongoing Kharif Marketing Season (KMS) 2020-21, government continues to procure kharif 2020-21 crops at MSP from farmers as per existing MSP schemes.

Paddy procurement for Kharif 2020-21 is continuing smoothly in the procuring states & UTs of Punjab, Haryana, Uttar Pradesh, Telangana, Uttarakhand, Tamil Nadu, Chandigarh, Jammu & Kashmir, Kerala, Gujarat, Andhra Pradesh, Chhattisgarh, Odisha, Madhya Pradesh, Maharashtra, Bihar, Jharkhand, Assam and West Bengal with purchase of over 479.35 LMT of paddy up to 30.12.2020. This is an increase of 23.81% against the last year corresponding purchase of 387.15 LMT. Out of the total purchase of 479.35 LMT, Punjab alone has contributed 202.77 LMTs which is 42.30% of total procurement.

About 60.67 lakh farmers have already been benefitted from the ongoing KMS procurement operations with MSP value of ₹ 90502.23 crores.

Further, based on the proposal from the states, approval was accorded for procurement of 51.66 LMT of pulse and oilseeds of Kharif Marketing Season 2020 for the states of Tamil Nadu, Karnataka, Maharashtra, Telangana, Gujarat, Haryana, Uttar Pradesh, Odisha, Rajasthan and Andhra Pradesh under Price Support Scheme (PSS). Further, sanction for procurement of 1.23 LMT of copra (the perennial crop) for the states of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala was also given. For other states/UTs approval will also be accorded on receipt of proposals for procurement of pulses, oilseeds and copra under PSS so that procurement of FAQ grade of these crops can be made at notified MSP for the year 2020-21 directly from the registered farmers, if the market rate goes below MSP during the notified harvesting period in the respective states/UTs by the central nodal agencies through state nominated procuring agencies.

Upto 30.12.2020, the government through its nodal agencies has procured 251633.79 MT of moong, urad, groundnut pods and soyabean having MSP value of ₹ 1346.76 crores benefitting 1,35,813 farmers in Tamil Nadu, Maharashtra, Gujarat, Haryana and Rajasthan.

Similarly, 5089 MT of copra (the perennial crop) having MSP value of ₹ 52.40 crores has been procured benefitting 3961 farmers in Karnataka and Tamil Nadu upto 30.12.2020 as against the last year corresponding purchase of 293.34 MT of copra. In respect of copra and urad, rates are ruling above MSP in most of the major producing states. The respective state/UTs governments are making necessary arrangements for commencement of procurement from the date as decided by the respective states based on the arrivals in respect of kharif pulses and oilseeds.

Procurement operations of seed cotton (kapas) under MSP are going on smoothly in the states of Punjab, Haryana, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Telangana, Andhra Pradesh, Odisha and Karnataka. Till 30.12.2020, a quantity of 7322391 cotton bales valuing ₹ 21461.67 crores has been procured benefitting 14,31,227 farmers.

General Survey of Agriculture

Trends in Foodgrain Prices

Based on the Wholesale Price Index (WPI) [Base year, 2011-12=100], the trend has emerged in different food items is shown in Table1.

The Consumer Price Index (CPI) based inflation rate on point to point basis has decreased from 7.61% in November, 2019 to 6.93% in November, 2020 according to data released by the Central Statistics Office (CSO) on 14th December, 2020. The Consumer Food Price Index (CFPI) for All-India Combined has decreased to 9.43% in November, 2020 from 11.00% in October, 2020.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative Post-Monsoon Season, 2020 rainfall for the country as a whole during the period 1st October, 2020 to 30th December, 2020 has been 1% higher than the Long Period Average (LPA). The Rainfall has been higher than LPA by 15% in South Peninsula, by 12% in Central India but lower than LPA by 39% in North-West India and by 15% in East & North East India and.

Out of 36 meteorological sub-divisions, 11 meteorological sub-divisions received large excess/excess rainfall, 09 meteorological sub-divisions received normal rainfall and 16 meteorological sub-divisions received deficient/large deficient rainfall.

Current live storage in 128 reservoirs (as on 31st December, 2020) monitored by Central Water Commission having Total Live Capacity of 172.13 BCM was 123.88 BCM as against 135.79 BCM on 31.12.2019 (last year) and 102.51 BCM of normal storage (average storage of last 10 years). Current year's storage is 91% of last year's storage and 121% of the normal storage.

Sowing position during Rabi 2020

Rabi sowing as on 01.01.2021, 620.71 lakh ha area has been sown as compared to 603.15 lakh ha during 2019-20 during the same period.

A statement indicating comparative position of area coverage under major crops as on 01.01.2020 during current Rabi season *vis-a-vis* the coverage during the corresponding period of last year is given in the Annexure 1.

TABLE 1. TRENDS IN FOODGRAIN PRICES BASED ON THE WHOLESALE PRICE INDEX (WPI)

[Base year, 2011-12=100]

Food Items	Weight	Percentage change in November, 2020 over October, 2020	Percentage change in November, 2020 over November, 2019
Foodgrains (Cereals +Pulses)	3.46	0.44	-2.28
Cereals	2.82	0.13	-5.52
Paddy	1.43	-0.31	0.68
Wheat	1.03	0.34	-10.09
Jowar	0.07	4.87	-6.06
Bajra	0.09	-0.26	-17.73
Maize	0.19	1.38	-18.91
Barley	0.01	0.00	-15.04
Ragi	0.01	2.01	3.40
Pulses	0.64	1.71	13.04
Gram	0.26	0.43	10.79

TABLE 1. TRENDS IN FOODGRAIN PRICES BASED ON THE WHOLESALE PRICE INDEX (WPI) - *Contd.*

[Base year, 2011-12=100]

Food Items	Weight	Percentage change in November, 2020 over October, 2020	Percentage change in November, 2020 over November, 2019
Arhar	0.13	0.46	13.61
Moong	0.07	1.54	12.54
Masur	0.05	2.15	18.36
Urad	0.09	3.58	15.98
Fruits & Vegetables	3.48	-4.09	6.87
Vegetables	1.87	-3.76	12.24
Potato	0.28	14.26	115.12
Onion	0.16	14.29	-7.58
Tomato	0.28	-13.52	11.40
Fruits	1.60	-5.03	-3.80
Oilseeds	1.12	2.53	8.29
Groundnut Seed	0.27	0.83	4.05
Rape & Mustard Seed	0.25	3.31	17.34
Copra (Coconut)	0.07	1.82	3.60
Gingelly Seed (Sesamum)	0.01	-2.78	-4.19
Safflower (Kardi Seed)	0.00	1.11	-16.63
Sunflower	0.02	-2.78	3.46
Soyabean	0.38	3.50	7.91

ANNEXURE 1: ALL INDIA PROGRESSIVE CROP SOWING – RABI (2020-21) AS ON 01-01-2021

(Area in lakh hectares)

Crop Name	Normal Area	Area sown			Absolute Change
		This Year	% of Normal	Last Year	
Wheat	303.28	325.35	107.7	313.95	11.40
Rice	41.78	14.83	35.5	15.47	-0.64
Jowar	33.40	25.21	75.5	28.25	-3.04
Maize	17.37	12.57	72.4	13.73	-1.17
Barley	6.38	6.75	105.8	7.41	-0.66
Total Coarse Cereals	57.14	45.12	79.0	49.90	-4.77
Total Cereals	402.20	385.30	95.8	379.32	5.98
Gram	92.77	105.83	114.1	100.06	5.77

ANNEXURE 1: ALL INDIA PROGRESSIVE CROP SOWING – RABI (2020-21) AS ON 01-01-2021 - *Contd.*

(Area in lakh hectares)

Crop Name	Normal Area	Area sown			Absolute Change
		This Year	% of Normal	Last Year	
Lentil	14.24	16.19	113.7	15.56	0.62
Peas	8.74	10.39	118.9	10.58	-0.18
Kulthi (Horse Gram)	2.14	3.66	171.3	5.02	-1.36
Urad	8.93	6.54	73.2	6.02	0.52
Moong	9.86	3.36	34.1	2.65	0.71
Lathyrus	3.98	3.05	76.5	3.01	0.03
Others	4.23	5.78	136.7	4.99	0.79
Total Pulses	144.88	154.80	106.9	147.90	6.90
Total Foodgrains	547.07	540.10	98.7	527.22	12.88
Rapeseed & Mustard	59.44	72.39	121.8	66.62	5.76
Groundnut	7.24	3.61	49.9	3.95	-0.34
Safflower	1.15	0.54	46.6	0.59	-0.05
Sunflower	2.37	0.87	36.8	0.92	-0.05
Linseed	2.74	2.67	97.2	3.09	-0.42
Total Oilseeds (Nine)	72.94	80.61	110.5	75.93	4.68
All- Crops	620.01	620.71	100.1	603.15	17.56

Source: Crops & PHMF Divisions, DAC&FW

Articles

Behaviour of Price and Market Arrivals of Brinjal in Western Maharashtra

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Abstract

The present study entitled "Behaviour of prices and market arrivals of brinjal in Western Maharashtra" is undertaken with objectives to study the seasonal and cyclical variations in prices and arrivals of brinjal and to study the response of prices on arrival of brinjal. The study is based on secondary data consisting of monthly prices and arrivals of brinjal, collected from three major Agriculture Produce Market Committees (APMC's) namely Pune, Kolhapur and Nashik. The arrival of brinjal in these markets was the highest. The data covered a period of 13 years i.e. 2005 to 2017. Moving average method is used to estimate seasonal variation and residual method for cyclical variations. The simple linear regression analysis is used to study the response of the prices on arrivals of brinjal. The study observed that the prices of brinjal were higher from the month of June to December in the selected markets. The higher cyclical variations were observed in the prices of brinjal during 2013 and 2017 in Pune; 2011 and 2014 in Kolhapur and Nashik. The peak period of arrivals of brinjal in selected markets was July to December. The higher cyclical variations were observed in the arrivals of brinjal in the selected markets during 2007, 2011, 2016 and 2017. The lag price of brinjal is found to be a major contributor in deciding current year prices.

Keywords: Price, Arrival, APMC, Seasonal Indices, Brinjal

1. Introduction

Agriculture sector in India employed about 60% (2017) of the workforce and contributed 16% of GDP in 2016-17. Agricultural marketing plays a significant role in the movement of commodities from the producer to the consumer and in stabilizing the prices. The planned increase in agricultural output must be coordinated with changes in the demand and supply for agricultural commodities and marketing. This can be fruitful only when producer's share in consumer's rupee increases considerably, irrespective of the volume of the marketable surplus produced with the farmers. The farmers sell their produce in the regulated markets, in accordance with the Agricultural Produce Market Act of 1939.

The APMC's were established by the Maharashtra State Govt. for regulating the marketing of different kinds of agriculture produce for the same market area. The growth of arrivals of commodities in the regulated markets resulted in dwindling sales of agriculture produce in the village over time. The information regarding behavior of the price in terms

of price level, trend and fluctuations is the most important factor in determining competitiveness of the commodity in the domestic as well as in international level. Analyzing the past trend in prices of commodities is also useful in understanding the present scenario and to formulate appropriate strategies to improve the marketing system as well as long term strategy on trade.

India is the second largest producer of fruits and vegetables in the world. Total area under horticultural crops is 25.43 million ha (2017-18) and production is 311.71 million tonnes (2017-18). Fruits and vegetables together contribute about 90% of the total horticultural production in the country. Brinjal is one of the most commonly grown vegetable crops of the country and its origin is India.

In India, brinjal occupies 730.40 thousand hectares area with a production of 12800.8 thousand MT which accounts for 7.12 percent of area and 6.94 percent of the total vegetable production with a productivity of 17.5 mt/ha in year 2017-18. In Maharashtra, the total area of under brinjal

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cultivation is 23000 ha, production of 430000 mt and with a productivity of 19.12 mt/ha. The area and production under brinjal is fluctuating over the years in India. Brinjal is the fourth most important vegetable grown after potato, onion and tomato in India. It is planted in three seasons; first in kharif (June-September), second in rabi (November-February) and third in the month of March. Brinjal is a widely grown and consumed vegetable that has got good demand in the domestic and international market. Brinjal prices were quite volatile in the past few years. Therefore, there is a need to analyze the behavior of brinjal prices. The present study attempts to fulfill the above needs and suggest suitable policy for the improvement of brinjal marketing.

1.1. Objectives of the study

- i. To study the seasonal and cyclical variations in prices and arrivals of brinjal.
- ii. To study the response of prices on arrival of brinjal.

2. Methodology

The study has been confined to the three major markets of western Maharashtra state. The data from markets namely Pune, Kolhapur and Nashik were taken into consideration on the basis of market arrivals. The study is based on secondary data. Secondary data consisting of monthly prices and arrivals of brinjal are collected from three major Agriculture Produce Market Committee (APMC)'s namely Pune, Kolhapur and Nashik as the arrival of brinjal in these markets are maximum.

The data thus collected were tabulated, analyzed and subjected to statistical and econometric analysis to study the price behavior and the response of prices on arrival of brinjal. For the study, monthly time series data on the prices and arrivals of brinjal are collected for the period from January, 2005 to December, 2017.

