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AGRICULTURAL SITUATION IN INDIA

Since 1948

JULY, 2021

AGRICULTURAL SITUATION IN INDIA

Publication Division

Directorate of Economics
and Statistics
Department of Agriculture & Farmers Welfare
Ministry of Agriculture & Farmers Welfare
Government of India
102A, F-Wing, Shastri Bhawan,
New Delhi-110 001
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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,
Deptt. of Publications,
Publications Complex (Behind Old Secretariat),
Civil Lines, Delhi-110 054.
Phone : 23813761, 23813762, 23813764, 23813765
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For article submission see last page.

VOL. LXXVIII July, 2021 No. 4

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From Editor's Desk

This edition of "Agricultural Situation in India" brings for its readers two academic research articles; one on trailing towards self-reliance in pulses; and second on yield and economic performance of onion cultivation in Maharashtra and an agro-economic research on extent of erosion of farm profitability due to market imperfections in Bihar. It also includes news relating to farm sector, wholesale prices of commodities, rate of inflation of food and non-food items, price indices, etc.

The main agricultural news covered in this publication are: cabinet approval of Minimum Support Prices (MSP) for kharif crops for marketing season 2021-22; Union Agriculture Minister addresses the 42nd session of FAO Conference; India-Australia discuss cooperation and collaboration in the field of agriculture; India and Fiji sign MoU for cooperation in the field of agriculture and allied sectors; Union Minister of State for Agriculture & Farmers' Welfare launches the Bamboo Market page on GeM portal; roadmap for self sufficiency in pulses and oilseeds; empowering farmers through Sub-Mission on Agricultural Mechanization (SMAM); establishment of 3 Centers of Excellence in Karnataka under Indo-Israel agriculture project.

For the month of May, 2021, food inflation stood at 12.94 percent. The Wholesale Price Index (WPI) of foodgrains, pulses and fruits increased by 0.12 percent, 12.09 percent and 20.17 percent, respectively, whereas for cereals, vegetables, paddy and wheat, it decreased by 2.52 percent, 9.00 percent, 0.49 percent and 2.54 percent, respectively, in May, 2021 as compared to corresponding period of last year. The cumulative monsoon season rainfall in the country during the period 1st June, 2021 to 30th June, 2021 has been 10 percent higher than the long period average (LPA). Current live storage in 130 major water reservoirs in the country was 55.61 BCM as against 40.17 BCM of normal storage based on the average storage of last 10 years.

The academic column's first article discusses the ways and means of making India a self-reliant country in pulses. This study is of major importance as India is a home to a vastly vegetarian population which makes it one of the biggest consumers of pulses. With its ever increasing population, the demand for pulses is going to increase rapidly in the near future. The analysis finds that though over the years the productivity of pulses in India has increased but still, India is dependent on its imports to meet the domestic demand. To fulfill the requirement of the population, an intervention is required. For this, better quality seeds may be provided to the growers, high yield and better resistant varieties may be developed and more area may be brought under its cultivation.

In the second article, the authors' analyse the yield and economic performance of onion cultivation in Maharashtra. Onion is one such crop which finds its use in most of the households in India and whose price fluctuation impacts one and all. The study tries to ascertain technical know-how of the growers, problems faced by them and to analyse the cost, return and yield gap in onion production. Based on a sample of 1212 farmers, the results reveal that still majority of farmers use traditional farming methods. Inadequate fertilizer availability affects the production, quality and yield while lack of storage facilities forces the onion growers to sell their produce at low prices during peak production. Though returns per hectare are good which makes it a profitable grow, but an intervention is required to enhance production, post harvest handling, better technology transfer to growers, ensure regular fertilizer availability, etc.

The Agro-economic Research section draws our attention to the extent of erosion of farm profitability due to market imperfections in Bihar. Conducted by the Agro-Economic Research Centre for Bihar & Jharkhand, the research uses multi stage sampling by selecting 100 farmer households each from 3 districts spanning across three agro-climatic regions of Bihar. The purpose of the research is to analyze the product market, input market and the government support structure available to the farmers. The findings reveal that majority of the farmers belong to marginal category and undertake cultivation of paddy, maize and wheat. Limited government involvement and collusion of private buyers are the two biggest reasons for unfair prices received for crops and high prices paid for the seeds and fertilizers. The input and labour costs are the major factors behind increased cost of cultivation and lowering of farmers' profits.

Promodita Sathish

Farm Sector News

Cabinet Decisions and Announcements

Cabinet approves Minimum Support Prices (MSP) for kharif crops for marketing season 2021-22

The Cabinet Committee on Economic Affairs, chaired by Prime Minister Shri Narendra Modi, has approved the increase in the Minimum Support Prices (MSPs) for all mandated kharif crops for marketing season 2021-22.

Government has increased the MSP of kharif crops for marketing season 2021-22 to ensure remunerative prices to the growers for their produce. The highest absolute increase in MSP over the previous year has been recommended for sesamum (Rs. 452 per quintal) followed by tur and urad (Rs. 300 per quintal each). In case of groundnut and nigerseed, there has been an increase of Rs. 275 per quintal and Rs. 235 per quintal, respectively, in comparison to last year. The differential remuneration is aimed at encouraging crop diversification.

MINIMUM SUPPORT PRICES FOR ALL KHARIF CROPS FOR MARKETING SEASON 2021-22

Crop	MSP 2020-21	MSP 2021-22	Cost* of production 2021-22 (Rs./quintal)	Increase in MSP (Absolute)	Return over cost (in percent)
Paddy (Common)	1868	1940	1293	72	50
Paddy (GradeA)^	1888	1960	–	72	–
Jowar (Hybrid) (Hybrid)	2620	2738	1825	118	50
Jowar (Maldandi)^	2640	2758	–	118	-
Bajra	2150	2250	1213	100	85
Ragi	3295	3377	2251	82	50
Maize	1850	1870	1246	20	50
Tur (Arhar)	6000	6300	3886	300	62
Moong	7196	7275	4850	79	50
Urad	6000	6300	3816	300	65
Groundnut	5275	5550	3699	275	50

Crop	MSP 2020-21	MSP 2021-22	Cost* of production 2021-22 (Rs./quintal)	Increase in MSP (Absolute)	Return over cost (in percent)
Sunflower Seed	5885	6015	4010	130	50
Soyabean (yellow)	3880	3950	2633	70	50
Sesamum	6855	7307	4871	452	50
Nigerseed	6695	6930	4620	235	50
Cotton (Medium Staple)	5515	5726	3817	211	50
Cotton (Long Staple)^	5825	6025	–	200	–

Source: DES, Ministry of Agriculture and Farmers Welfare.

Note: * Refers to comprehensive cost which includes all paid on costs such as those incurred on account of hired human labour, bullock labour, machine labour, rent paid for leased in land, expenses incurred on use of material inputs like seeds, fertilizers, manures, irrigation charges, depreciation on implements and farm buildings, interest on working capital, diesel/electricity for operation of pump sets, etc., miscellaneous expenses and imputed value of family labour.

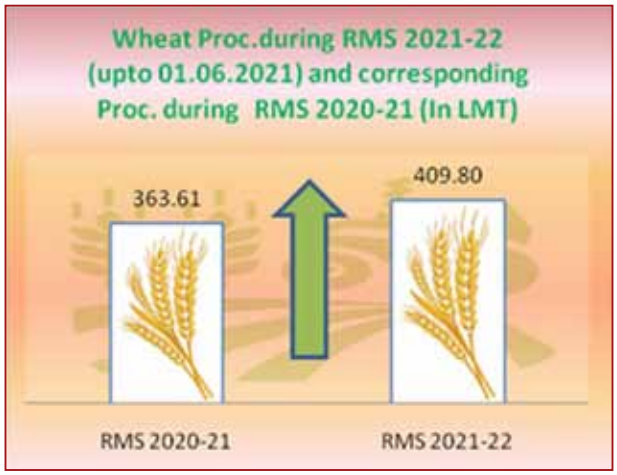
^ Cost data are not separately compiled for paddy (grade A), jowar (maldandi) and cotton (long staple)

The increase in MSP for kharif crops for marketing season 2021-22 is in line with the Union Budget 2018-19 announcement of fixing the MSPs at a level of at least 1.5 times of the all-India weighted average Cost of Production (CoP), aiming at reasonably fair remuneration for the farmers. The expected returns to farmers over their cost of production are estimated to be highest in case of bajra (85%) followed by urad (65%) and tur (62%). For rest of the crops, return to farmers over their cost of production is estimated to be at least 50%.

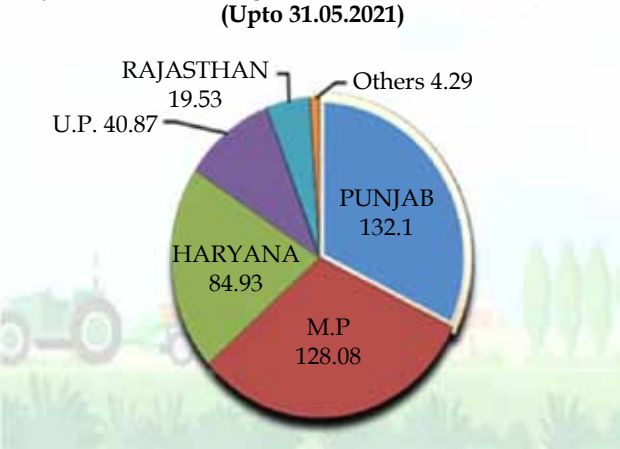
Government Intervention

MSP operation during Rabi Marketing Season 2021-22

Procurement of wheat in ongoing Rabi Marketing Season 2021-22 is continuing smoothly in the procuring states of Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Gujarat, Himachal Pradesh and Jammu & Kashmir at MSP. Till now (upto 01.06.2021), a quantity of over 409.80 LMT of wheat has been procured (which is all time high, as it has exceeded previous high 389.92 LMT of RMS 2020-21) against the last year corresponding purchase of 363.61 LMT. About 44.12 lakh farmers have already been benefitted from the ongoing RMS procurement operations with MSP value of Rs. 80,936.19 crores.

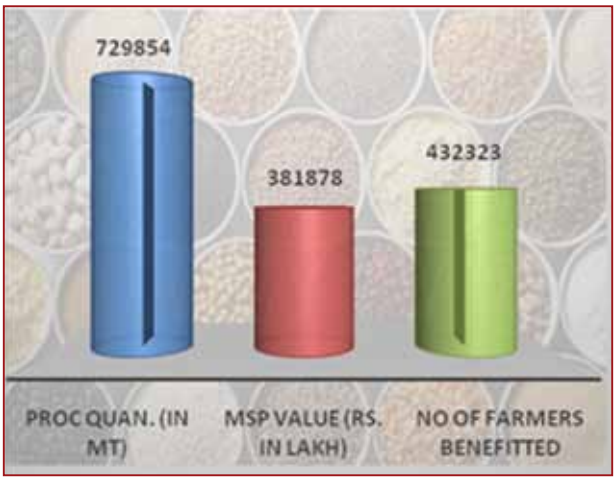


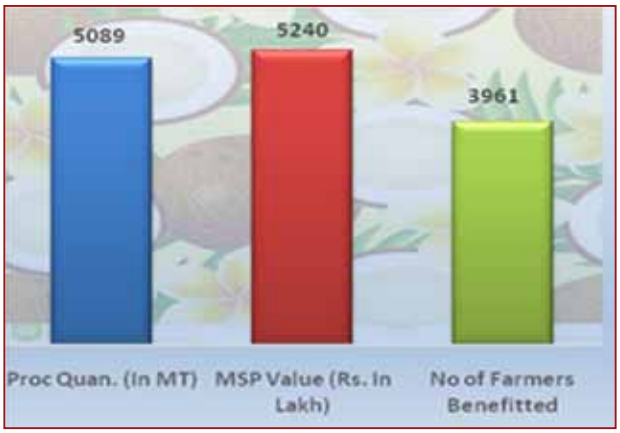
Major Wheat Procuring States in RMS 2021-22 (In LMT) (Upto 31.05.2021)



Source: DF&PD, Ministry of Consumer Affairs, Food and Public Distribution, GoI

Further, based on the proposal from the states, approval was accorded for procurement of 107.81 LMT of pulse and oilseeds of Kharif Marketing Season 2020-21 & Rabi Marketing Season 2021 and Summer Season 2021 for the states of Tamil Nadu, Karnataka, Maharashtra, Telangana, Gujarat, Haryana, Madhya Pradesh, Uttar Pradesh, Odisha, Rajasthan and Andhra Pradesh under Price Support Scheme (PSS). The sanction for procurement of 1.74 LMT of copra (the perennial crop) for the states of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala was also given.





Source: DF&PD, Ministry of Consumer Affairs, Food and Public Distribution, GoI

Upto 01.06.2021, the Government through its nodal agencies has procured 7,29,854.74 MT of moong, urad, tur, gram, masoor, groundnut pods, mustard seed and soyabean having MSP value of Rs. 3,818.78 crores and benefitting 4,32,323 farmers of Tamil Nadu, Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Uttar Pradesh, Telangana, Haryana and Rajasthan under Kharif 2020-21 & Rabi 2021.

Similarly, 5089 MT of copra (the perennial crop) having MSP value of Rs. 52.40 crores has been procured benefitting 3961 farmers in Karnataka and Tamil Nadu during the crops season 2020-21. For the season 2021-22, sanction for procurement of 51,000 MT of copra from Tamil Nadu has been given, against which procurement will be started from the date as decided by the State Government.

Union Minister of State for Agriculture & Farmers' Welfare launches the Bamboo Market page on GeM portal

The National Bamboo Mission and the Government e-Marketplace (GeM) have been working together for having a dedicated window on the GeM portal for marketing of the bamboo goods (bamboo based products & quality planting materials). Resultant to the collaboration, a dedicated window "The Green Gold Collection" for bamboo products was launched by the Union Minister of State for Agriculture Shri Parshottam Rupala during a virtual event on 3rd June, 2021. The event witnessed participation by 200+ participants, largely bamboo enterprises from across the country.

"The Green Gold Collection" [*https://gem.gov.in/national-bamboo-mission*], a unique initiative of the National Bamboo Mission and GeM, showcases a range of exquisitely handcrafted bamboo and bamboo products, handicrafts, disposals and office utility products on the GeM portal, and aims to provide bamboo artisans, weavers and entrepreneurs in rural areas with market access to government buyers. Product categories ranging from bamboo poles to bamboo products in furniture, lifestyle & décor, kitchenware, industrial machinery, handcrafted items such as toys and office utility items like agarbatti/incense sticks, disposables, water bottles, yoga mats, charcoal, etc. are being uploaded on the portal for government buyers. This initiative seeks to promote the adoption and use of bamboo products among government buyers and usher a sustainable rural economy for an AtmaNirbhar Bharat.

Meetings and Events

Union Minister of Agriculture and Farmers' Welfare addresses the 42nd session of FAO Conference

Union Agriculture Minister, Shri Narendra Singh Tomar virtually participated in 42nd session of FAO Conference. He congratulated the Food and Agriculture Organisation for completing 75 glorious years of service to humanity on 16th October, 2020. To commemorate the long standing relationship between India and the FAO, the Prime Minister of India had released a special seventy five rupees commemorative coin which aptly combines the themes of agricultural production and nutrition in its motto - "सही पोषण देश रोशन" meaning "a country will shine if the nutrition is correct".

The Minister said that FAO has benefitted from India's vast repository of knowledge which is shared globally among the member countries. India has been working closely with FAO, extending technical expertise and assistance in incidences of trans-boundary pests mainly fall armyworm and desert locust. He also acknowledged the support of FAO in endorsing India's proposal for an International Year of Pulses which was celebrated in 2016 and for declaring 2023 as the International Year of Millets.

India-Australia cooperation and collaboration in the field of agriculture

A virtual meeting between Shri Narendra Singh Tomar, Minister for Agriculture and Farmers' Welfare and Mr. David Littleproud, Australian Minister for Agriculture, Drought & Emergency Management, was held on 1st June, 2021. It was acknowledged that the frequent engagement between the two nations at the highest level has resulted in significant progress in many spheres of the bilateral relations during the last five years.

The two Ministers met to follow up on the collaboration in field of agriculture highlighted in the Comprehensive Strategic Partnership announced by Prime Ministers of India and Australia on 4th June, 2020. The India - Australia Grains Partnership was a significant inclusion aiming to use Australia's expertise in post harvest management to strengthen rural grain storage and supply chains so as to reduce losses and wastage. Shri Tomar expressed satisfaction at the progress being made in this area of cooperation between the two countries and informed that National Institute of Agricultural Marketing will be the nodal organisation from India.

Both the Ministers expressed satisfaction on the progress of giving market access to the respective agricultural products and shared technical information with each other. Australia has recently given market access for export of Indian pomegranates. There would be a joint strategy for deeper access for Indian mangoes and pomegranates in Australian markets led by the Indian High Commission in Canberra also. The Australian Minister assured to fast track the Indian requests for market access for okra and pomegranate arils.

On the issue raised by Minister of Australia for closer cooperation between India and Australia in multilateral fora like FAO and G20, Shri Tomar said that he looked forward for closer dialogue between likeminded countries. He suggested that climate change was one area where there was great opportunity for India and Australia to work together since both countries had similar commitments. He mentioned the flagship program

of National Innovation for Climate Resilient Agriculture and said collaboration could be set up with the research organisations of Australia.

India and Fiji sign MoU for cooperation in the field of agriculture and allied sectors

Union Minister for Agriculture & Farmers' Welfare, Shri Narendra Singh Tomar and Fiji's Minister of Agriculture, Waterways & Environment, Dr. Mahendra Reddy signed a Memorandum of Understanding (MoU) for cooperation in the field of agriculture and allied sectors between India and Fiji in a virtual meeting held on 22nd June, 2021.

Shri Tomar said that cordial and friendly relations between India and Fiji are based on mutual respect, cooperation and strong cultural and people-to-people ties. Prime Minister Modi's historic visit to Fiji and the first Forum for India Pacific Islands Cooperation has given a new impetus to India's engagement with Fiji and the Pacific region. He added that food and agriculture are closely related to climate change and both countries are cooperating in dealing with global challenges in this regard. Despite the corona pandemic, India has been able to distribute about 7 tonnes of seeds of 14 varieties of fruits and vegetables as requested by Fiji, as a grant from the Government of India, for the livelihood restoration of communities affected by cyclone Yasa.