2.1. Tools used for analysis

The analytical techniques used in the study are:

- i. Study of the seasonal and cyclical variations in prices and arrivals of brinjal.

Most widely used method of measuring

seasonal fluctuations i.e. method of moving average was used to calculate seasonal indices. To measure the seasonal variations in prices and arrivals, seasonal indices were calculated employing a twelve months ratio to moving average method.

- ii. Estimation of cyclical indices of prices and arrivals of brinjal.

The residual method of estimating cyclical movement in time series was used for estimating cyclical indices after eliminating the seasonal variation and trend components. This is accomplished by dividing (Y_t) by corresponding (S) for time 't' symbolically. These deseasonalized data contain cyclical and irregular components and are plotted against time for examining cyclical behavior. If there is any existence of a cycle, periodicity of cycle is noted.

- iii. Relationships between Market Arrivals and Prices.

The arrivals and prices are subjected to change over a period of time due to innovations, supply of more inputs and increase in population. The estimation of time trend on growth of these variables may be helpful in studying the directions of change and in guiding policy formulations. The econometric model used for the purpose can be stated as:

$$P_t = a + bP_{t-1} + cY_t + u_t$$

where,

P_t = current price (₹/quintal) of brinjal in period t ,

Y_t = current arrival (quintals) of brinjal in period t ,

P_{t-1} = lagged price of brinjal,

a = Intercept

b & c = Regression coefficient

u_t = error term

3. Results and Discussion

3.1. Seasonal indices for brinjal prices

In order to analyze the long run seasonal variation

in prices of brinjal in the selected markets, seasonal indices for prices was computed by adopting 12 months moving average method. The seasonal indices of monthly prices of brinjal in the selected markets are presented in table 1.

TABLE 1: SEASONAL INDICES OF MONTHLY PRICES FOR BRINJAL PRICES IN SELECTED MARKETS OF WESTERN MAHARASHTRA

Month	Pune	Kolhapur	Nashik
Jan	85.27	77.81	80.27
Feb	67.65	58.90	99.19
Mar	82.88	72.35	73.37
Apr	75.25	80.76	60.61
May	90.88	85.70	71.35
Jun	117.17	111.48	122.45
July	102.10	108.95	126.27
Aug	113.80	112.80	134.85
Sept	106.60	95.66	113.92
Oct	135.81	120.05	115.28
Nov	111.48	93.25	107.77
Dec	116.66	190.88	105.55

Source: APMC's of Pune, Kolhapur and Nashik

It is seen from the table that the maximum prices were observed during the month of June to December. In the prices, the highest value of seasonal indices was observed for the month of December i.e. 190.88 percent in Kolhapur market followed by Pune (135.81 percent) in October month and Nashik (134.85 percent) in August month. The lowest price was observed for the month of February i.e. 58.90 percent in Kolhapur market followed by Nashik (60.61 percent) in April month and Pune (67.65 percent) in February month.

3.2. Cyclical indices for Brinjal prices

The cyclical indices for brinjal prices were worked out for the period 2005-2017 and are presented in table 2.

It is evident from the selected markets that

very high cyclical indices were observed in the year 2013, 2016 and 2017 in Pune market and in 2010, 2011 and 2014 in Kolhapur and Nashik markets. The lowest price indices were recorded in 2008 and were found to be 86.25, 65.55 and 76.15, respectively, in the selected markets.

TABLE 2: CYCLICAL INDICES FOR BRINJAL PRICES IN SELECTED MARKETS OF WESTERN MAHARASHTRA

Year	Pune	Kolhapur	Nashik
2005	107.84	93.15	117.20
2006	111.63	95.16	110.85
2007	95.87	115.11	80.11
2008	86.25	65.66	76.15
2009	93.19	83.55	84.22
2010	97.13	114.15	116.27
2011	88.70	138.65	118.35
2012	95.23	100.81	80.25
2013	113.57	87.25	110.12
2014	95.38	184.68	146.82
2015	93.38	83.14	92.11
2016	112.80	85.78	84.85
2017	113.19	88.95	87.95

Source: APMC's of Pune, Kolhapur and Nashik

3.3. Seasonal indices for brinjal arrivals

To identify the long run seasonal variations in the arrivals of brinjal, seasonal indices were calculated by 12 months moving average. The seasonal indices thus calculated are presented in table 3.

It is seen from the table, the maximum arrival of brinjal in the market during the month of June to December. The highest arrival was observed in July, October, November and December in Pune APMC; July to September in Kolhapur and during May to July in Nashik. The lower arrival of brinjal observed during January to April as recorded from the value of seasonal indices, one can conclude that it was the lean period of arrivals for brinjal.

TABLE 3: SEASONAL INDICES FOR BRINJAL ARRIVALS IN SELECTED MARKETS OF WESTERN MAHARASHTRA

Month	Pune	Kolhapur	Nashik
Jan	101.38	92.87	84.30
Feb	88.28	88.15	99.15
Mar	92.20	74.27	67.98
Apr	77.13	60.10	87.11
May	84.22	85.12	148.86
Jun	75.48	111.35	171.95
July	113.11	130.23	103.23
Aug	96.20	137.88	98.95
Sept	104.88	127.81	103.76
Oct	153.15	106.87	73.98
Nov	119.37	106.87	81.41
Dec	117.45	93.38	87.82

Source: APMC's of Pune, Kolhapur and Nashik

3.4. Cyclical indices for brinjal arrivals.

The cyclical indices for brinjal arrivals were worked out for the period 2005-2017 and are presented in table 4.

TABLE 4: CYCLICAL INDICES FOR BRINJAL ARRIVALS IN DIFFERENT MARKETS OF WESTERN MAHARASHTRA

Year	Pune	Kolhapur	Nashik
2005	127.15	88.81	101.70
2006	105.52	107.80	102.22
2007	120.32	124.45	118.45
2008	95.18	100.18	42.51
2009	69.75	107.65	97.60
2010	81.35	141.35	87.12
2011	170.20	143.06	127.10
2012	105.44	94.52	143.48
2013	77.20	74.84	105.11
2014	59.88	59.71	64.88
2015	104.64	86.40	52.45
2016	123.35	112.16	153.23
2017	107.85	110.87	120.41

Source: APMC's of Pune, Kolhapur and Nashik

It is seen from table 4 that the cyclical variations were observed in the arrivals of brinjal in the selected markets. The higher arrivals were recorded during the year 2007, 2011, 2016 and 2017 in all selected APMC's.

3.5. Response of the prices on arrivals of brinjal

To ascertain the response of the prices on the arrivals of brinjal in selected markets, the simple linear regression analysis was employed and the results are presented below in table 5.

TABLE 5: RESPONSE OF PRICES ON ARRIVALS OF BRINJAL

Sr. No.	Markets	Particulars		
		b (Pt-1)	c (Yt)	R ²
1	Pune	0.92	0.05	0.80**
2	Kolhapur	0.86	-0.05	0.60*
3	Nashik	0.81	-0.18	0.72**

Source: Estimated from the data of arrivals and prices of brinjal

Note: *; ** indicating significance at 1% and 5% level of significance.

It is observed from table 5 that the total contribution in the current year prices of brinjal is given by lag price (Pt-1) and current year arrival (Yt) of brinjal were 80 percent, 60 percent and 72 percent in Pune, Kolhapur and Nashik markets, respectively, as indicated by the value of R² which is statistically significant at 1 percent and 5 percent level. The lag price of brinjal is found to be a major contributor in deciding current year prices. However, the current year arrival shows non-significant results.

4. Conclusion

- The prices of brinjal were higher from the month of June to December in selected markets i.e. Pune, Kolhapur and Nashik.
- The cyclical variations were observed in the prices of brinjal in the selected markets. The higher variations were recorded during the year 2011 and 2014 in Kolhapur and Nashik APMC's.
- The peak period of arrivals of brinjal in the selected markets is July to December, whereas, January to May is the lean period of arrivals of brinjal in the selected markets.

- iv. The cyclical variations were observed in the arrivals of brinjal in the selected markets.
- v. The lag price of brinjal is found to be a major contributor in deciding current year prices.

5. Policy Implication and Suggestions:

- i. The wide variations in arrivals and prices affects the returns to the brinjal growers. In order to encourage brinjal growers to continue the production of brinjal, there is a need to set up efficient market information network by the state government, so that farmers can get timely and adequate market information which may help them to get better prices for vegetables.
- ii. The farmers may plan to sell their produce in all the selected markets during the months of June, July, August, September, October, November and December as the prices were high.

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Enabling Informed Resource Allocation Decision by Vegetable Growers of Varanasi, Uttar Pradesh: Price Forecasting using ARIMA

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Abstract

The ARIMA model for forecasting prices of major vegetables of Varanasi market of Uttar Pradesh were developed. ARIMA(0,1,0)(1,1,0)[52], ARIMA(3,1,1)(0,1,0)[52], ARIMA(2,1,4)(1,0,0)[52], ARIMA (0,1,1)(1,1,0)[52] were best fit models for tomato, potato, onion, brinjal, respectively. The parameters of the ARIMA models emerged to be significant. The accuracy test of models was done by comparing the forecasted price of major vegetables with those of actual weekly prices for the period 5th Jan to 26th April, 2020. The accuracy test of MAPE ranged from 0.74% for brinjal to 29.09% for onion. The Theil's U statistics ranged from 0.004 for binjal to 0.32 for onion. The high accuracy of the model was inferred from the value of Theil's U statistic lying nearer to zero. The price of tomatoes is estimated to increase in the future, while other vegetables are expected to be stable. Thus, the comparative advantage of the vegetables is revealed which would be taken into account by the farmers for allocating land and other resources for production of vegetables. The findings are also useful to policy makers and extension agencies for making suitable changes in the programmes for promotion of vegetables in the Varanasi district of Uttar Pradesh.

Keywords: Price forecasting, ARIMA, RMSE, Theil's U statistics, Vegetables

1. Introduction

The horticulture production in the country reached 313.85 million tonnes of production outpacing the foodgrain production of 291.95 million tonnes during 2019-20. Diversification and value addition is viewed as a strategy for doubling farmers' income. The hope lies in the horticulture sector for enhancing diversification and processing of primary produce. The key challenges the horticulture sector faces is post harvest losses, availability of quality planting material and lack of market access to small holders. Majority of the horticultural producers are small and marginal farmers. This, along with high perishability of the produce, present challenges to marketing of horticultural produce. The weakness in the horticultural supply generally results into cyclical

glut/shortages and price spikes/ troughs (GoI, 17a). Uttar Pradesh is the leading state in horticulture production in the country. The area under vegetables is 14 lakh hectares and production is 264 lakh tonnes. It accounts for 13.6 percent of total vegetable area and 15.1 percent of total production of the country in the year 2016-17 (GoI, 2017b).

In 2018-19, the fruit-vegetable export from Uttar Pradesh amounted to ₹ 277.98 crore out of which Varanasi and surrounding areas accounted for 40% of the total exports (Anonymous, 2019a). Fresh Vegetables and Fruits Exporters Association (VAFA), Mumbai, have signed an MoU with four Farmer Producer Organizations (FPOs) for sourcing of fresh vegetables and fruits for export to international markets. FPOs have been engaged to ensure supply

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of quality produce from the region. The first trial shipment of vegetables from these FPOs was sent to Dubai through sea route (Anonymous, 2019b; PTI, 2019). Varanasi is exporting 4 tons of green vegetables like green chilli, cucumber, gourd to London and Saudi Arabia. Looking into the potential of production of fruits and vegetables in the Varanasi Division comprising Ghazipur, Chandauli, Jaunpur, Sant Kabi Nagar and Mirzapur, APEDA is setting up Agri-Export hubs in the region (Dikshit, 2020). In order to provide different marketing platforms to the farmers and to prevent them from exploitation by middleman and traders, UP Government has ended the condition to bring produce to state mandis. It has also abolished mandi tax. This would help them save 2% of mandi tax and estimated 15% handling losses due to loading and unloading of produce. Now the owners of cold storage and warehouses can sell the stored produce from their premises. It has also decided to open farmer-consumer markets near farms and villages to decongest mandis (Mishra, 2020). Companies like Ninjacart, Crofarm, KrishHub are procuring directly from farmers and selling to retailers thus eliminating middlemen and a commission charges. The farmers are updated about the quantum of demand, current prices offered and other details either via apps or by SMS. They offer the farmers 15%-20% higher than mandi price. Farmers are also taking the advice of these startups as to what crop to grow to get the best price (Aravind, 2019). The Uttar Pradesh state government is planning to adopt contract farming as one of the most important tools of its multi pronged strategy to enhance farmers' income in Uttar Pradesh. Under contract farming, farmers grow crops as part of an agreement with private companies that purchase their produce on the basis of mutually agreed terms and conditions. This arrangement is said to promise an assured market and good price to farmers and relatively low-price goods to consumers (Parashar, 2017).