The MoU provides for cooperation in the fields of dairy industry development, rice industry development, root crop diversification, water resources management, coconut industry development, food processing industry development, agriculture mechanization, horticulture industry development, agricultural research, animal husbandry, pest and disease, cultivation, value addition and marketing, post-harvest and milling, breeding and agronomy.

Under the MoU, a Joint Working Group will be established to set down procedures and plan and recommend programs of cooperation towards achieving its aims. The Working Group will hold its meetings alternatively in India and Fiji once in every two years. The MoU will remain valid for a period of five years from the date of its signing and any variation to its duration will be approved in writing by both parties.

General Agriculture Sector News

Digital ecosystem of agriculture with farmers at the centre

The Minister of Agriculture and Farmers' Welfare, Shri Narendra Singh Tomar, has said that the dream of a self-reliant and digital India will only be realized by taking along the agriculture sector. A number of schemes including the historic Prime Minister Kisan Samman Nidhi (PM-Kisan) worth Rs.75,000 crore per annum are being implemented transparently to increase the income of farmers. This was stated by the Union Minister, Shri Tomar during the MoU signing ceremony of the Ministry of Agriculture and Farmers' Welfare with four institutions namely: (i) Patanjali Organic Research Institute, (ii) Amazon Web Services (AWS), (iii) ESRI India Pvt. Ltd., (iv) Agribazar India Pvt. Ltd. The MoUs have been signed with these organizations for pilot project using Kisan Database as basis within a period of one year: with ESRI for setting up and launching of "National Agriculture Geo Hub", with Amazon Web Services for creation of digital services and innovation ecosystem linked with digital agriculture in the agricultural value chain, with Agribazar to collaborate with Department of Agriculture for pilot project in 3 states (Uttar Pradesh, Madhya Pradesh and Rajasthan) to promote digital agriculture and an MoU has been signed with Patanjali for agricultural management and farmer service in 3 districts (Haridwar- Uttarakhand, Hamirpur- Uttar Pradesh and Moraina- Madhya Pradesh).

The Ministry of Agriculture and Farmers' Welfare has constituted a Task Force and a Working Group of Experts and Technology Experts in the field to prepare a roadmap for digital agriculture.

Recognizing the importance of digitization in agriculture, the department is preparing a centralised farmers database and formulating various services based on it in order to create a digital ecosystem for agriculture. This database will be linked with the land records of farmers

across the country and unique farmer IDs will be generated. Under an integrated database for farmers, information related to all benefits and assistances provided through various schemes of the Central and State Governments can be kept at one place and it can be a source of information for providing benefits to the farmers in future. A database with the details of about 5 crore farmers has been prepared so far. It is expected that the database will soon be completed by incorporating the details of all landholding farmers into it. The available data related to PM Kisan, Soil Health Card and PM Crop Insurance scheme have already been integrated. The process of collating data from other databases of the Ministry of Agriculture as well as the Ministries of Fertilizers, Food and Public Distribution is in progress.

Various kind of support will be received from the database including IDEA (InDEA Digital Ecosystem of Agriculture) and solutions based on it through the case based use developed with help of these pilot projects, some of which are as follows: Farmers will be able to make informed decisions about which crop to grow, what type of seed to use, when to sow and what best practices to adopt to maximize yield. Those involved in the agricultural supply chain can plan their procurement and logistics with accurate and timely information. An accurate and smart farming can be possible by getting proper information at the right time. Farmers can decide whether they have to sell or store their produce, and further when, where and at what price they have to sell it. In the process, farmers get benefitted from innovative solutions and individual-specific services powered by emerging technologies which protect their privacy.

Roadmap for self sufficiency in pulses and oil-seeds

Union Agriculture Minister Shri Narendra Singh Tomar on 2nd June, 2021 held a virtual interaction with the farmers who have received seed minikits. Addressing the farmers, Union Agriculture Minister mentioned that the Central Government in collaboration with the states has been implementing various activities to enhance production and productivity of pulses and oilseeds under the National Food Security Mission. From the year 2014-15, there has been a renewed focus on increasing the production of pulses and oilseeds. The efforts have yielded good results. Oilseeds production has increased from 27.51 million tonnes in 2014-15 to 36.57 million tonnes in 2020-21 (3rd advance estimates), while pulses production has increased from 17.15 million tonnes in 2014-15 to 25.56 million tonnes in 2020-21 (3rd advance estimates). He stated that though trends in area, production and productivity of oilseeds and pulses are encouraging, but these need further acceleration. He mentioned that the seed minikits programme is a major tool for introducing new varieties of seeds in the farmers' fields and is instrumental for increasing the seed replacement rate.

The mini kits are being provided by the central agencies National Seeds Corporation (NCS), NAFED and Gujarat State Seeds Corporation and wholly funded by the Government of India through the National Food Security Mission. The conversation with the farmers revealed their awareness about the programme and the benefits of the mini kits which they promised to share with fellow farmers. The farmers also appreciated the role played by the state agriculture officers and the extension being done by the Krishi Vigyan Kendras. The distribution of seeds will continue till 15th June, 2021 so that the seeds reach the farmers before the kharif sowing commences.

20,27,318 seed minikits of pulses, about 10 times more than last year, and more than 8 lakh soybean seed minikits and 74 thousand groundnut minikits are to be provided free of cost, directly to the farmers under the National Food Security Mission along with free distribution of soybean seeds for intercropping and in high potential districts in 41 and 73 districts, respectively.

India is making tremendous progress in the agriculture sector and country is estimated to produce a record 305.43 million tonnes during 2020-21. In addition to meeting domestic needs, India also earns from export and maintains a positive trade.

The Government's priority is on increasing production of pulses and oilseeds. The formulated

strategies are to increase production through area expansion, productivity through HYVs, MSP support and procurement. Experience in the Mustard Mission of Rabi 2020-21 of only selected varieties having yield potential more than 20 quintals per hectare resulted in 13% increase in productivity and 14% in production from almost the same area.

3 Centers of Excellence established in Karnataka under Indo-Israel Agriculture project

For taking forward the Israeli technologies in the field of Horticulture, Sh. B. S. Yediyurappa, Chief Minister, Government of Karnataka and Sh. Narendra Singh Tomar, Minister for Agriculture & Farmers' Welfare, Government of India jointly inaugurated the 3 Centers of Excellence (COEs) established in Karnataka under Indo-Israel Agricultural Project (IIAP).

MIDH Division of Ministry of Agriculture & Farmers' Welfare, Government of India and MASHAV - Israel's Agency for International Development Cooperation - are leading Israel's largest G2G cooperation, with 29 operational Centres of Excellence (COEs) across India in 12 states, implementing advanced Israeli Agro-Technology tailored to local conditions.

Out of these 29 fully functional COEs, 3 are in Karnataka, *viz.*, COE Kolar for mango, COE Bagalkote for pomegranate and COE Dharwad for vegetables. These Centres of Excellence will generate knowledge, demonstrate best practices and train officers and farmers.

Shri Tomar said that these centers will help farming community of Karnataka to get access to the latest innovative Israeli technologies and adopting them to increase production and productivity will help in increasing the farmers' income. These COEs have the capacity of 50,000 grafts production and 25 lakh vegetables seedlings production annually. About 20,000 farmers have visited these COEs to gain knowledge about the modern cultivation practices in horticulture.

Empowering farmers through Sub-Mission on Agricultural Mechanization (SMAM)

To empower the farmers through Sub-Mission on Agricultural Mechanization (SMAM) scheme, Government of India has released funds for various activities of farm mechanization like establishment of Custom Hiring Centres, farm machinery bank, high-tech hubs and distribution of various agricultural machinery, etc. to different states.

Agricultural mechanization plays a vital role in optimizing the use of land, water energy resources, manpower and other inputs like seeds, fertilizers, pesticides, etc. to maximize the productivity of the available cultivable area and make agriculture a more profitable and attractive profession for rural youth. Agricultural mechanization is one of the key drivers for the sustainable development of the agriculture sector. Sustainable agriculture mechanization growth will require appropriate and precision agricultural machinery adequately supported by the latest technology.

FUNDS RELEASED BY DAC&FW UNDER SMAM SCHEME

State	Funds released during 2014-2021 (in Crores)	Funds released during 2021-22 (in Crores)	To be utilized for
Madhya Pradesh	288.24	16.20	Distribution of 2000 agricultural machinery and equipment, est. of 90 Custom Hiring Centres
Andhra Pradesh	621.33	32.93	Est. of 525 CHC's and 34 hi-tech labs
Tamil Nadu	421.65	21.74	Distribution of 269 agricultural machinery and equipment, est. of 115 CHC's, 10 hi-tech labs and 100 farm machinery banks

State	Funds released during 2014-2021 (in Crores)	Funds released during 2021-22 (in Crores)	To be utilized for
Kerala	89.94	12.35	Distribution of 4280 nos of various machines and equipment to farmers on subsidy and est. of 58 farm machinery banks
Arunachal Pradesh	36.36	3.66	Distribution of 6045 nos of various machines and equipment to farmers on subsidy
Manipur	61.05	2.27	Est. of 18 farm machinery banks
Nagaland	110.05	7.57	Distribution of 497 nos of various machines and equipment to farmers on subsidy and est. of 25 farm machinery banks
Tripura	121.12	6.12	Est. of 65 farm machinery banks
Uttar Pradesh	294.74	22.12	Est. of 290 CHC's and 290 farm machinery banks
Uttarakhand	182.05	10.53	Distribution of 1685 nos of various machinery and equipments to farmers on subsidy, est. of 6 CHC's and 35 farm machinery banks
West Bengal	53.81	2.6	Est. of 25 CHC's

Source: DAC&FW, Ministry of Agriculture and Farmers Welfare.