The study intends to provide the future price information of major vegetable crops namely, potato (*Solanum tuberosum*), tomato (*Lycopersicum esculentum*), onion (*Allium cepa*) and brinjal (*Solanum melongena*) of Varanasi market of Uttar Pradesh. The knowledge will help the farmers in allocation of area across different commodities and to make marketing and storage decisions to maximise returns and income. The price information will also help the traders and wholesalers to adjust their marketing strategy, thus the study is going to help

the entire vegetable supply chain leading to greater efficiency in the marketing system. The ARIMA model has been used by many studies, however, most of them were focused on cereals, pulses and oilseeds (Jadhav *et al.*, 2017; Darekar & Reddy, 2018a; Darekar & Reddy 2018b; Kumbhar *et al.*, 2018). Very few studies have been done to understand the future prices of vegetables (Jalikatti & Patil, 2015; AlmemaychuAmara, 2002; Arivarasi & Ganesan, 2015; Hossain & Abdulla, 2016; Chaudhary *et al.*, 2019 and Darekar *et al.*, 2016). Most of the studies have evaluated a single commodity while the knowledge of future prices of multiple commodities is more meaningful as it enables farmers to have choice.

1.1. Objectives of the study

The study was taken up with following specific objectives:

- (i) To develop the ARIMA model for major vegetables for the Varanasi market.
- (ii) To forecast the prices of major vegetables.

2. Methodology

The forecasted price would enable the farmers of eastern Uttar Pradesh especially of Varanasi district to take a decision with respect to production and marketing of various agricultural commodities, as to when to produce and harvest. Data of price and arrival of brinjal has been compiled from AGMARKNET for Varanasi market, Uttar Pradesh.

The secondary time series prices data of onion, potato, tomato and brinjal from Varanasi agricultural markets of Uttar Pradesh, India has been compiled for the periods 2010 to 2020 for brinjal, 2016 to 2020 for onion, potato and tomato. The time series data has been collected from the website *AGMARKNET.nic.in* of the Department of Agricultural Marketing and Inspection, Ministry of Agriculture, Government of India.

The autoregressive model of order p is denoted by AR (p) and is given by equation 1.

$$X_t = c + \sum_{i=1}^p \phi_i X_{t-i} + \varepsilon_t \quad \dots \dots (1)$$

Where, $\phi_1, \phi_2, \dots, \phi_p$ are the parameters of the model, c is a constant and ε_t is white noise. The

moving average model of order q (MA (q)) is illustrated by equation 2.

$$X_t = \varepsilon_t - \theta_1\varepsilon_{t-1} - \theta_2\varepsilon_{t-2} - \dots - \theta_q\varepsilon_{t-q} \quad \dots\dots (2)$$

Where, $\theta_1, \theta_2, \dots, \theta_p$ are the coefficients of the model and ε_t is the white noise. The ARIMA (p,d,q) model in terms of the backward shift operator B can be shown by equation 3.

$$(1 - \phi_1B - \dots - \phi_pB^p) W_t = (1 - \theta_1B - \dots - \theta_qB^q) A_t \quad \dots\dots (3)$$

where, $W_t = (1-B)^dZ_t$, is the first difference of the price series of vegetables. Z_t and A_t is the random shock which follows a white noise process with mean zero (O'Donovan, 1983 & Pankartx, 1984).

The seasonal autoregressive integrated moving average SARIMA (P,Q,D) model in terms of backward shift operator B can be expressed as equation 4 and equation 5.

$$(1 - \phi_sB^s - \dots - \phi_{sP}B^{sP}) W_t = (1 - \theta_sB^s - \dots - \theta_{sQ}B^{sQ}) A_t \quad \dots\dots (4)$$

Where, $W_t = (1-B_s)^dZ_t$, s=52 for weekly data; 12 for monthly data and 4 for quarterly data. The random shock A_t does not follow white noise process.

$$(1 - \phi_1B - \dots - \phi_pB^p) (1 - \phi_sB^s - \dots - \phi_{sP}B^{sP}) \\ W_t = (1 - \theta_1B - \dots - \theta_qB^q) (1 - \theta_sB^s - \dots - \theta_{sQ}B^{sQ}) A_t \quad \dots\dots (5)$$

A constant term θ_0 is added to the model to accommodate the possibility that the variables W_t may have a non-zero mean. Thus the model can be shown as equation 6.

$$(1 - \phi_1B - \dots - \phi_pB^p) (1 - \phi_sB^s - \dots - \phi_{sP}B^{sP}) \\ W_t = \theta_0 + (1 - \theta_1B - \dots - \theta_qB^q) (1 - \theta_sB^s - \dots - \theta_{sQ}B^{sQ}) A_t \quad \dots\dots (6)$$

Since we considered the weekly price data the model can be written in the form of equation 7.

$$(1 - \phi_1B - \dots - \phi_pB^p) (1 - \phi_{52}B^{52} - \dots - \phi_{52P}B^{52P}) \\ W_t = \theta_0 + (1 - \theta_1B - \dots - \theta_qB^q) (1 - \theta_{52}B^{52} - \dots - \theta_{52Q}B^{52Q}) A_t \quad \dots\dots (7)$$

Where,

Autoregressive operator of order

$$p = 1 - \phi_1B - \dots - \phi_pB^p$$

Seasonal autoregressive operator of order

$$P = 1 - \phi_sB^s - \dots - \phi_{sP}B^{sP}$$

Moving average operator of order

$$q = 1 - \theta_1B - \dots - \theta_qB^q$$

Seasonal moving average operator of order

$$Q = 1 - \theta_sB^s - \dots - \theta_{sQ}B^{sQ}$$

2.1. Diagnostic measures for evaluation of forecast performance

Akaike's information criteria (AIC) is useful for determining the order of an ARIMA model. It can be written as equation 8.

$$AIC = -2\log(L) + 2(p+q+k+1) \quad \dots\dots (8)$$

Where L is the likelihood of the data, k=1 if c≠0 and k=0 if c=0. The last term in parentheses is the number of parameters in the model (including σ^2 , the variance of the residuals).

The corrected Akaike's information criteria (AICc) is given by equation 9.

$$AICc = AIC + \frac{2(p+q+k+1)(p+q+k+2)}{T-p-q-k-2} \quad \dots\dots (9)$$

The Bayesian information criterion (BIC) is illustrated by equation 10.

$$BIC = AIC + [\log(T)-2](p+q+k+1) \quad \dots\dots (10)$$

A good model is attained by minimizing the AIC, AICc or BIC. It is to be noted that these information criteria are not a good guide to select the appropriate order of differencing (d) of a model, but only for selecting the values of p and q.

The accuracy of the forecasted model is assessed with use of mean absolute percentage error, mean squared error, root mean square error and Theil's inequality coefficient.

The mean absolute percentage error (MAPE) is given

by equation 11.

$$M = \frac{1}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right| \quad \dots\dots (11)$$

Where, A_t is the actual value of price (₹ per quintal) and F_t is the forecast value (₹ per quintal).

The mean squared error or mean squared deviation is the average of squares of the errors, i.e., the average squared difference between the estimated value and the actual value and is shown by equation 12.

$$MSE = \frac{1}{N} \sum_{t=1}^N (A_t - F_t)^2 \quad \dots\dots (12)$$

Where, A_t and F_t are the actual and predicted prices of vegetables in Varanasi market of Uttar Pradesh and N is total number of observations.

2.2. The root mean square error (RMSE) is depicted by equation 13.

$$RMSE = \left\{ \frac{1}{n} \left[\sum_{t=1}^n (A_t - F_t)^2 \right] \right\}^{1/2} \quad \dots\dots (13)$$

TABLE 1: COEFFICIENTS OF ARIMA MODEL FOR MAJOR VEGETABLES OF VARANASI MARKET, UTTAR PRADESH

	Coefficient	Standard error	z-value	Pr(> z)
Tomato				
Model=ARIMA(0,1,0)(1,1,0)[52]				
SAR(1)	-0.4395	0.0905	-4.8584	1.184e-06 ***
$\sigma^2=90372$; Loglikelihood=-896.37				
AIC=1796.74; AICc=1796.83; BIC=1802.42				
Potato				
Model=ARIMA(3,1,1)(0,1,0)[52]				
AR(1)	1.2281	0.209	5.871	4.322e-09 ***
AR(2)	-0.2665	0.1549	-1.7204	0.08536
AR(3)	-0.01416	0.1037	-0.1366	0.8914
MA(1)	-0.8408	0.1896	-4.4338	9.259e-06 ***
$\sigma^2=4844$; log likelihood=-706.93				
AIC=1423.86 AICc=1424.36 BIC=1438.08				
Onion				
Model=ARIMA(2,1,4)(1,0,0)[52]				
AR(1)	-0.6396	0.0415	-15.3996	< 2.2e-16 ***

Theil's inequality coefficient (TIC) or Theil's U statistic (Theil, 1966) is scale independent and is expressed by equation 14.

$$U = \frac{\sqrt{\left(\frac{1}{n}\right) \sum_{t=1}^n (F_t - A_t)^2}}{\left[\sqrt{\left(\frac{1}{n}\right) \sum_{t=1}^n F_t^2} + \sqrt{\left(\frac{1}{n}\right) \sum_{t=1}^n A_t^2} \right]} \quad \dots\dots (14)$$

The value of U ranges from 0 to 1 and value close to 0 indicates efficient model.

3. Results and Discussion

The suitable forecasting model for different crops were found to be ARIMA(0,1,0)(1,1,0)[52] for tomato, ARIMA(3,1,1)(0,1,0)[52] for potato, ARIMA(2,1,4)(1,0,0)[52] for onion and for brinjal ARIMA (0,1,1)(1,1,0)[52] (Table 1). Since agricultural commodities are seasonal in nature, the ARIMA model has seasonal components associated with it and is able to influence the forecasted prices. The forecasting models were chosen based on the lowest AICc values recorded from among various feasible models.

**TABLE 1: COEFFICIENTS OF ARIMA MODEL FOR MAJOR VEGETABLES OF VARANASI MARKET, UTTAR PRADESH
- Contd.**

	Coefficient	Standard error	z-value	Pr(> z)
AR(2)	-0.9024	0.0324	-27.8150	< 2.2e-16 ***
MA(1)	0.6875	0.0651	10.5576	< 2.2e-16 ***
MA(2)	0.7889	0.0635	12.4158	< 2.2e-16 ***
MA(3)	-0.1644	0.0599	-2.7428	0.006091 **
MA(4)	-0.1914	0.0622	-3.0786	0.002080 **
SAR(1)	0.0193	0.0743	0.2600	0.794897
Brinjal				
Model=ARIMA (0,1,1)(1,1,0)[52]				
MA(1)	0.2590	0.11045	2.3451	0.0190235 *
SAR(1)	-0.4299	0.1136	-3.7846	0.0001539 ***
$\sigma^2=22359$; log likelihood=-666.26				
AIC=1338.52 AICc=1338.76 BIC=1346.42				

Note: Significance codes: *** is 1 percent level of significance, ** indicates 5 percent level of significance; * indicates 10 percent level of significance; ARIMA= Autoregressive Integrated Moving Average; SAR=Seasonal Autoregressive; AR= Autoregressive; MA= Moving Average; AIC=Akaike's information criteria (AIC); AICc=Corrected Akaike's information criteria (AICc); and BIC=Bayesian information criteria (BIC)

Source: Authors' own computation

The accuracy test was done with 17 weekly data points of actual prices of major vegetables to assess the accuracy of the forecasts by various models for different vegetable crops. The tests performed to measure the accuracy are mean square error, mean absolute percent error, root mean square error and Theil's U statistics. The mean absolute percent error

ranges from 0.74% for brinjal to 29% for onion (Table 2). It is observed that the Theil's U statistics is very close to zero and therefore the forecast of major vegetable prices of Varanasi market is very close to actual value. This speaks to the validity of the model that it can be used for forecasting prices very accurately and precisely.

TABLE 2: ACCURACY TEST OF FORECAST PRICE OF MAJOR VEGETABLES IN VARANASI MARKET

Week ending	Tomato		Potato		Onion		Brinjal	
	Actual value	Point estimate						
5 th Jan, 2020	1084	1316	1304	1165	6275	1699	1310	1295
12 th Jan, 2020	1151	1332	1255	1161	4625	1634	1279	1267
19 th Jan, 2020	984	1259	1258	1128	3622	2092	1233	1226
26 th Jan, 2020	1000	1243	1255	1158	3388	1956	1257	1250
2 nd Feb, 2020	858	1162	1231	1194	3260	1631	1266	1259
9 th Feb, 2020	861	1024	1153	1252	2763	1960	1309	1307
16 th Feb, 2020	898	948	1103	1260	2306	2043	1332	1330
23 rd Feb, 2020	864	883	1048	1242	2055	1693	1340	1344

TABLE 2: ACCURACY TEST OF FORECAST PRICE OF MAJOR VEGETABLES IN VARANASI MARKET - Contd.