About Sub-Mission on Agricultural Mechanization (SMAM)

Ministry of Agriculture and Farmers' Welfare launched a Sub-Mission on Agricultural Mechanization (SMAM) in 2014-15 with the objectives of increasing the reach of farm mechanization to small and marginal farmers and to the regions & difficult area where farm power availability is low. To boost up mechanization in the agriculture sector, improved agricultural implements and machinery are essential inputs for modern agriculture that enhance the productivity of crops besides reducing human drudgery and cost of cultivation. Mechanization also helps in improving the utilization efficiency of other inputs and is therefore considered to be one of the most important segments of the agriculture sector to boost the income of farmers and growth of the agricultural economy. For strengthening of agricultural mechanization in the country and to bring more inclusiveness, Sub-Mission on Agricultural Mechanization (SMAM) has been introduced with the main objectives to promote 'Custom Hiring Centres' and 'Hi-tech Hubs of High-Value Machines' to offset the adverse economies of scale arising due to small and fragmented landholding and high cost of individual ownership; creating awareness among stakeholders through demonstration and capacity building activities and ensuring performance testing and certification of agricultural machines at designated testing centres located all over the country.

General Survey of Agriculture

Trend in Food Prices

The rate of inflation, based on monthly WPI, stood at 12.94% (provisional) for the month of May, 2021 as compared to –3.37% during the corresponding period of last year.

Based on Wholesale Price Index (WPI) (2011-12=100), WPI in case of foodgrains increased by 0.12 percent in May, 2021 over May, 2020.

Among foodgrains, WPI of pulses and fruits increased by 12.09 percent and 20.17 percent, respectively, whereas for cereals and vegetables, it decreased by 2.52 percent and 9.00 percent in May, 2021 over corresponding period of last year.

Among cereals, WPI for paddy and wheat decreased by 0.49 percent and 2.54 percent, respectively, in May, 2021 over May, 2020.

The WPI in case of foodgrains increased by 1.06 percent in May, 2021 over April, 2021.

Among foodgrains, WPI for cereals and pulses increased by 0.83 percent and 2.11 percent, respectively, whereas for vegetables and fruits, it decreased by 8.34 percent and 7.16 percent, respectively, in May, 2021 over April, 2021.

Among cereals, WPI for paddy and wheat increased by 0.68 percent and 0.96 percent, respectively, in May, 2021 over April, 2021.

WPI FOOD INDEX (Weight 24.38%)

The Food Index consisting of 'Food Articles' from Primary Articles group and 'Food Product' from Manufactured Products group have decreased by 0.19% from 158.9 in April, 2021 to 158.6 in May, 2021.

Food-vs.-Non-Food Inflation

The inflation rate for non-food items increased by 2.82 percentage points (from 11.74% in April, 2021 to 14.56% in May, 2021) while the inflation rate of food items increased by 0.53 percentage points (from 7.58% in April, 2021 to 8.11% in May, 2021) resulting an increase in WPI based inflation rate for all commodities from 10.49% in April, 2021 to 12.94% in May, 2021.

The Consumer Price Index (CPI) based inflation rate has increased to 6.30% in May, 2021 on point to point basis (*i.e.* May, 2021 over May, 2020) as it was a month ago 4.23%, according to data released by the Central Statistics Office (CSO) on 14th June, 2021. The Consumer Food Price Index (CFPI) for All-India combined has increased to 5.01% in May, 2021 from 1.96% in April, 2021.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative Monsoon Season (June-September), 2021 rainfall for the country as a whole during the period 1st June, 2021 to 30th June, 2021 has been 10% higher than the Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period has been higher than LPA by 17% in Central India, by 14% in North-West India, by 4% in South Peninsula and by 3% in East & North East India.

Out of 36 meteorological sub-divisions, 16 meteorological sub-divisions received large excess/excess rainfall, 12 meteorological sub-divisions received normal rainfall and 08 meteorological sub-divisions received deficient/large deficient rainfall.

Current live storage in 130 reservoirs (as on 01st July, 2021) monitored by Central Water Commission having Total Live Capacity of 174.23 BCM was 55.61 BCM as against 56.19 BCM on 01.07.2020 (last year) and 40.17 BCM of normal storage (average storage of last 10 years). Current year's storage is 99% of last year's storage and 138% of the normal storage.

Articles
Trailing Towards Self-Reliance in Pulses

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Abstract

Grain legumes are excellent source of protein, dietary fibres, starch, micronutrients and vitamins particularly for economically poor section of population in India. The study is targeted to analyse the growth in area and production, demand, availability and trade of pulses in India and also to examine policy options for enhancing pulses production. Pulses reached to all high time production level of 23.92 million tonnes in TE 2018-19.The pulses production registered an annual increase of 3.84 percent in production in nearly last two decades owing to expanding area and better yield. Madhya Pradesh alone contributed about one third (30.95%) of pulses production in India indicating a growth rate of 5.57 percent. Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh share about 70 percent of total pulses production in India. Chickpea, lentil and pigeon pea are vastly cultivated in these states. Uttar Pradesh has indicated a negative growth in pulses due to shifting of area towards wheat, paddy, oilseeds and sugarcane production due to encouraging public policies and profitability. The chickpea area is mostly concentrated in central and southern region of India owing to evolution of short duration with tolerance of biotic and abiotic stresses. The net availability of pulses in India improved noticeably in recent years reaching to level of 20.40 kg/ year /capita as result of higher internal production and large import from North America, Russia, Australia, Myanmar and African nations. India imported one fourth of total pulses production mainly lentil, dry peas, pigeon pea, mung bean and urad bean to meet rising demand of vegetarian population. India also exported kabuli chickpea and organic pulses to markets in Indian sub-continent, African nations and Gulf countries.

Keywords: *Production, Import, Availability, NFSM, Pulses*

1. Introduction

Pulses are edible dry seeds of plants belonging to the *Leguminosae* family and consumed in the form of whole seed, split grain, dehulled split grain and flour. The split grains of these pulses are called dal and are excellent source of high quality protein, essential amino acids, fatty acids, fibres, mineral and vitamins for millions of people in the world. The protein content of grain legumes is almost double the protein content of wheat and thrice that of rice (Rodino *et al*., 2011; Belhassen *et al*., 2019). The higher content of iron in legumes also benefits in alleviating iron deficiency (anaemia) in the population of developing nations. Pulses are predominantly grown under resource poor and harsh environments frequently prone to drought, other biotic and abiotic stresses in the world. Pulses being protein source having low carbon and water footprints and its cultivation also help to reduce the footprints of succeeding crops. Endowed with the unique ability of biological nitrogen fixation, soil amelioration and improving soil physical environment (increase soil microbial activity, solubilize insoluble phosphorous, restoring organic matter) and carbon sequestration,

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Received: 30 Sept, 2020

Editorial Decision: 25 July, 2021

pulses have remained an integral component of sustainable crop production system, especially in the dry areas (Panwar & Srivastava, 2012). Pulses are characterised with low water requirement (250 to 300 mm), capacity to withstand harsh climate, adaptability to inter or mixed cropping, lower input requirement and suitable for human and animal consumption. Pulses meet up to 80 percent of its nitrogen fixation from air and leaves behind substantial amount of residual nitrogen and organic matter for subsequent crops (Singh, 1995).

United Nations declared 2016 as International Year of Pulses to heighten people awareness of the nutritional benefits as part of sustainable food production (improving soil fertility and environment) aimed towards achieving food and nutritional security. Presently, at the global level, pulses are the second most important group of crops after cereals. Pulses are produced on 12-15 percent of global arable land and contributing 33 percent of the dietary protein nitrogen (N) needs of humans (Graham & Vance, 2003). The global pulses production was 86.32 million tonnes from an area of 88.47 million ha with an average yield of 975 kg per ha in 2018 (FAO, 2018). The major contribution in global pulses production was Asia (43.55 percent) trailed by Africa (22.02 percent), North America (11.27 percent) and Australia (3.18 percent) in 2018.