Week ending	Tomato		Potato		Onion		Brinjal	
	Actual value	Point estimate						
1 st Mar, 2020	976	943	987	1288	1970	1844	1360	1361
8 th Mar, 2020	925	1016	1030	1329	1972	2064	1365	1360
15 th Mar, 2020	834	1041	1227	1349	1910	1787	1397	1389
22 nd Mar, 2020	843	1210	1360	1375	1837	1765	1373	1360
29 th Mar, 2020	950	1402	NA	1423	NA	2030	1364	1349
5 th Apr, 2020	NA	1589	1503	1458	1855	1880	1428	1406
12 th Apr, 2020	1540	1575	1544	1453	1668	1736	1458	1440
19 th Apr, 2020	1433	1398	1616	1505	1364.3	1965	1476	1460
26 th Apr, 2020	1155	1300	1559	1567	1185.7	1951	1565	1545
MAPE	18.62%		10.46%		29.09%		0.74%	
MSE	47362		21481		2423279		133.1	
RMSE	217.63		146.99		1556.7		11.54	
Theil's U statistic	0.097		0.056		0.32		0.004	

Note: MAPE= mean absolute percentage error; MSE= Mean squared error or mean squared deviation; RMSE=Root Mean Square Error (RMSE); NA= Not Applicable

Source: Authors' own computation

The prices of vegetables were predicted for 23 weeks beyond the study period starting from May, 2020 till the first week of September (Table 3). The projection is also done with 90% accuracy on higher than point estimate and lower than point estimates. The point estimates are the average price likely to remain in a particular week. The price is likely to hover around this mean price which is given as point estimates. The risk adverse farmers could take the price with 90% lower confidence level for making decisions. The risk takers could consider the

90% higher confidence level price for taking farm decisions. The prices of all the major vegetables are expected to be rising especially after June. The rising trend in prices of onion and brinjal is expected to continue till September. The crops like potato and onion can be stored and brought to market when there is favourable price. Thus the knowledge of forecast price would help in deferring the sale of produce. Such farmers must consider the storage cost, transport cost, and loss in storage to take a decision to defer sale of produce.

TABLE 3: FORECAST PRICES OF MAJOR MARKETS OF VARANASI AT DIFFERENT POINTS OF TIME OF THE YEAR 2020

	Tomato			Potato			Onion			Brinjal		
	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90	Hi = 90
3 rd May	1513	-585	3611	1617	574	2660	1759	-342	3860	1619	319	2919
10 th May	1644	-511	3799	1631	545	2717	1899	-260	4058	1604	267	2940

TABLE 3: FORECAST PRICES OF MAJOR MARKETS OF VARANASI AT DIFFERENT POINTS OF TIME OF THE YEAR 2020 - *Contd.*

	Tomato			Potato			Onion			Brinjal		
	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90*	Hi = 90	Point estimate	Lo = 90	Hi = 90
17 th May	1619	-593	3830	1702	573	2830	1989	-223	4201	1675	303	3047
24 th May	1638	-628	3904	1704	534	2874	1810	-450	4071	1756	349	3162
31 st May	1837	-482	4157	1733	522	2944	1848	-465	4161	1790	350	3230
7 th Jun	2066	-305	4438	1759	508	3011	1985	-379	4349	1793	320	3266
14 th Jun	2005	-417	4428	1773	481	3064	1864	-546	4274	1801	295	3306
21 st Jun	2127	-345	4599	1812	481	3142	1824	-633	4282	1759	222	3296
28 th Jun	2427	-94	4948	1842	473	3211	1976	-530	4483	1922	355	3490
5 th Jun	2498	-72	5067	1882	475	3289	1923	-628	4474	2043	445	3641
12 th Jun	2564	-53	5180	1898	454	3341	1830	-764	4425	2054	426	3682
19 th Jun	2733	70	5396	1908	427	3388	1949	-691	4590	2072	415	3728
26 th Jun	2848	140	5556	1932	416	3449	1988	-696	4672	1998	312	3683
2 nd Jul	3043	290	5796	1965	413	3518	1886	-840	4611	1995	281	3709
9 th Jul	3145	348	5942	1967	380	3555	1928	-840	4697	1982	241	3724
16 th Jul	3115	275	5956	1990	368	3612	1984	-826	4795	1973	204	3742
23 rd Jul	2751	-133	5634	1987	332	3643	1894	-956	4744	1972	176	3768
30 th Jul	2418	-507	5344	1999	309	3688	1888	-1003	4779	1974	152	3796
6 th Aug	2233	-734	5200	1988	266	3711	1987	-944	4918	2027	178	3875
13 th Aug	2001	-1007	5009	2000	245	3755	1943	-1027	4912	2091	217	3965
20 th Aug	1915	-1133	4963	1908	120	3695	1903	-1105	4912	2106	206	4006
27 th Aug	1872	-1216	4960	1787	-32	3606	1980	-1068	5027	2197	272	4122
4 th Sep	1994	-1134	5121	1808	-42	3658	1955	-1130	5040	2436	487	4385

Note: Lo=90 means the price is expected to be with 90 per cent accuracy on the lower side of point estimate. Hi=90 means the price is expected to be with 90 per cent accuracy on the higher side of point estimate. * The price per quintal with -ve sign means it is restricted to zero in true sense.

Source: Authors' own computation

4. Conclusion and Suggestions

The ARIMA model for forecasting prices of major vegetables was developed. ARIMA(0,1,0)(1,1,0)[52], ARIMA(3,1,1)(0,1,0)[52], ARIMA(2,1,4)(1,0,0)[52] and ARIMA (0,1,1)(1,1,0)[52] were best fit models for tomato, potato, onion, brinjal, respectively. The parameters of the ARIMA models emerged to be significant. The accuracy test of models was done by comparing the forecasted price of major vegetables

with those of actual weekly prices for the period 5th January to 26th April, 2020. The accuracy test of MAPE ranged from 0.74% for brinjal to 29.09% for onion. The Theil's U statistics ranged from 0.004 for binjal to 0.32 for onion. The high accuracy of the model was inferred from the value of Theil's U statistic lying nearer to zero. The ARIMA models were used for forecasting prices of major vegetables for the period 3rd May to 4th September, 2020. The price of tomatoes is likely to increase in future. The

price of all other vegetables is expected to be stable.

- i. The forecast prices with 90 percent accuracy on the higher side of the point estimate reveals that tomato, onion would rule higher price in future and would be followed by brinjal and potato. Thus, the risk averse farmers can take decisions accordingly as to how much area to allocate across different commodities based on the predicted prices.
- ii. The findings would be useful for extension service and to policymakers for their policies and programmes.

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Agro-Economic Research

The Extent of Erosion into Farm Profitability due to Market Imperfections in Punjab*

PARMINDER KAUR AND PARMINDER SINGH

1. Introduction

Punjab is the most frequently quoted success story in the annals of the history of agricultural development in India. The states' contribution in making the country self reliant in food is well documented and appreciated. Advent of new farm technology which includes use of modern inputs such as high yielding and short duration varieties of crops, chemical fertilizers, insecticides, pesticides and increased use of irrigation water and farm mechanization resulted in considerable increase in agricultural production and income of the farmers. After a tremendous performance since the mid-1960, the agriculture sector in Punjab is facing many challenges. Slow down in agricultural growth rate, escalation in costs of production, falling profitability in farming, reduction in employment elasticity of the agriculture sector, increasing incidence of landlessness and indebtedness among the farmers and farmers' suicides are the major issues currently afflicting the Punjab agriculture. Fall in the ground water table, increasing soil fertility imbalance, appearance of new pests and weeds are posing major threats to the long-term sustainability of agriculture. The state is now faced with a serious crisis in the agricultural economy and there is severe distress in the rural areas. The returns from farming are on the decline as pricing and procurement are unfavourable. Even crops like maize, which have been even recommended for diversification in the state, are not being purchased at the minimum support price (MSP) announced. Thus, to improve the economic condition of farmers, improvement in conditions related to cultivation, livestock and wage employment is needed. An in-depth analysis of the product and factor markets is necessary. However, profitability of any crop is not determined by its productivity alone. Factors like cost of cultivation of the crop, market price of the produce, marketing facility from government agencies, etc., play an important role in deciding the profit. The present study attempts to study the functioning of some of these important outputs and input markets and their effect on erosion of farm profitability.

1.1. Objectives of the study

- i. Analyze the product markets (output) including price(s) received (market as well as MSP if any), marketing channels, market structure and bottlenecks.
- ii. Analyze the input markets including seeds, fertilizer, labour, etc., with particular attention to costs (of the inputs), market structure and problems in accessing the same.
- iii. Analyze the government support structure including access to credit.
- iv. Analyze the coping strategies of farmers during economic hardships and their social networks.

2. Methodology

To work out the extent of erosion into farm profitability due to market imperfections in Punjab, the farm level primary data were collected from a sample of 300 farmers representing different farm size categories and agro-climatic regions of state.

The Punjab state comprises three broad agro-climatic regions and to meet the specific objectives of the study, at first stage of sampling three districts of Punjab *viz.* Moga, Bathinda and Hoshiarpur, representing each region of the state were selected randomly. Moga district represents the central plain zone, while Bathinda and Hoshiarpur districts represent south-western plain zone and the sub-mountain undulating zone of the state, respectively. The districts were chosen with sufficient variation in the cropping pattern across the districts. At the second stage, from each district, two villages were selected with sufficient geographic spread. The selected villages were not contiguous in location. A complete household listing was carried out in the selected villages. If a village was very large (>500 households), listing of at least 300 households, from all the locations in the village, was carried out. If a village was having less than 300 households,

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the cluster of villages were selected randomly for the farm household survey. Finally from each of the selected village /or cluster, 50 representative farm households, in proportion to their respective proportionate share in different categories in the village *viz.*, marginal (up to 2.5 acre), small (>2.5–5.0 acre), medium (>5.1–10.0 acre), large (>10.0–25.0 acre) and very large(>25 acre) were selected randomly. Thus, overall from state, a total sample of 300 farmer households comprising 103 marginal, 102 small, 52 medium, 35 large and 8 very large farmers formed the basis for the present enquiry.

To address the aforementioned objectives of the study, detailed information on production of crops and animal products and use of inputs in physical as well as monetary terms along with other socio-economic aspects of farm households was collected. Data related to sale of the output, main marketing channels, all the inputs used and their procurement channels, labour and credit use patterns were also collected. Besides, information on MSP, assistance under government schemes, insurance, problems in farming, economic risks faced and coping strategies thereof was also collected from respondent farmers through the interview method using the specially designed schedules for the purpose.

The information pertained to the crop year 2018-19 (Reference year).

Tabular analysis and simple statistical tools such as averages and percentages were used for the interpretation of the results.

3. Results and Discussion

The results of the study are presented under the following sub heads.

3.1. Overview of the sample villages

The results brought out that from the total sample of 300 households, the number of marginal, small, medium, large and very large farmers were 103 (34.33%), 102 (34%) , 52 (17.33%), 35 (11.67%) and 8 (2.67%), respectively. Overall, 89 percent of the total farmers belonged to the general category followed by OBC (9%) and SC category (2%). None of the respondent farmers belonged to scheduled tribes. Cultivation was found to be the principal occupation of 94 percent of the farmers. On an average, the size of landholding was 2.57 hectares which varied

between 0.77 hectares to 14.07 hectares across land holding categories.

The leasing-out of land was found prevalent only among the marginal farmers. All the farmers had irrigated land. All the sampled farmers had possession of livestock, with the small farmers having more number of livestock while the least number of livestock was found on very large farms. All the households possessed only milk animals. The major source of farmers' income was from cultivation followed by income from animal husbandry.

Overall, 94.95 percent of the income was earned from cultivation while from animal husbandry, the net income earned was just 5.05 percent. On an average, farmers received ₹ 3.04 lakh as an annual net income from cultivation while from animal husbandry, annual net income received was ₹ 16188. The net annual income from cultivation varied between ₹ 82919 to ₹ 15.27 lakh among different categories of landholdings and from animal husbandry, the annual net income was found varying between ₹ 7856 and ₹ 26520 among different farm categories.

3.2. Crop and Input Markets

The cropping pattern depicted that paddy and wheat crops were the major kharif and rabi crops grown by the sample farmers as these were found to be 39.51 percent and 42.68 percent of the gross cropped area, respectively. Besides paddy and wheat, other crops grown by the sample farmers were maize, cotton, sugarcane, kharif fodder, potato, mung bean, spring maize and rabi fodder. It was observed that marginal, small and medium category farmers cultivated more area under wheat and paddy crops followed by maize and cotton crops. Large and very large farmers besides growing wheat and paddy preferred to cultivate potato and mung bean crops. The average yield per hectare of paddy and wheat was 7220 kgs and 4665 kgs, respectively, while the yield of sugarcane was 75618 kgs. The yield of all these crops was found to be highest on very large farms. Paddy and wheat produced was sold to government agencies at minimum support prices (MSP), while cotton, mung bean and spring maize was sold entirely in the open market. Sugarcane was sold to sugar mills and potato was disposed of to the regional traders by the sampled farmers. All the paddy and wheat farmers (100%) were satisfied with the disposal channels of their

produce. In case of other crops such as maize, cotton, sugarcane, potato, mung bean and spring maize, farmers were not satisfied with the disposal channels for selling their produce as they received lower prices than the market price. The per farm value of the crops produced on marginal, small, medium, large and very large farms were estimated at ₹ 1.27 lakh, ₹ 2.95 lakh, ₹ 6.66 lakh, ₹ 15.96 lakh and ₹ 33.15 lakh, respectively. Overall, the value of crops was to the tune of ₹ 5.34 lakh. The prices obtained were considered reasonable by 73.12, 45.71, 12.5, 16, 79.66 and 16 percent of paddy, maize, cotton, sugarcane, wheat and spring maize growing farmers. None of the potato and mung bean growing farmers stated the prices of these crops as reasonable.