Production of pulses is largely restricted to Asian countries and particularly in the Indian sub-continent. The diversified agro-climatic condition in India positively supports the cultivation of more than one and half dozen pulses in various regions in kharif, rabi and spring/summer seasons. India is the largest producer of pulse sharing 27.09 percent of total global production (86.32 million tonnes) from an area of 29.03 million ha. The productivity of pulses in is still low in India as pulses are grown in poor fertility lands with minimum inputs, biotic stresses and rainfed conditions (80 percent of total pulses area). Pulses are considered as a high risk crops in India being neglected since the Green Revolution. As a result, the productivity of the pulses in India is quite low, even less than one tonne ha^{-1} compared to wheat and rice (Johansen *et al*., 2000). India is largest producer of chickpea, lentil and pigeon pea with 66.19 percent, 25.58 percent and 71.97 percent of global production (FAO, 2018). Chickpea, pigeon pea, urad bean, mung bean and lentil are important pulses contributing 43.29 percent, 15.33 percent, 13.92 percent, 10.03 percent and 6.67 percent, respectively, to the total pulses production (23.40 million tonnes) in India. The other pulses like field pea, moth bean, horse gram, lathyrus (khesari), cowpea, rajmash, etc. covered the remaining pulses production. The pulses in India are grown in semi-arid areas which face high rainfall variability adding to high instability and low productivity. The plot of lands with better fertility and having adequate irrigation facility is usually not allotted to pulses and its cultivation is pushed to marginal lands (Joshi & Saxena, 2002; Lingareddy, 2015). The production of pulses in India has witnessed an upward trend during first few years and it has consistently remained about 16 million tonnes or higher since 2010. The pulses as integral part of cropping systems particularly in rice-wheat as it helps to restore soil fertility, weed influx and higher prevalence of biotic stresses by checking soil pathogen and nitrogen fixation.

Pulses are the backbone of Indian agriculture as well as the predominantly vegetarian diets of millions of people. Pulses are consumed equally by India's rich and poor as it is one of the less expensive sources of protein (Mohanty & Satyasai, 2015). Pulses on account of their vital role in the nutritional security and soil ameliorative properties have been an integral part of sustainable agriculture since ages. Pulses, as an important source of protein, constitute a basic ingredient in the diet of vast majority of poor and vegetarian population in India. Pulses are not only a low cost source of protein for majority of Indian consumers but also low cost substitute for vegetables in periods of their higher prices.

India is yet to achieve self-sufficiency in pulse production against its aggregate demand. The decline in the consumption of pulses has lead to increase in malnutrition and decline in protein intake (Shalendra *et al*., 2013). India is still a home to about 24 percent of undernourished people in the world (Sharma *et al*., 2016). About 15.2 percent of people in India are undernourished. The low production of pulses in India has resulted in increasing deficit on the one hand and reduction

of foreign currency reserves by mounting import bills, unpredictable price rise and lower net profit compared to competing crops, imbalance in cropping pattern on the other hand (Joshi & Saxena, 2002; Srivastava *et al.*, 2010; Tuteja, 2011).

1.1 Objectives of the Study

The present study has been attempted with objectives:

(*i*) to analyse growth in area and production for India as well as major pulses growing states,

(*ii*) to examine demand availability and trade of pulses in India and

(*iii*) to study the policy interventions for enhancing pulses production in India.

2. Data Source and Methodology

The study is based on the information extracted from various issues of "Agricultural Statistics at a Glance" published by Directorate of Economics and Statistics, Government of India, websites of Agricultural and Processed Food Products Export Development Authority (*APEDA*), FAOSTAT and other reliable published sources. The data pertaining to area, production, import, export, net availability of pulses for India as well as various destinations of export and import of pulses in the world were mined from published sources. The planted area and production figures were assembled for the major pulses growing states like Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh for the time period 2000-2019. The information related to policy interventions for inducing pulses production in India was extracted from websites/ reports of Indian Council of Agricultural Research, crop development programs like National Food SecurityMission (NFSM), Bringing Green Revolution to Eastern India (BGREI), Rashtriya Krishi Vikas Yojana(RKVY), etc. funded by Indian government. The triennium endings (three year average) were intended to escape fluctuation in data. The descriptive statistics and tabular analysis was done to arrive at meaningful inferences.

To estimate the Compound Growth Rates (CGRs) in area and production of pulses for the period under study *i.e.* 2000-2019 for India as whole and major pulse nurturing states of India, the time period was split into three periods; Period-I (2000-01 to 2009-10), Period-II: (2010-11 to 2018-19) and Period-III/Overall Period: (2000-01 to 2018-19). The CGRs for area, production and yield of pulses for different periods were intended using the following formula:

$$Y = ab^t$$

Where, Y = Dependent variable in period t (Area/production)

a = intercept

b = Regression coefficient

t = Years which takes value

The equation was transformed into linear form by taking logarithm on both sides for estimation purpose. The compound growth rate (r) in proportion was then computed using the equation as Compound growth rate (r) = [Antilog (b) -1]*100.

3. Results and Discussion

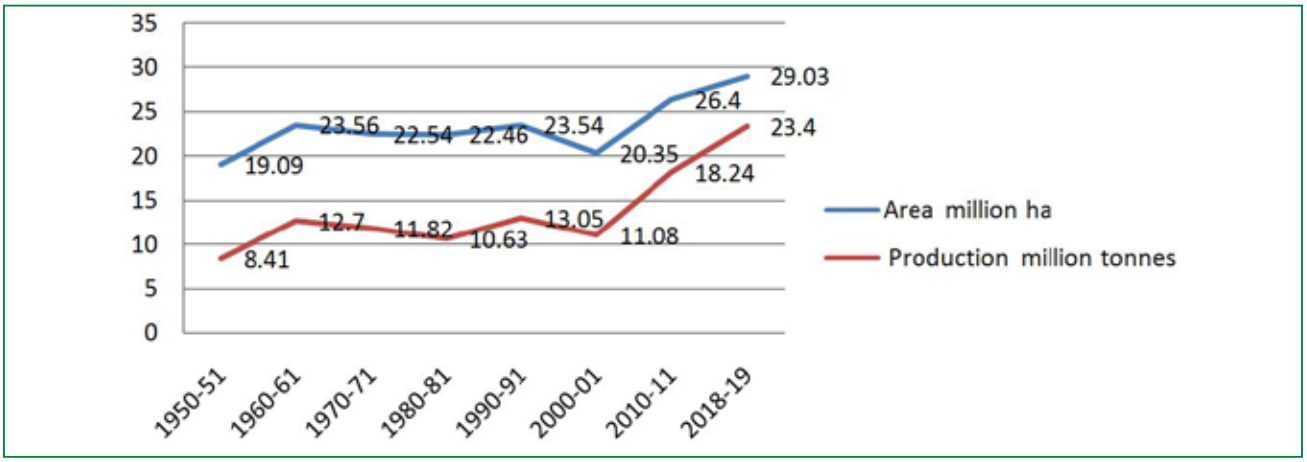
3.1 Pulses production in India

Pulses are an affordable source of protein and minerals for a large proportion of rural population in the world. Pulses are important legume crops in food, feed and farming systems of South Asia, North and East Africa. Pulses are also grown on large areas in North America, Australia and Russia to tap emerging import markets in South Asia and Middle East countries. India is a leader in production, consumption and import of pulses in the world. India is the only nation growing a variety of pulse crops which none of the other nations in the world cultivate. It ranked first in acreage under chickpea, pigeon pea and lentil

on area of 9.44 million ha, 4.78 million ha and 1.51 million ha, respectively, in 2018-19. The other important pulse grown in India are field pea, black gram (urad bean), green gram (mung bean), French bean, lathyhrus (grass pea), moth bean, cowpea, horse gram (kulthi), etc. Pulses are primarily cultivated in rainfed conditions as sole crop or intercropping/mixed cropping in all three seasons in different environments in India. Some pulses like urad bean and mung bean are cultivated throughout the year in one or other region of India.

The area under pulses is more or less static being around 20 million ha over the period ranging from 1950s to 2000s (Bera *et al*., 2011). Pulses have received limited policy support despite their multiple benefits. The area under pulses has dropped in North India, while it has extended in Central and South India (Ali & Gupta, 2012; Gowda *et al*., 2013). The regional area shift reported was noticeable in case of chickpea. The pulses cultivation in irrigated areas of North India were also replaced by fine cereals, cotton, sugarcane, oilseeds and their cultivation confined largely in dry land areas after inception of Green Revolution in late sixties. The plausible reasons for stagnancy in production and more or less in area up to 2000s are narrow genetic base, less focussed research efforts, more vulnerable to biotic stresses, low inputs use, usage of farm saved seeds, low adoption of crop management practices (CMP), rainfed cultivation, moisture stress during various stages of pulses. All these elements resulted in low farm yield of around 400-600 kg ha^{-1} (441 kg ha^{-1} in 1950-51 to 541 kg ha^{-1} in 2000-01) persisting higher gap between achievable yield and farm yield of pulses in various regions.

Figure 1: Area and Production of Pulses in India



Source: 'Agricultural Statistics at a Glance', DES, Ministry of Agriculture and Farmers Welfare, Govt. of India

The production level of pulses was around 10-12 million tonnes upto end of 19th century and it was a matter of concern due to rising demand till 2010 (Figure 1). The pulses production remained unattractive to Indian farmers owing to relatively low yield of pulses and favoured policy support to fine cereals (Ahlawat *et al*., 2016). The increase in pulses production was 3.84 percent annually with growth of 1.68 percent in area during nearly two decades (Table 1). The annual increase in area (2.45%) in period-II (2010-19) was more than double the growth rate of area (1.16%) in period-I (2000-2009) as pulses (pigeon pea, chickpea, lentil) cultivation increased in rice fallow areas, in Central and Southern region of India, summer mung bean under rice-wheat system in North India and field pea in Uttar Pradesh. The growth rate of pulses production for period-II (4.12%) was higher than period-I (2.71%) as pulse growers were incentivised and made accessible to quality

seeds and improved production technologies under various centrally sponsored pulses oriented programmes in 11th Plan.