The rest of the farmers considered prices for their produce as unreasonable. Overall, the major reasons revealed by the sampled farmers for unreasonable prices of paddy and wheat were high input costs (52%) and high lease rent (34%). It was further reported that it became difficult for them to cover the cost of production due to high input costs and high lease rent.

For maize, cotton, potato and mung bean and spring maize, farmers revealed the prices unreasonable due to non-procurement of the produce by government agencies and farmers were unable to get remunerative price and had to sell their produce at the much lower price, and in case of cotton they sold at the price lower than Minimum Support Price (MSP).

The farmers used various inputs *viz.* seeds, fertilizers, manures, plant protection chemicals, diesel, human labour and irrigation for crop production. It was found that the majority of farmers purchased and farm saved paddy and wheat seeds while all the farmers who were growing maize, cotton, mung bean used only purchased seeds which they procured from input dealers as well as local traders. The per farm expenses incurred on inputs for producing various crops on respective farms were ₹ 44977, ₹ 1.06 lakh, ₹ 2.56 lakhs, ₹ 7.38 lakhs and ₹ 17.87 lakhs, respectively, with overall expenses of ₹ 2.29 lakhs. The prices paid for the use of various inputs were considered unreasonable by the farmers. The major reasons for dissatisfaction were unsubsidized inputs, no price control, inputs considered costly even after subsidy.

3.3. Animal Products and Input Markets

Related to animal husbandry, all the farmers obtained returns from the sale of milk only. Majority of the households *i.e.* 137 (79.19%) sold milk to local traders (vendors) followed by government agency (16.76%). The monthly sale value of milk on marginal, small, medium, large and very large farms was ₹ 4236, ₹ 7912, ₹ 8743, ₹ 12244 and ₹ 11888, respectively. For lactation period, per farm sale value on the respective farm situations was ₹ 33888, ₹ 63296, ₹ 69944, ₹ 97952 and ₹ 95104, respectively. Overall, sale value of milk for lactation period was to the tune of ₹ 59240. It was brought out that all the sampled farmers used these channels as their first disposal for sale of their animal product. The satisfaction was revealed by only 37.57 percent of the sampled farmers with the disposal channels for selling their produce and dissatisfaction was revealed due to receiving lower price than the market price and delayed payments. No minimum support price for milk, no assured procurement by the government, few buyers of milk, collusion of buyers were the major reasons revealed for unreasonable prices from the sale of milk by the sampled farmers. It was further brought out that all the categories of farmers used farm produced green as well as dry fodder. Only very large farmers used purchased concentrates while farmers of other categories *i.e.* marginal, small used both farm produced and purchased concentrates. Farmers used concentrates purchased from input dealers. Overall, the total monthly per farm variable expenditure for the purchase of inputs related to animal husbandry was ₹ 5382. On marginal, small, medium, large and very large farms, monthly per farm variable expenditure was to the tune of ₹ 3254, ₹ 4965, ₹ 7262, ₹ 8929 and ₹ 10351, respectively. For lactation period, the total per farm variable expenses related to animal husbandry was ₹ 26032, ₹ 39720, ₹ 58096, ₹ 71432 and ₹ 82808, respectively, on the farms of respective landholding categories. Related to animal husbandry, out of the total variable expenses (for lactation period), per farm expenditure on the purchase of concentrates was found highest. It was revealed by the majority of the sampled farmers that prices paid for the purchase of concentrates were reasonable. The unreasonable prices revealed by the rest of the farmers were due to costly concentrates. The prices for concentrates were revealed unreasonable due to non availability of subsidised concentrates and no control over their prices. As the farmers used purchased concentrates, for which, quality of

concentrates was revealed good by 97 percent of the sampled farmers and only 3 percent of the farmers reported the concentrates of satisfactory quality.

3.4. Labour Market

For farming and livestock activities, more of the casual labour was employed by large farmers. The average number of labour employed per annum for farming and livestock operations was 2.69. Out of this, the number of family labour was 2.21 (1.52 male, 0.67 female and 0.02 children) while farm servants and casual labour was 0.15 (0.103 male and 0.05 female) and 0.33 respectively. None of the farm servants was found to be employed on marginal farms. On the whole, the average wage paid to the male farm servants was ₹ 310.78 per day. Female servants were hired for petty works on a monthly basis for ₹ 600 or ₹ 700 to do work for a few hours daily. So, per day wages for their work were estimated to the tune of ₹ 22.69 only. The casual labour worked for ₹ 316.49 for farming and livestock operations. The reason reported by sampled farmers (58.33%) for unreasonable wages was limited labour supply which was due to labourers' intention of doing MGNREGA work and due to shortage of labour supply, farmers had to pay high wages for farming and livestock activities. None of the sampled farmers was found to be engaged as wage labour in the study area.

3.5. Credit Market

All the sampled farmers availed credit and the cooperative societies were the most preferred source of credit of 288 farmers (57.83%) while from government banks and microfinance/ community group/NGO's, credit was borrowed by 99 (19.88%) and 111 farmers (22.29%), respectively. It was revealed that the rate of interest paid by the farmers of different categories for availing loans from cooperative societies, government banks and microfinance/ community group/ NGO's credit was 7 percent, 8.45 percent and 17.92 percent, respectively. On an average, the amount of credit borrowed was found to be more from government banks (₹ 4.06 lakh) followed by micro finance/ community group/NGO's (₹ 1.89 lakh) and cooperative societies (₹ 1.54 lakh). From the government bank and microfinance/ community groups/NGO's, majority of the borrower farmers availed credit for both current expenditure in farm business and consumption expenditure

while from cooperative societies, majority of the farmers *i.e.* 251 farmers (87.15%) borrowed loan for current expenditure in farm business. All the farmers in different landholdings categories repaid the loan borrowed from cooperative societies and government banks. But the loans borrowed from micro finance/ community group/ NGO's were fully repaid by 48(43.24 %) farmers and not fully repaid by 63 farmers (56.75 %). The reasons reported for non repayment of loans by the majority of the farmers were due to both income being always less than their expenditure and also their decision to repay the loan when they would get payment after harvesting.

3.6. Asset Endowments of the Households, Government Support Programs and Insurance

The net expenditure was calculated as the difference between the total expenditure incurred in the purchase of productive assets and receipts from the sale of those assets. On the whole, net expenditure was found positive only on medium (₹ 15.57 lakh) and on very large farms (₹ 26.45 lakh). On other farms *i.e.* on marginal, small, large farms and over all farm situation the net expenditure was ₹ 6500, ₹ 23.05 lakh, ₹ 27.42 lakh and ₹ 8.51 lakh, respectively. Per farm net expenditure on marginal, medium, large and very large farms was ₹ 63, ₹ 22598, ₹ 29942, ₹ 78343 and ₹ 3.30 lakh and overall was estimated as ₹ 2838. For technical advice for their crops, the farmers accessed various sources *i.e.* extension agents, Krishi Vigyan Kendras, agricultural universities/ colleges, private commercial agents, progressive farmers, radio/newspapers/internet, veterinary department. It was found that majority of the farmers did not require to access these sources which might be due to the reason that in Punjab paddy and wheat crops are being grown as principal crops since the green revolution and farmers themselves become so experienced in growing these crops.

Mostly, contact with these sources for technical guidance by majority of the farmers was need based. The advice which was taken by the sampled farmers was adopted by 100 percent of the farmers.

Regarding the opinions of the respondent farmers regarding the support under procurement and awareness about minimum support price (MSP), the study brought out that all the 227 paddy growers (100%) and 300 wheat growers (100%) were aware of the assured procurement and MSP at which they sold

their produce. They all were found aware of MSP but the majority of them couldn't specify the name of the agency to which they sold their produce. Other crops like maize, mung bean and potato were not procured by the government agencies. Farmers received assistance under the scheme PM-Kisan scheme. On the whole, 145 sampled farmers out of 300 farmers received assistance under the PM-Kisan scheme. PMAASHA scheme was not applicable in the Punjab state. The crops grown by all the farmers *i.e.* paddy, wheat, maize, cotton, sugarcane, potato and mung bean were not insured at all. The main reasons for not insuring the crops which were revealed by the farmers were that they were not interested while some revealed that they did not need to insure the crops. The farmers also reported the lack of resources for premium payment and dissatisfaction with terms and conditions.

3.7. Problems in Farming, Economic Risks Faced, Coping Strategies and Social Networks

The income from farming was revealed inadequate as majority of the farmers (62%) reported pest problems/crop diseases followed by destruction of crops by wild (wild boars) animals (54.55%), high input costs (30%), problem of paddy straw management (25.67%), small land size (25.67%), prices not remunerative (18.67%), fluctuating rainfall (16.33%) and high interest rates charged on loan amount (14.17%), respectively. The severity was revealed high in case of small land size, pest problems/crop diseases, high interest rate of money lender, other animal problems and high rental value of lease in land and problems of paddy straw management. Seasonal unemployment, sharp fluctuations in input prices, lack of access to inputs, lack of finance/capital, sharp fluctuations in output prices and seasonal unemployment were the economic risks faced by the farmers. To cope with the economic risks, on the whole, the majority of the farmers (42.16%) reduced their household consumption.

Other strategies undertaken by the farmers to bear risks were borrowing money from input dealers/commission agents (6.86%), borrowing money from the bank (5.88%), starting petty business/shop (4.90%), storing crops for better price (8.82%). For having the information regarding the social networks of the farmers, it was found that out of 300 respondent farmers, 97 percent were members of agricultural cooperative societies while

only 9.6 percent of the households were having membership of dairy/milk cooperative societies and only one farmer was a member of self help group. The reasons for not having membership of such societies revealed by farmers were that they did not get any opportunity while others considered it as time consuming.

4. Policy Implications

The present study attempts to study the functioning of important output and input markets and their effect on erosion of farm profitability. Punjab has achieved very high levels of productivity of crops especially paddy and wheat with intensive use of different inputs. At a high level of output, the exploitation of natural resources per unit of output is even higher. It has led to the development of macro and micro-nutrient deficiencies in the state. Therefore, in order to maintain and improve the yield, the farmers have been further increasing the use of inputs. The increase in the prices of inputs *i.e.* urea, di-ammonium phosphate, weedicides, etc., has been very high. The cost of inputs has increased faster than the output prices. Punjab agriculture has become highly capital intensive. Capital investments are required for deepening of tube wells, replacement of centrifugal to submersible pumps, thus squeezing the profitability of agriculture and causing a big drain on farmers' income. The institutional credit to the farmers has increased overtime but it has not been adequate enough to make a real dent on non-institutional lending to the farmers. The institutional credit to the farmers also comes at a cost other than the rate of interest. It is fraught with many inadequacies such as amount, easiness and timeliness, etc. The Punjab farm sector is also saddled with a large number of small and marginal farmers operating up to 2 hectares of land. They constitute about 35 percent of the operational holdings. Farmers need sustained support in the form of increased returns from their crop cultivation. Thus, mere increase of minimum support price (MSP) for crops alone would not guarantee better income to the farmers. Along with price incentives, concerted efforts are required to be taken to strengthen the non-price incentives such as the procurement system and market infrastructure for crops other than paddy and wheat which fits well in the diversification plan of the Government of Punjab. Further, educating the farmers about subsidiary occupations, providing loans at low rates of interest, creating sufficient non-

farm employment opportunities, assured purchase of agricultural produce and further subsidizing agricultural inputs can help in minimising some of the existing problems of the farmers and thus increase their incomes.

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** Complete reference can be seen in the detailed report available at the website of respective AERC

Commodity Reviews

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2020-21 up to 31.12.2020 is 32.14 million tonnes as against 25.94 million tonnes during the corresponding period of last year.

The details are given in Table 1. A comparative analysis of procurement of rice for the period of marketing season 2020-21 (up to 31.12.2020) and the corresponding period of last year is given in figure 1. The percentage share of different states in procurement of rice has been given in figure 2.