Since 2010, the production level of pulses increased considerably and it was consistently more or equal to 16 million tonnes and it has been obtained largely due to higher yield (Sharma, *et al.*, 2013). There was record increase in pulses production after 2015-16 and it was all time high *i.e.*, 25.42 million tonnes in 2017-18 though there is a slight decline in pulses production in 2018-19 (4th crop estimate). The slight increase in pulses production was recorded in 11th Plan with the implementation of Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (*ISOPOM) in 2004* in mission mode approach targeting 171 districts of 14 states. The further increase in pulses production was harnessed with inception of especially pulses focussed NFSM program in 2007-08. The various pulses centric interventions under NFSM with active involvement of various stakeholders, research support to ICAR institutes and State Agricultural Universities (SAUs) and their technical backstopping accelerated the pace of pulses production through intensifying planted area and boosting yield.

3.2 Pulses production in major states

Pulses are grown in almost all states of India. However, commercial cultivation of pulses is experienced to large extent in 16 states excluding North Eastern India, hilly states (Jammu & Kashmir, Himachal Pradesh and Uttarakhand), Kerala and Goa. Among these, Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh contributed 80 percent of total pulses production with share of 78.23 percent of total pulses area in India (2018-19). The production of pulses is concentrated in Central, Southern and Western regions of India. There is a large variation in irrigated harvested area under pulses among states and it varied from 7.10 percent in Andhra Pradesh to 42.80 percent in Madhya Pradesh.

TABLE 1: AREA UNDER PULSES IN VARIOUS STATES OF INDIA: 2000-19

State	Triennium ending				Compound growth rate (%)		
	TE 2000-03	TE 2012-13	TE 2018-19	Average (19 years)	Period-I	Period-II	Period-III
			Area(Lakh ha)				
Chhattisgarh	7.72	6.69	8.01	8.20	1.58	5.32	-0.48
Karnataka	35.28	40.73	35.16	23.44	2.33	3.79	2.05
Madhya Pradesh	39.54	52.21	70.08	50.73	1.86	4.75	3.34
Maharashtra	35.05	35.28	40.73	36.25	–0.12	1.27	0.59
Rajasthan	25.12	41.53	55.02	38.45	4.55	3.89	3.66
Uttar Pradesh	26.84	24.12	23.58	23.43	–1.76	7.01	–4.38
India	**209.50**	**247.10**	**294.90**	**242.06**	**1.16**	**2.45**	**1.68**
			Production (lakh tonnes)				
Chhattisgarh	3.61	4.19	6.12	4.86	5.22	11.26	2.46
Karnataka	8.00	13.19	18.19	11.85	4.86	4.21	5.42
Madhya Pradesh	26.25	42.38	74.04	60.34	14.65	10.28	5.57
Maharashtra	18.59	25.58	30.77	23.31	3.03	-0.09	2.22
Rajasthan	8.81	25.50	34.15	21.16	23.84	3.77	12.45

State	Triennium ending				Compound growth rate (%)		
	TE 2000-03	TE 2012-13	TE 2018-19	Average (19 years)	Period-I	Period-II	Period-III
	Production (lakh tonnes)						
Uttar Pradesh	22.46	22.57	22.62	20.56	–2.80	-0.19	–1.10
India	**118.60**	**178.80**	**239.20**	**164.82**	**2.71**	**4.12**	**3.84**

Source : Agricultural Statistics at a Glance, Ministry of Agriculture and Farmers Welfare , Govt. of India

Among six states in which pulses are cultivated on large scale, Madhya Pradesh constituted 18.87 percent of total area in TE 2002-03. The other states, Maharashtra, Karnataka, Rajasthan, Uttar Pradesh and Chhattisgarh shared about 62.06 percent of total area. The area under pulses increased by 17.16 lakh ha in Madhya Pradesh and 5.49 lakh in Karnataka while it was almost stagnant in all other states upto TE 2012-13 (Table 1). The increase in area of pulses was about 1.77 times in Madhya Pradesh and 2.19 times in Rajasthan in nearly last two decades (2000-2019). The area under pulses indicated slight decline in Uttar Pradesh and marginal increase in Chhattisgarh over years. The total pulses in India increased by 85.40 lakh ha in the same period revealing growth rate of 1.68 percent. The share of all the six states dropped from 80.93 to 78.87 percent of total pulses area because of increased pulses cultivation in rice fallow areas of Eastern states, Andhra Pradesh, Telangana. The annual increase in area was recorded highest (3.66%) in Rajasthan followed by Madhya Pradesh (3.24%), Karnataka (2.05%). The growth rate of pulses area in Uttar Pradesh (-4.28%) and Chhattisgarh (-0.48%) was found negative in overall period. The growth rate of pulses was found positive in period-I and period-II except slight decline in Uttar Pradesh (-1.76%) and Maharashtra (-0.12%) in period-I. The increase in area in the state of Madhya Pradesh was due to additional area brought under cultivation and expanded irrigated net sown area. The increase in area in Rajasthan might be attributed to shifting of area from cluster bean, pearl millet and barley because of low profitability. The higher area in Karnataka was reported (Nethrayini & Mundinamani, 2013) due to shift of area towards chickpea and pigeon pea from less profitable sorghum, millets, cotton, etc. The area under pulses in Uttar Pradesh declined over years owing to decline in acreage under chickpea, lentil and pigeon pea as area shifted towards less risky crops like paddy, wheat, sugarcane and oilseeds. The scenario of pulses cultivation has drastically changed in India during the past five decades primarily because Green Revolution exaggerated wheat, paddy, cotton and sugarcane cultivation in Northern India switching from chickpea, pigeon pea, lentil, mung bean. The development of short to medium duration terminal heat escaping chickpea varieties suitable to warmer, short season environment and with comparative advantage over competing crops has resulted in area under chickpea to leap in Central and Southern India. There has been a major shift (about 4.0 million ha) in chickpea area from Northern India (Punjab, Haryana and Uttar Pradesh) to states of Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka (Gowda *et al*., 2015).

The pulses production in India touched to all time high level (25.42 million tonnes) in 2017-18 since 1950s. The pulses production was 23.92 million tonnes even after taking average of last three years (2016-2019). The contribution of all six states in total pulses production in India increased from 73.94 to 77.72 percent over time span of 19 years. The pulses production was largely contributed by Madhya Pradesh (22.13%) in TE 2002-03 followed by Uttar Pradesh (18.94%), Maharashtra (15.67%), Rajasthan (7.43%), Karnataka (6.75%) and Chhattisgarh (3.04%). Pulses production increased about three times in Madhya Pradesh over 19 years as it was only 26.25 lakh tonnes in TE 2002-03 which augmented to 74.04 lakh tonnes TE 2018-19. The increase in pulses production was attained in Rajasthan (4.0 times), Maharashtra (1.5 times), Karnataka (2.0

times) and Chhattisgarh (1.5 times) in nearly last two decades as rates of increase in area and yield were the dominant sources of pulse output growth. However, Madhya Pradesh alone backed about one-third (30.95%) of pulses production in India in TE 2018-19. The other states like Maharashtra (12.86%), Rajasthan (14.28%), Uttar Pradesh (9.46%), Karnataka (7.61%) and Chhattisgarh (2.56%) contributed about 47 percent of total production. The pulses production for all states exhibited positive signs in all periods expect Uttar Pradesh (Meena *et al*., 2016; Avinash & Patil, 2018) as combined effect of expanding area and better yield. The per annum increase in pulses production was attained highest in Rajasthan (12.45%), trailed by Madhya Pradesh (5.57%), Karnataka (5.42%), Maharashtra (2.22%) and Chhattisgarh (2.46%) after 2000s. The higher level of pulses production in all states was achieved in TE 2018-19 as focussed approach for various interventions like cluster demonstrations, production and distribution of quality seed, propagation of production and protection technologies, adoption of micro-irrigation, creation of irrigation structures, etc. was targeted under various crop centric programs like NFSM. RKVY, BGREI, PMKSY etc. The pulse production dropped in Uttar Pradesh as decline in area was not covered by improved yield.

The yield of pulses in India is still around 700-800 kg ha^{-1} and it is less against global average yield (975 kg ha^{-1}) particularly for pulses like chickpea, pigeon pea and lentil. The poor yield realization in pulses in India and also in states is accredited to geographical shift, weather aberrations, complex diseases and pests condition, cultivation in rainfed and poor soil fertility, low inputs use, moisture stress, terminal heat, poor SRR and VRR, usage of farm saved seeds, higher amount of risk involved, inadequate procurement arrangements, difficulty in storage of produce, limited use of farm machinery, low involvement of private sector in research and development activities, etc. An improved technology propagation to bridge the yield gap and extending area under pulses in rice fallow areas, replacement of low productive crops, cultivation as intercropping/sequential cropping will likely boost pulses production in India (Roy *et al*., 2011; Grover & Singh, 2012; Inbasekar, 2014; Singh *et al*., 2015).