TABLE 1: PROCUREMENT OF RICE

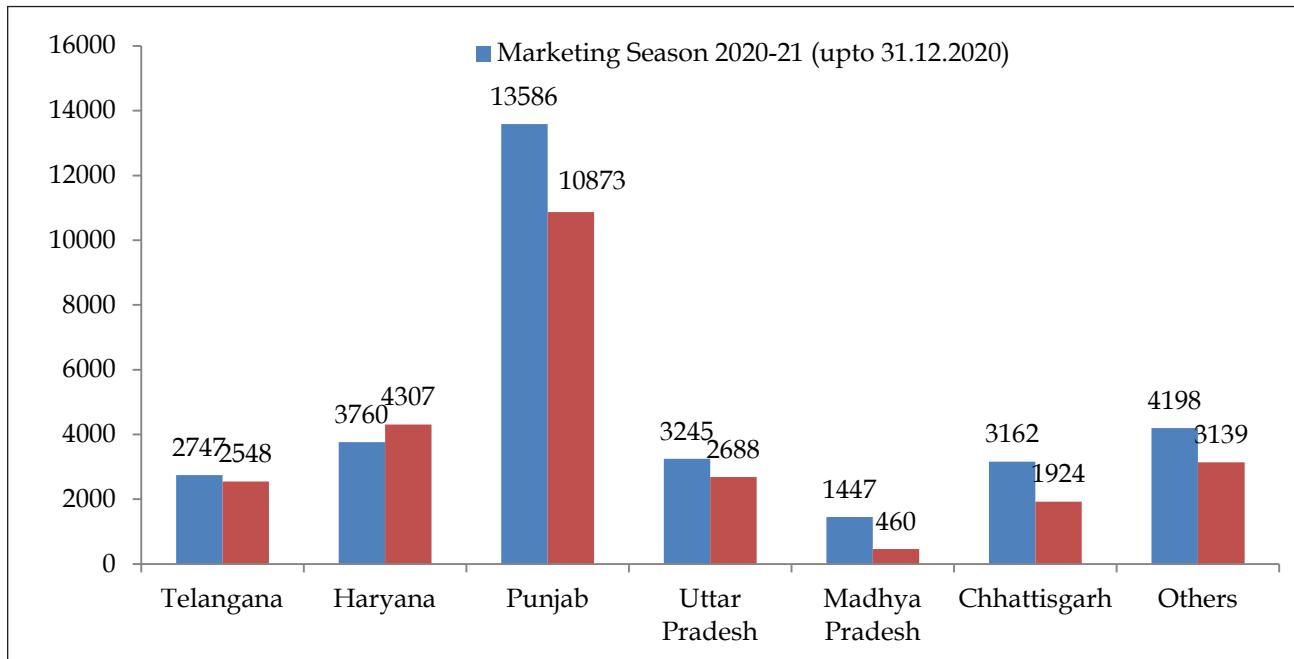
(In thousand tonnes)

State	Marketing Season 2020-21 (upto 31.12.2020)		Corresponding Period of last Year 2019-20	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5
Telangana	2747	8.5	2548	9.8
Haryana	3760	11.7	4307	16.6
Punjab	13586	42.3	10873	41.9
Uttar Pradesh	3245	10.1	2688	10.4
Madhya Pradesh	1447	4.5	460	1.8
Chhattisgarh	3162	9.8	1924	7.4
Others	4198	13.1	3139	12.1
Total	32145	100.0	25939	100.0

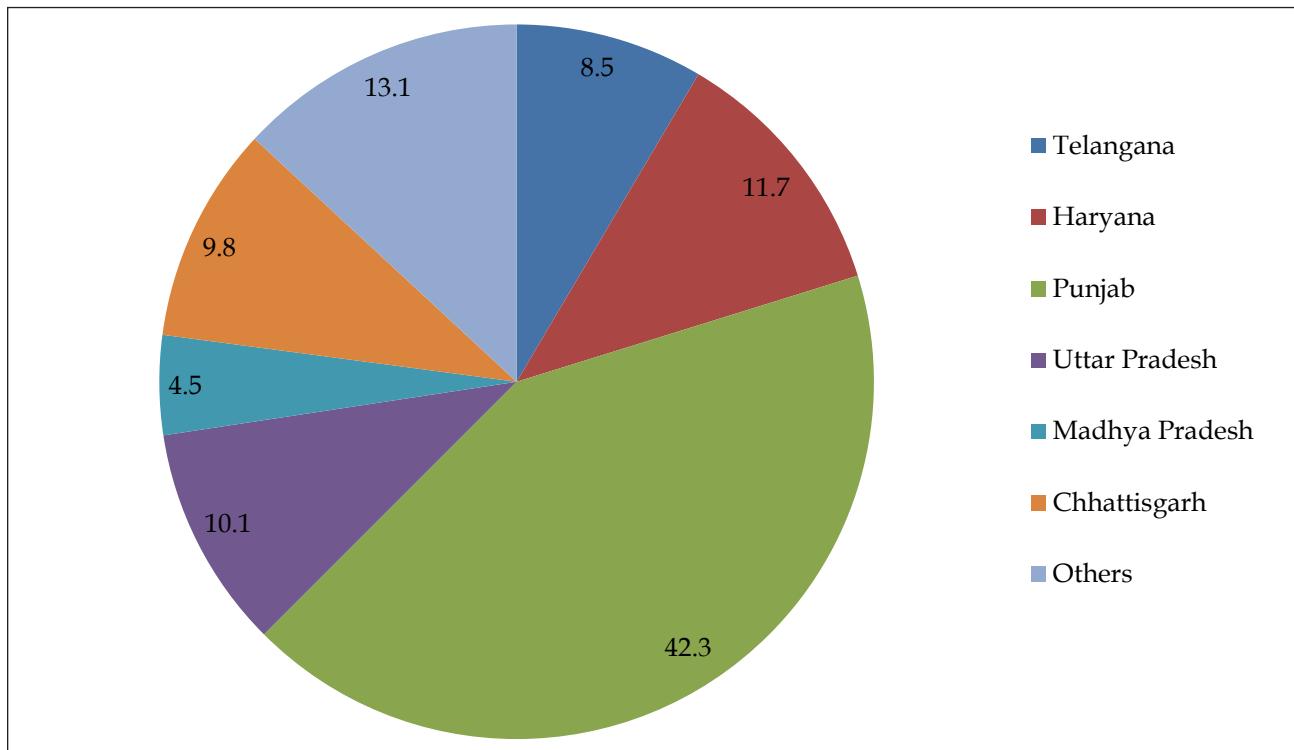
Source: Department of Food & Public Distribution.

Figure 1: State-wise Procurement of Rice

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 2: Percentage Share of Different States in Procurement of Rice during Marketing Season 2020-21 (up to 31.12.2020)

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat during rabi marketing season 2020-21 up to 29.09.2020 is 38.99 million tonnes as against 34.79 million tonnes during the corresponding period of last year. The

details are given in Table 2. The figure 3 depicts the comparison of procurement of wheat during the marketing season 2020-21 (up to 29.09.2020) with the corresponding period of last year. The percentage share of different states in procurement of wheat has been given in figure 4.

TABLE 2: PROCUREMENT OF WHEAT

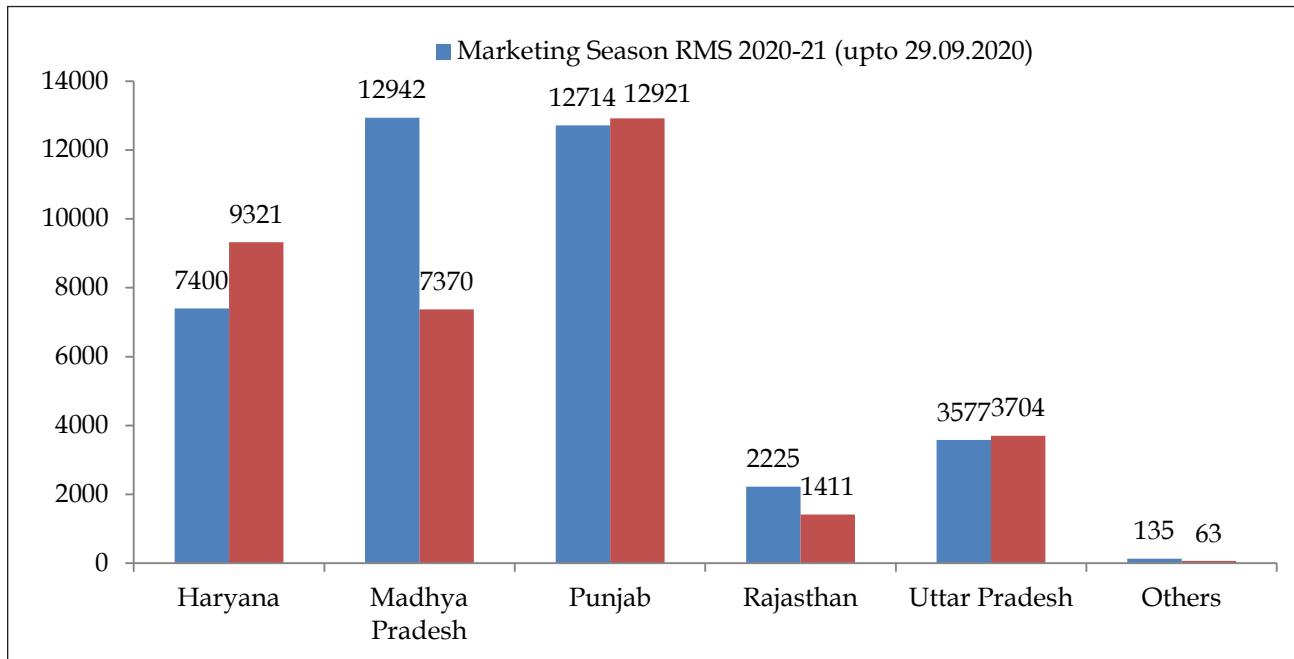
(In thousand tonnes)

State	Marketing Season RMS 2020-21 (upto 29.09.2020)		Corresponding Period of Last Year RMS 2019-20	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5
Haryana	7400	19.0	9321	26.8
Madhya Pradesh	12942	33.2	7370	21.2
Punjab	12714	32.6	12921	37.1
Rajasthan	2225	5.7	1411	4.1
Uttar Pradesh	3577	9.2	3704	10.6
Others	135	0.3	63	0.2
Total	38993	100.0	34790	100.0

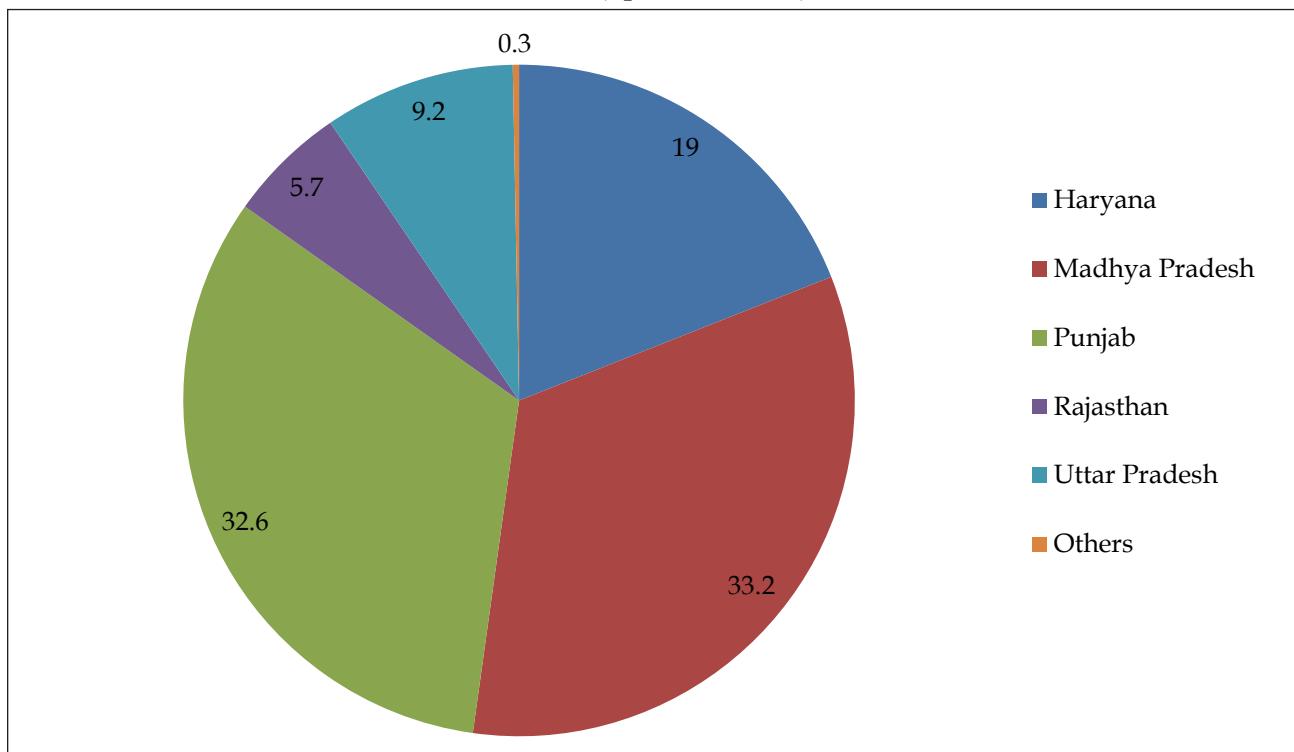
Source: Department of Food & Public Distribution.

Figure 3: State-wise Procurement of Wheat

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 4: Percentage Share of Different States in Procurement of Wheat during Marketing Season 2020-21 (up to 29.09.2020)

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 162 in November, 2020 showing an increase of 2.53 percent over the previous month and increased by 8.29 percent over the previous year.