3.3 Demand and availability of pulses

The growth in production of pulses in India has not retained stride with the growth in population after 1990s due to lack of adequate returns to producers (Meena *et al*., 2016). Until the late 1990s, India continued to be nearly self-reliant in pulses and had not necessitated any sizable imports. The annual import of pulses (0.54 million tonnes) was low during 1990s and 2000s even with less domestic production (13.21 million tonnes), taken average of 11 years. During 2001-2008, there was a sharp increase in import, nearly four times of annual import of pulses in 1990-2001. There was just a marginal increase in annual production. This might be accredited to gradual reduction of import duty, trade liberalization, higher income and population growth. The decadal total pulses availability for 2009-19 indicate that annual import (4.23 million tonnes) increased to 8.0 times of the period 1990-2001 and more than 2.0 times of the period 2001-08 even with a rise in production (19.30 million tonnes) in India (Table 2). The removal of trade barriers, abolition of custom duty on pulses from 2013 onwards and increased purchasing power of consumers are the major contributors for sizable pulses import in India.

TABLE 2: Import, Export, Production and Net Availability of Pulses in India during Last Decades

(Million tonnes)

Period	Import	Export	Production	Net availability
1990-91 to 2000-01 (11 Years average)	0.54	0.09	13.21	13.66
2001-02 to2007-08 (8 years average)	2.07	0.22	13.68	15.53
2009-10 to2018-19 (10 Years average)	4.23	0.21	19.30	23.32

Source: Agricultural statistics at a Glance published by Ministry of Agriculture and Farmers Welfare, Govt. of India

The per capita net availability of pulses in India was 25.70 kg/year/capita in 1956, which reduced to 13kg/year/capita in the year 1981 and further dropped to 10.90 kg/year/capita in the year 2003. The continuous decline in availability of pulses is attributed to a stagnant production which was lagging behind consumption requirement owing to higher growth in population and introduction of protein based industries (Tuteja, 2011; Pataki *et al*., 2017). However after 2000s, with the increase in production of pulses owing to expanding area and yield enhancement supported with policy interventions and production incentives to boost domestic production and increased imports, accessibility of pulses has started improving and has presently reached 20.40 kg/year/capita (GoI, 2018). Moreover, pulses are also included under targeted public distribution system (TDPS) to improve the accessibility to economical poor population in some parts of India. Though the production of pulses has registered an impressive growth in the recent decade, it is not in pace with the increase in the population. Still the pulses availability is less than 23.725 kg/year/capita as recommended by Indian Council of Medical Research (ICMR). The present pulses availability is quite significant as per dietary concern because there are other sources of protein such as milk and milk products, meat, egg, etc. to meet daily protein requirement. Moreover, food consumption pattern has undergone considerable change owing to various factors like increase in income, urbanization, change in consumer taste and preferences, awareness about safe and healthy food, etc. The dietary plan has moved from cereals and pulses towards fruits, vegetables, processed food and non-vegetarian food (Shalendra *et al*., 2013). The demand of pulses is estimated to be 39 million tonnes by 2050, which will require production growth of 2.2% per annum and productivity of pulses to be raised from around 750 kg ha^{-1} to 1350 kg ha^{-1} taking into consideration land availability (25 million ha) for pulses(Anon., 2015). To ensure adequate availability of pulses in future, it is essential to take proactive steps to improve pulses production by developing high yielding cultivars and adopting more efficient production and protection technologies with constructive policy options, procurement arrangement, lucrative MSP to motivate the farmers to cultivate more area under pulses particularly in rice fallow areas in Eastern and costal states, summer pulses in rice-wheat cropping system, intercrops with wide spaced crops and on farm bunds. Pulses demand is very sensitive to price among low-income consumers and substitute with vegetables, however substitution among pulses is limited as per tastes and preference of consumers in India.

3.4 Pulses trade in India

India is also a major importer of pulses driven by a high domestic consumption. During the 1970s and 1980s, India adopted a protectionist trade policy with respect to pulses import to protect pulse growers by imposing quantitative restrictions, quotas, tariffs and a variety of other equally prohibitive trade mechanisms (Agbola, 2003). In the 1990s, India undertook structural reforms and adopted a more liberal outlook on international trade, leading to significant reductions in tariff and non-tariff barriers. The import duties on pulses declined steadily during the 1980s and 1990s (Gregory *et al*., 2003). From 1989 to 1994, the import duty on pulses was only 10 percent and it was further reduced to 5 percent in 1995 and ultimately, it was abolished entirely in 2000. In 2001 again, custom duty of 5 percent was imposed on pulses import and in 2002–2003 it was increased to 10 percent (Sathe & Agarwal, 2004). From 2007-12, imports of pulses were made almost duty free and the custom duty on import of pulses was completely eliminated in 2013 (Negi & Roy, 2015). The perpetual scarcity in Indian pulses production in the wake of mounting domestic demand and adoption of more liberal approach to international trade led to a rise in the volume of imports. The current pulses scenario in India exemplifies that the domestic supply of pulses which was more than 22 million tonnes in last three years was not sufficient to meet the growing demand in domestic markets. This was due to the fact that different parts of India have dietary inclinations for specific type of pulses. An interesting pattern of consumption that is seen for pulses in India is very little substitution among different types of pulses (Joshi *et.al*, 2017).

TABLE 3: NET AVAILABILITY OF PULSES IN INDIA: 2000-2019

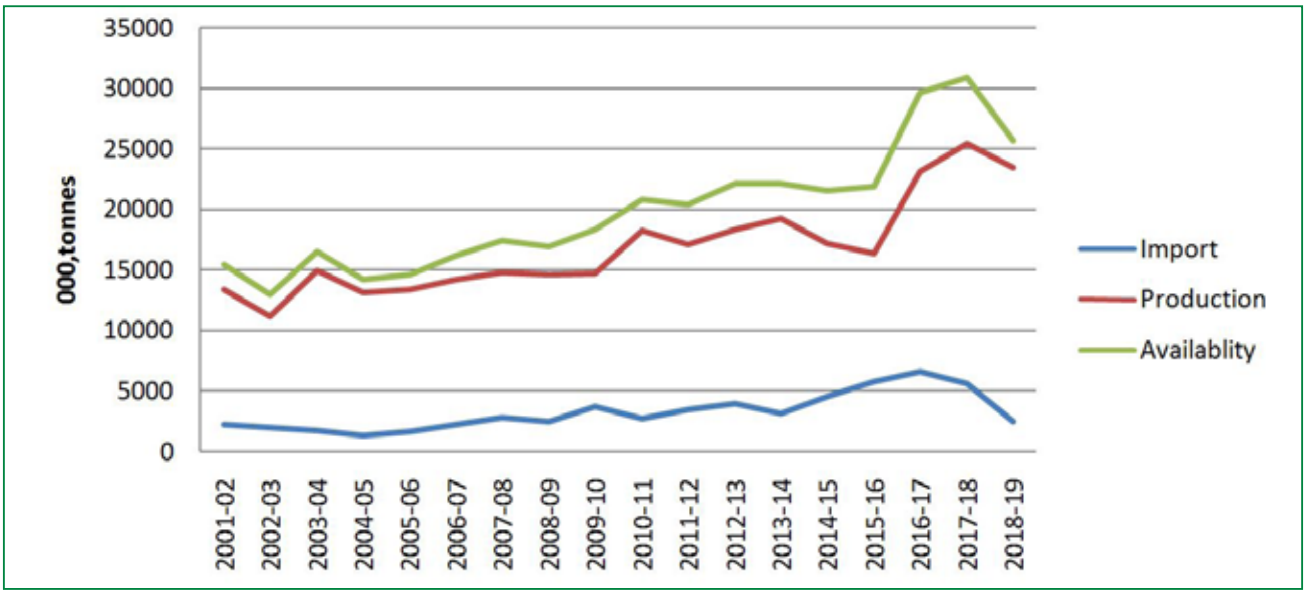
	Quantity (000, tonnes)				% to total production	
Year	Import	Export	Production	Total availability	Import	Export
2001-02	2217.82	161.64	13370	15426.18	16.59	1.21
2002-03	1992.29	148.08	11130	12974.21	17.90	1.33
2003-04	1723.33	153.88	14910	16479.45	11.56	1.03
2004-05	1339.45	271.18	13130	14198.27	10.20	2.07
2005-06	1695.95	447.44	13380	14628.51	12.68	3.34
2006-07	2270.97	250.70	14200	16220.27	15.99	1.77
2007-08	2835.05	164.20	14760	17430.85	19.21	1.11
2008-09	2474.11	136.27	14570	16907.84	16.98	0.94
2009-10	3749.99	100.13	14660	18309.86	25.58	0.68
2010-11	2777.83	209.02	18240	20808.81	15.23	1.15
2011-12	3495.84	173.50	17090	20412.34	20.46	1.02
2012-13	4013.24	202.67	18340	22150.57	21.88	1.11
2013-14	3177.89	345.55	19250	22082.34	16.51	1.80
2014-15	4584.85	222.10	17150	21512.75	26.73	1.30
2015-16	5797.71	255.60	16320	21862.11	35.53	1.57
2016-17	6608.95	137.18	23130	29601.77	28.57	0.59
2017-18	5607.26	179.11	25420	30848.15	22.06	0.70
2018-19	2527.88	285.78	23400	25642.10	10.80	1.22
CGR (%)	**6.95**	**0.92**	**3.80**			