The WPI of all individual oilseeds showed a mixed trend. The WPI of groundnut seed (0.83 percent), rape and mustard seed (3.31 percent), copra (1.82 percent), niger seed (0.65 percent), safflower (1.11 percent) and soyabean (3.50 percent) increased over the previous month. However, the WPI of gingelly seed (sesamum) (2.78 percent), and sunflower (2.78 percent) decreased over the previous month. The WPI of cotton seed has shown no improvement over the previous month and increased by 8.50 percent over the previous year.

Manufacture of Vegetable and Animal Oils and Fats

The WPI of vegetable and animal oils and fats as a group stood at 147.1 in November, 2020 which shows an increase of 4.70 percent over the previous month. Moreover, it also increased by 23.20 percent over the corresponding months of the previous year. The WPI of mustard oil (2.55 percent), soybean oil (5.68 percent), sunflower oil (2.53 percent), groundnut oil (2.98 percent) rapeseed oil (2.65 percent) copra oil (3.22 percent) and cotton seed oil (4.14 percent) increased over the previous month.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 213.2 in November, 2020 showing a decrease of 4.09 percent over previous month and an increase of 6.87 percent over the corresponding month of the previous year.

Potato

The WPI of potato stood at 443.8 in November,

2020 showing an increase of 14.26 percent over the previous month. Moreover, it also increased by 115.12 percent over the corresponding months of the previous year.

Onion

The WPI of Onion stood at 442.4 in November, 2020 showing an increase of 14.29 percent over the previous month and a decrease of 7.58 percent over the corresponding months of the previous year.

Condiments & Spices

The WPI of condiments & spices (group) stood at 156.5 in November, 2020 showing an increase of 2.29 percent over the previous month and an increase of 2.29 percent over the corresponding months of the previous year. The WPI of black pepper increased by 0.89 percent, chillies (dry) increased by 2.62 percent and turmeric increased by 0.45 percent over the previous month.

Raw Cotton

The WPI of raw cotton stood at 105.4 in November, 2020 showing an increase of 5.82 percent over the previous month and a decrease of 3.83 percent over the corresponding months of the previous year.

Raw Jute

The WPI of raw jute stood at 252.5 in November, 2020 showing an increase of 5.87 percent over the previous month and an increase of 23.71 percent over the corresponding months of the previous year.

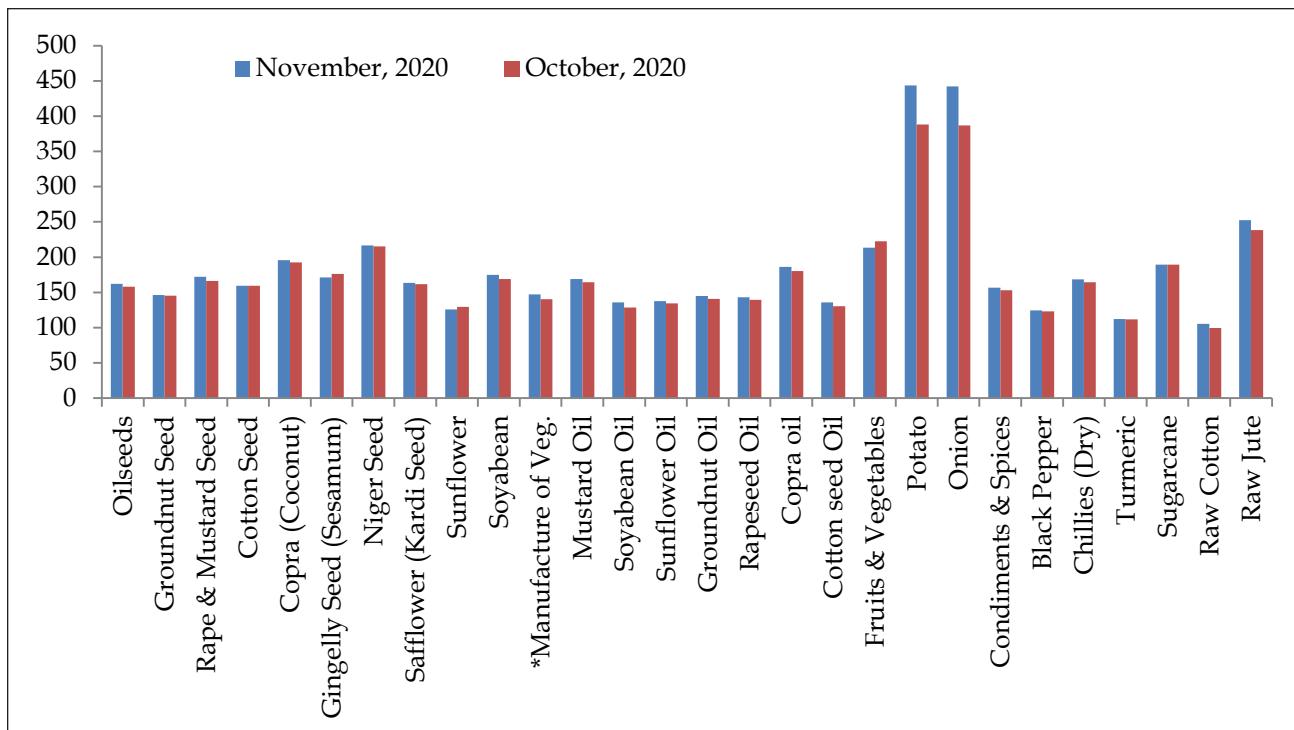
Wholesale Price Index of Commercial Crops is given in Table 3. A graphical comparison of WPI for the period of November, 2020 and October, 2020 is given in figure 5 and the comparison of WPI during the November, 2020 with the corresponding month of last year has been given in figure 6.

TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12=100)

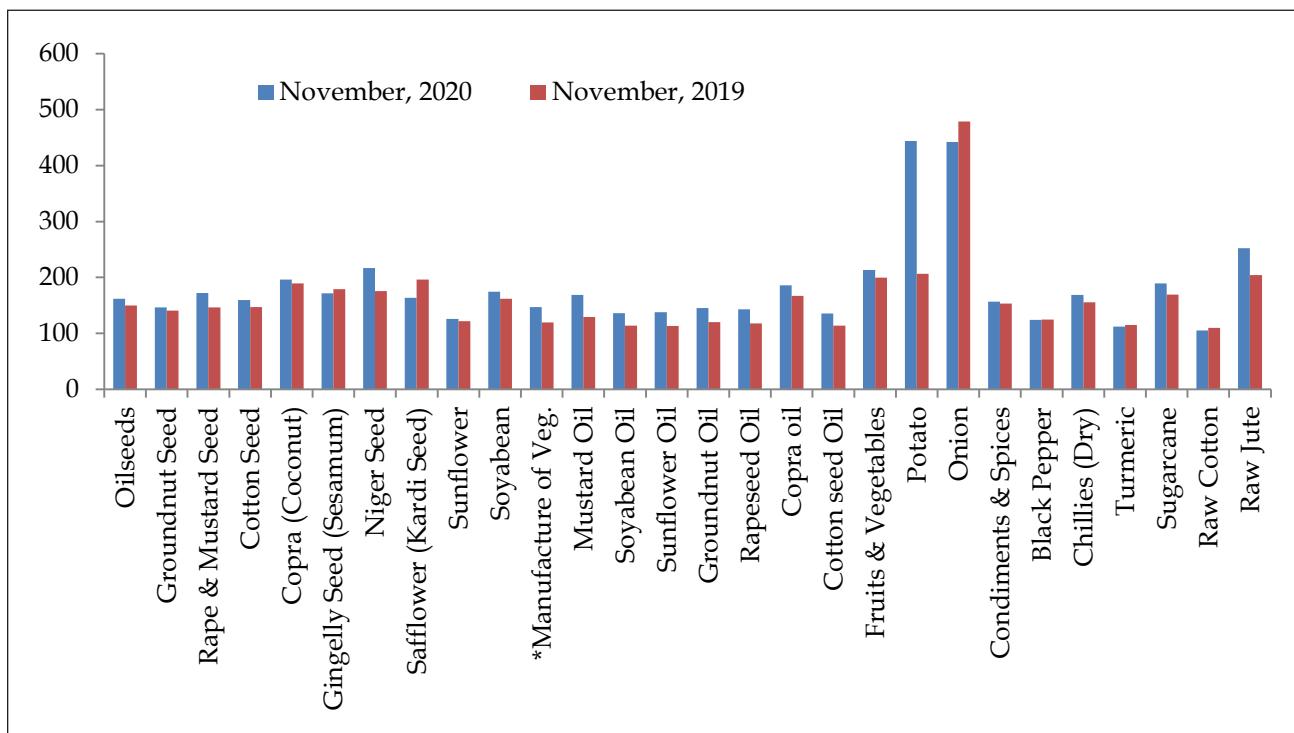
Commodity	Latest November, 2020	Month October, 2020	Year November, 2019	Percentage variation over the	
				month	year
Oilseeds	162.0	158.0	149.6	2.53	8.29
Groundnut Seed	146.3	145.1	140.6	0.83	4.05
Rape & Mustard Seed	171.9	166.4	146.5	3.31	17.34
Cotton Seed	159.5	159.5	147.0	0.00	8.50
Copra (Coconut)	195.9	192.4	189.1	1.82	3.60
Gingelly Seed (Sesamum)	171.3	176.2	178.8	-2.78	-4.19
Niger Seed	216.6	215.2	175.4	0.65	23.49
Safflower (Kardi Seed)	163.4	161.6	196.0	1.11	-16.63
Sunflower	125.7	129.3	121.5	-2.78	3.46
Soyabean	174.6	168.7	161.8	3.50	7.91
Manufacture of Vegetable and Animal Oils and Fats	147.1	140.5	119.4	4.70	23.20
Mustard Oil	168.7	164.5	129.2	2.55	30.57
Soyabean Oil	135.9	128.6	113.7	5.68	19.53
Sunflower Oil	137.6	134.2	113.2	2.53	21.55
Groundnut Oil	145.0	140.8	120.1	2.98	20.73
Rapeseed Oil	143.1	139.4	118.0	2.65	21.27
Copra oil	186.1	180.3	166.8	3.22	11.57
Cotton seed Oil	135.7	130.3	113.9	4.14	19.14
Fruits & Vegetables	213.2	222.3	199.5	-4.09	6.87
Potato	443.8	388.4	206.3	14.26	115.12
Onion	442.4	387.1	478.7	14.29	-7.58
Condiments & Spices	156.5	153.0	153.0	2.29	2.29
Black Pepper	124.3	123.2	124.8	0.89	-0.40
Chillies (Dry)	168.6	164.3	155.4	2.62	8.49
Turmeric	112.2	111.7	114.7	0.45	-2.18
Sugarcane	189.4	189.4	169.5	0.00	11.74
Raw Cotton	105.4	99.6	109.6	5.82	-3.83
Raw Jute	252.5	238.5	204.1	5.87	23.71

Figure 5: WPI of commercial crops during November, 2020 and October, 2020



*Manufacture of Vegetable, Animal Oils and Fats

Figure 6: WPI of commercial crops during November, 2020 and November, 2019



*Manufacture of Vegetable, Animal Oils and Fats

Statistical Tables

Wages

1. DAILY AGRICULTURAL WAGES IN SOME STATES (CATEGORY-WISE)

(In ₹)

State	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman	Skilled Labour		
					M	W	M	W		M	M	M
Andhra Pradesh	Krishna	Ghantasala	Oct, 20	8	500	300	800	500	400	NA	NA	NA
	Guntur	Tadikonda	Oct, 20	8	400	300	400	NA	350	NA	400	NA
Telangana	Ranga Reddy	Arutala	July, 20	8	800	267	800	NA	NA	NA	NA	500
Karnataka	Bangalore	Harisandra	Dec, 19	8	360	340	300	300	340	330	500	400
	Tumkur	Gidlahali	Nov, 19	8	350	320	350	350	350	320	400	360
Maharashtra	Bhandara	Adyal	June, 20	8	300	200	275	200	275	200	400	350
	Chandrapur	Kothari	June, 20	8	300	200	300	200	300	NA	350	300
												200

1.1. DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE)

(In ₹)

State	District	Centre	Month & Year	Type of Labour	Other Agri Labour							Skilled Labours		
					Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Herdsman	Carpenter	Black Smith	Cobbler	
Assam	Barpeta	Howly	June, 20	M	8	300	NA	250	250	200	NA	275	280	NA
				W	8	NA	NA	170	170	150	NA	NA	NA	NA
	Muzaffarpur	Narsinghpur	June, 20	M	8	350	400	350	350	400	NA	500	500	NA
				W	8	250	300	250	250	300	NA	NA	NA	NA
Bihar	Shekhpura	Kutaut	May, 20	M	8	200	200	200	250	250	NA	450	450	NA
				W	8	NA	200	200	250	250	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihava	Feb,20	M	8	400	NA	NA	NA	180	160	320	300	200
				W	8	NA	NA	NA	NA	160	140	NA	150	NA

1.1. DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE)-*Contd.*

(In ₹)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours								Skilled Labours		
					Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Carpenter	Black Smith	Cobbler		
Gujarat*	Rajkot	Rajkot	April, 20	M	8	292	292	292	292	272	120	510	483	450	
				W	8	NA	292	292	292	272	100	NA	NA	NA	
	Dahod	Dahod	April, 20	M	8	300	300	150	150	150	NA	400	350	300	
				W	8	NA	250	150	150	150	NA	NA	NA	NA	
Haryana	Panipat	Ugarakheri	July, 20	M	8	400	400	400	400	400	NA	550	400	NA	
				W	8	NA	300	300	350	300	NA	NA	NA	NA	
	Mandi	Mandi	Feb, 20	M	8	450	330	330	330	330	330	430	430	300	
				W	8	NA	330	330	330	330	330	NA	NA	NA	
Kerala	Kozhikode	Koduvally	June, 20	M	4-8	1240	850	NA	800	800	NA	950	NA	NA	
				W	4-8	NA	NA	700	700	700	NA	NA	NA	NA	
	Palakkad	Elappally	June, 20	M	4-8	NA	600	NA	600	720	NA	750	NA	NA	
				W	4-8	NA	NA	350	350	350	NA	NA	NA	NA	
Madhya Pradesh	Hoshangabad	Sangarkhera	Oct, 20	M	8	300	NA	250	250	250	150	500	500	NA	
				W	8	NA	NA	200	200	200	NA	NA	NA	NA	
	Satna	Kotar	Oct, 20	M	8	300	300	300	300	300	300	500	500	500	
				W	8	NA	300	300	300	300	300	NA	NA	NA	
Odisha	Gwalior	Mohana	Oct, 20	M	8	300	250	250	300	250	250	500	500	500	
				W	8	NA	200	200	250	200	200	NA	NA	NA	
	Bhadrak	Chandbali	March, 20	M	8	450	400	400	450	441	400	500	400	350	
				W	8	NA	300	350	300	325	300	NA	NA	NA	
Punjab	Ganjam	Aska	March, 20	M	8	300	300	300	300	342	250	500	500	500	
				W	8	NA	250	250	250	280	220	NA	NA	NA	
	Monga	Nathoke	Sep, 20	M	8	500	500	NA	NA	500	NA	500	460	NA	
				W	8	NA	400	NA	NA	400	NA	NA	NA	NA	

1.1. DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE)-*Concl.*

(In ₹)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours										Skilled Labours			
					Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsmen	Carpenter	Black Smith	Cobbler					
Rajasthan	Barmer	Kuseep	Aug, 20	M	8	500	500	400	NA	NA	500	700	500	NA				
				W	8	NA	NA	NA	NA	NA	300	NA	300	NA				
	Jalore	Sarnau	Aug, 20	M	8	400	400	300	NA	NA	NA	600	400	NA				
				W	8	NA	NA	250	NA	NA	NA	NA	NA	NA				
Tamil Nadu*	Thanjavur	Thanjavur	Sep, 20	M	8	NA	372	NA	263	395	NA	478	450	NA				
				W	8	NA	170	173	165	178	NA	NA	NA	NA				
	Tirunelveli	Tirunelveli	Sep, 20	M	8	NA	500	NA	NA	689	NA	NA	NA	NA				
				W	8	NA	NA	208	209	NA	NA	NA	NA	NA				
Tripura	State Average		Aug, 19	M	8	331	331	297	276	275	275	350	319	NA				
				W	8	NA	331	250	229	225	241	NA	NA	NA				
	Meerut	Meerut	Sep, 20	M	8	300	300	300	300	300	NA	500	NA	NA				
				W	8	NA	250	250	250	250	NA	NA	NA	NA				
Uttar Pradesh*	Jhansi	Jhansi	Sep, 20	M	8	250	290	250	NA	300	NA	450	NA	.NA				
				W	8	NA	230	250	NA	270	NA	NA	NA	NA				
	Chandauli	Chandauli	Sep, 20	M	8	NA	NA	NA	NA	300	NA	500	NA	NA				
				W	8	NA	NA	NA	NA	300	NA	NA	NA	NA				

M - Man

W - Woman

NA - Not Available

NR - Not Reported

* The State reported district average daily wage

Prices

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA

Commodity	Variety	Unit	State	Centre	Nov-20	Oct-20	Nov-19
Wheat	PBW 343	Quintal	Punjab	Amritsar	1750	1800	2200
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1730	1700	1990
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1751	1820	2136
Jowar	-	Quintal	Maharashtra	Mumbai	3200	3200	4000
Gram	No III	Quintal	Madhya Pradesh	Sehore	4370	4740	3800
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1650	1250	1850
Gram Split	-	Quintal	Bihar	Patna	6250	6200	6050
Gram Split	-	Quintal	Maharashtra	Mumbai	6300	6100	6000
Arhar Split	-	Quintal	Bihar	Patna	9440	9480	8180
Arhar Split	-	Quintal	Maharashtra	Mumbai	9000	8800	8500
Arhar Split	-	Quintal	NCT of Delhi	Delhi	8300	8300	7900
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	9200	10000	8200
Gur	-	Quintal	Maharashtra	Mumbai	4500	4500	5100
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4500	4500	4500
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2650	2900	2200
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	5300	4940	3800
Mustard Seed	Black	Quintal	West Bengal	Raniganj	NA	NA	4350
Mustard Seed	-	Quintal	West Bengal	Kolkata	6100	5800	4550
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4950	4950	4800
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	5000	4900	4700
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2100	2100	2400
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3000	3000	2800
Castor Seed	-	Quintal	Telangana	Hyderabad	NA	NA	4000
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	8600	8200	9280
Copra	FAQ	Quintal	Kerala	Alleppey	12750	12400	10450
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	5100	5000	5300
Groundnut	-	Quintal	Maharashtra	Mumbai	8400	8500	8500

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA-Contd.

Commodity	Variety	Unit	State	Centre	Nov-20	Oct-20	Nov-19
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1585	1525	1360
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	2100	2050	1400
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2150	2050	1530
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2300	2250	2050
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1575	1545	1455
Castor Oil	-	15 Kg.	Telangana	Hyderabad	1890	1890	1335
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	2000	2000	1830
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	3400	3320	2900
Coconut Oil	-	15 Kg.	Kerala	Cochin	2700	2565	2313
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2250	2100	2000
Groundnut Cake	-	Quintal	Telangana	Hyderabad	NA	NA	3857
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	5300	5000	5200
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	4200	3900	3900
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	5750	5775	4850
Jute Raw	W 5	Quintal	West Bengal	Kolkata	6050	6275	4850
Oranges	-	100 No	NCT of Delhi	Delhi	NA	NA	708
Oranges	Big	100 No	Tamil Nadu	Chennai	400	400	650
Banana	-	100 No.	NCT of Delhi	Delhi	375	375	458
Banana	Medium	100 No.	Tamil Nadu	Kodaikanal	600	600	700
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	85000	80000	95000
Almonds	-	Quintal	Maharashtra	Mumbai	62000	64000	70000
Walnuts	-	Quintal	Maharashtra	Mumbai	65000	70000	65000
Kishmish	-	Quintal	Maharashtra	Mumbai	20000	21000	18000
Peas Green	-	Quintal	Maharashtra	Mumbai	8000	9500	5800
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	2650	3200	2300
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2000	2000	2000
Cauliflower	-	100 No.	Tamil Nadu	Chennai	3000	2200	2000
Potato	Red	Quintal	Bihar	Patna	3650	3350	1580

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA-Concl.

Commodity	Variety	Unit	State	Centre	Nov-20	Oct-20	Nov-19
Potato	Desi	Quintal	West Bengal	Kolkata	3660	3200	1800
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	3943	4187	2720
Onion	Pole	Quintal	Maharashtra	Nashik	2900	4550	5500
Turmeric	Nadan	Quintal	Kerala	Cochin	11000	11000	11000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	9800	9500	11000
Chillies	-	Quintal	Bihar	Patna	15200	14700	11240
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	30000	29000	31000
Ginger	Dry	Quintal	Kerala	Cochin	27000	28000	26000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	100000	100000	120000
Cardamom	Small	Quintal	West Bengal	Kolkata	200000	180000	270000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	6000	6000	6200
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	60030	60030	70000
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	40000	39000	40000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	40500	40500	38400
Fish	Rohu	Quintal	NCT of Delhi	Delhi	9000	9000	16700
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	NA	35000	30000
Eggs	Madras	1000 No.	West Bengal	Kolkata	5000	5476	5000
Tea	-	Quintal	Bihar	Patna	24800	24800	21720
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	NT	NT	NA
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	39500	39500	38200
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	28000	29500	26500
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	9850	9750	7400
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	4400	4800	4300
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	13200	13200	13200
Rubber	-	Quintal	Kerala	Kottayam	12300	13900	12000
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	66000	65000	59500

Crop Production

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING FEBRUARY, 2021

State (1)	Sowing (2)	Harvesting (3)
Andhra Pradesh	Summer Rice, Ragi (R) Sugarcane	Winter Rice Jowar (K), Maize (R), Ragi (K), Wheat Gram, Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Linseed, Cotton, Turmeric, Onion (2nd Crop) Coriander.
Andhra Pradesh	Assam Autumn Rice, Summer Potato (Hills), Jute.	Gram Urad (R), Winter Potato, Tobacco, Rapeseed & Mustard, Linseed, Cotton.
Bihar	Sugarcane.	Wheat, Barley, Gram, Winter Potato (Plain), Rapeseed & Mustard, Sugarcane, Linseed.
Gujarat	Sugarcane.	Jowar (R), Wheat, Gram Tur (K), Other Rabi Pulses, Winter Potato, Sugarcane, Ginger, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Cotton, Turmeric, Onion.
Himachal Pradesh	Winter Potato (Hills),	—
Jammu & Kashmir	Sugarcane, Onion.	Winter Potato.
Karnataka	Summer Rice, Mung (R), Sugarcane.	Winter Rice, Jowar (R), Maize (R), Wheat, Barley, Gram, Tur (K), Other Kharif Pulses, Potato, Sugarcane, Black Pepper, Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Turmeric Cardiseed.
Kerala	Summer Rice, Tur (K), other Rabi Pulses (Kulthi), Sugarcane, Sesamum.	Winter Rice, Urad (R), Sugarcane, Cotton, Sweet Potato. Madhya Pradesh Sugarcane, Onion, Jowar (R), Wheat, Barley, Small Millets (R), Gram, Tur, Urad (R), Mung (R), Other Rabi Pulses, Winter Potato (Hills) Sugarcane, Ginger, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Sweet Potato, Turmeric, Sannhemp, Cardiseed, Onion.
Maharashtra	Sugarcane.	Jowar (R), Wheat, Barley, Gram, Tur (K), Urad (R), Mung (R), Other Rabi Pulses, Witner Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Rapeseed & Mustard, Linseed, Cotton, Cardiseed.
Manipur	Jute.	Wheat, Castorseed, Rapeseed & Mustard, Turmeric, Orissa Sugarcane, Chillies (Dry), Bajra (R), Winter Potato (Plains), Chillies (Dry), Rapeseed & Mustard.

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING FEBRUARY, 2021-Contd.

State (1)	Sowing (2)	Harvesting
		(3)
Punjab and Haryana	Sugarcane, Tobacco, Onion, Potato.	Potato, Sugarcane, Rapeseed & Mustard, Turmeric Rajasthan Sugarcane, Gram, Tur (K), Winter Potato (Plains), Sugarcane, Castorseed, Rapeseed & Mustard, Linseed.
Tamil Nadu	Summer Rice, Jowar (R), Sugarcane, Groundnut, Cotton, Onion, Sesamum (Late).	Winter Rice, Jowar (R), Bajra, Ragi Small Millets (K), Gram, Tur, Urad (K) Mung (K), Other Rabi Pulses (Kulthi), Winter Potato, Sugarcane, Black Papper, Tobacco, Castor seed, Sesamum, Cotton, Turmeric, Onion,
Tripura	Sugarcane.	Gram, Urad (R), Mung (R), Other Rabi Pulses, Winter Potato (Plains), Sugarcane, Chillies (Dry), Rapeseed & Mustard, Sweet Potato.
Uttar Pradesh	Summer Rice, Small Millets (R), Sugarcane, Tobacco Jute, Tapioca (Ist Crop).	Rapeseed & Mustard.
West Bengal	Summer Rice, Sugarcane.	Tur (K), Urd (R), Mung (R), Other Rabi Rulses, Winter Potato Sugarcane, Ginger, Chillies (Dry), Tobacco Sesamum, (Ist Crop, Rapeseed & Mustard.

(K) – Kharif (R) – Rabi

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Note to Contributors

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Abbreviations used

N.A. – Not Available.

N.Q. – Not Quoted.

N.T. – No Transactions.

N.S. – No Supply/No Stock.

R. – Revised.

M.C. – Market Closed.

N.R. – Not Reported.

Neg. – Negligible.

Kg. – Kilogram.

Q. – Quintal.

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