Source: Agricultural Statistics at a Glance, Ministry of Agriculture and Farmers Welfare, Govt. of India

Considerable quantity of pulses (13.70 million tonnes in 2018) had been imported by 130 nations in the world (APEDA, 2018) as to meet consumption demand of nations which have been unable to produce and capture through internal production. India imports pulses mainly from North America (dry pea, lentil), Russia (chickpea), Australia (chickpea), Myanmar (urad bean, mung bean, pigeon pea) and African nations (pigeon pea). The share of pulses imported to total domestic pulses production in India was lowest (10.20%) in 2004-05 and it was highest in (35.53%) in 2015-16 (Table 3). The import of pulses in India exhibited secular (positive) trend with growth rate (6.95%) in last two decades reasonably higher as large quantity of pulses were imported to meet rising demand due to trade liberalization (Sharma *et al*., 2013). The impact of trade liberalization has been quite visible on the growth rates of import and export of pulses in India (Figure 2). The higher demand of pulses in India might be stimulated due to higher income and population growth in India and some developed economies increased their production taking advantage of economies of scale to capture market in India (Merga & Haji, 2019). Barring two years 2010-11 and 2013-14, the portion of pulses import varied between 20-35 percent of total internal production in last decade even with higher domestic production (Table 3). The higher growth rate (15.19%) of pulses imported in value term in last two decades triggered heavy burden on national exchequer. India imported 42.34 million tonnes of total pulses with worth of 25.11 million (000, US dollar) in last ten years (2009-19) and out of which Canada (38.18%), Myanmar (17.93%) and Australia (13.25%) being leading among top ten nations. The others nations exporting pulses to India are Russia (6.79%), USA (4.58%), Tanzania

(3.19%), Ukraine (2.88%), Mozambique (2.40%), France (1.68%), Malawi (1.04%) and accounted for 22.57 percent of total pulses import in India (Figure 3). The export of pulses especially chickpea and lentil from African nations was not much due to cultivation of low yield potential of local cultivars owing to poor cultural practices, susceptibility to biotic and abiotic stresses, unavailability of improved seed, non-reach of high-yielding varieties with market-preferred traits and poor market mechanism (Maya & Maphosa, 2020).

Figure 2: Import, Production and Net Availability of Pulses in India



Source: Agricultural Statistics at a Glance, DES, Ministry of Agriculture and Farmers' Welfare, Govt. of India and FAOSTAT, Food and Agriculture Organisation (FAO), Rome, Italy

Figure 3: Nations Exporting Pulses to India

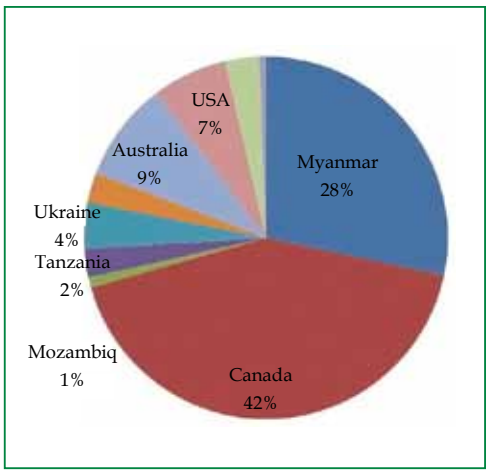
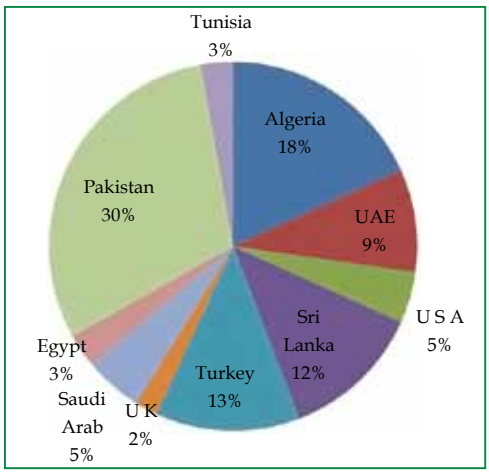


Figure 4: Nations Importing Pulses from India



Source: FAO STAT, Food and Agriculture Organisation (FAO), Rome, Italy

India is leader in import of pulses in world and it also ranked 8th in export of pulses to various destinations in the world indicating very low growth rate (0.92%) during 2000-19. The export of pulses has been completely banned in India since 2006 except Kabuli chickpea and organic pulses like lentil, pigeon pea. The pulses export from India varied from 0.68 percent to 1.80 percent of total domestic production in last one decade (Table 2). During 2009-2019, the total pulses exported were about 2.11 million tonnes with a growth rate of 0.44 percent per annum with value of 2.16 million (000, US dollar). Out of total exports in last ten years, Pakistan (23.40%), Algeria (14.09 %), Turkey (9.78%) and Sri Lanka (9.60%) shared 56.87 percent (Figure 4). The other importing nations like UAE (6.99%), Saudi Arabia (3.92%), USA (3.48%), Egypt (2.30%), Tunisia (2.20%) and United Kingdom (1.57%) contributed 20.47% of total pulses exported from India. The pulses like kabuli chickpea, lentil, pigeon pea, etc. are exported predominantly to Middle East nations, South Asia and to Indian population dominating nations of North America and Europe.

3.5 Policy interventions for pulses in India

All India Coordinated Pulses Improvement Project (AICPIP) come into existence in 1967 with aim to address various researchable issues for increasing production and productivity of pulses in India. Further, considering production potential of pulses, AICPIP was bifurcated into three groups *i.e.* chickpea, pigeon pea and MULLaRP. ICAR in coordination with State Agricultural Universities (SAUs), ICRISAT, WVC and ICARDA released more than 560 high yielding cultivars having biotic and abiotic tolerance suitable for cultivation in different crop seasons in diverse production environments of India (Singh & Partap, 2015).

Pulses Development Scheme was initiated for the first time in the 4th Plan (1969-74) for introduction of production technologies and improved varieties. Further to enhance adoption of improved technology, National Pulses Development Project (NPDP) was launched in 1985-86 (7th Plan) in 13 states. Later on, to supplement the efforts under NPDP, a program "Special Food Grain Production Programme (SFPP)" on pulses was also implemented during 1988-89 on 100 percent funding from Government of India. To provide further impetus, NPDP for pulses was brought under the ambit of Technology Mission on Oilseeds (TMO) in 1990 which was introduced for oilseeds in 1985. Later on, NPDP and TMO were merged in "Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize (ISOPOM)" launched in 2004 (10th Plan) and it was implemented for pulses in 14 states with major emphasis on production and distribution of quality seed, adoption of improved technologies, timely supply of necessary inputs, extension support, strengthening the market inventions, effective pricing policies and post-harvest technologies for increasing pulses production with the mission mode tactic. The integrated research and extension efforts which aimed at better utilisation of fallow areas have been fruitful and area under pulses has increased considerably in rice fallow areas in different agro-ecologies of India.

Considering the importance of pulses in food security, National Food Security Mission (NFSM) was propelled during in 2007-08 (11th Plan) to enhance the production of rice, wheat and pulses by 10 million tonnes, 8 million tonnes and 2 million tonnes, respectively, through area expansion and productivity enhancement by the end of 2011-12. The interventions included promotion and extension of improved technologies *i.e.*, seed, integrated nutrient management-INM (micro-nutrient, soil amendments), integrated pests management-IPM and resource conservation technologies along with capacity building of farmers. The mission targeted an area of 17 million ha under pulses in 171 identified districts of 17 states. Close to 1.27 million ha was added to the area under cultivation by 2011-12 through the utilisation of rice fallows, inter-cropping with wider-spaced crops and replacing coarse cereals and attained additional production of 2.89 million tonnes with increased yield of 87 kg ha^{-1}. To accelerate the pulses production, other programs like Accelerated Pulses Production Programme (A3P) was implemented during 2010-14 with intervention to demonstrate production and protection technologies in village-level blocks in 16 states. Special initiatives for "Pulses and Oilseeds in Dry Land Area" under RKVY during 2010-11 in

7 states; Integrated development of 60,000 pulses villages in rainfed areas under RKVY during 2011-12 in 11 states and "Special plan to achieve 19+ million tonnes of Pulses production during Kharif 2012-13" in 8 states and additional area coverage of pulses rabi/summer under NFSM-Pulses for additional rabi/summer production during 2014-15 in 14 states had also been implemented.

During 12th Plan, pulses element of NFSM was extended to 638 districts of 29 states in India with additional production target of 4.0 million tonnes by the end of 12th Plan. Further, activities like large scale cluster demonstrations by KVKs, distribution of seed minikits, creation of 150 seed hubs in 24 states for production of quality seed, strengthening of 12 research centres in 8 states for additional breeder seed production, inclusion of pulses in cropping system approach were also introduced and mission achieved success in realizing additional production of 6.04 million tonnes by end of 2016-17. The rice-pulses cropping system under BGERI in 2015-16 was introduced to promote cultivation in rice fallow areas in 7 Eastern states of India to generate additional pulses production. In addition to NFSM, the centrally sponsored schemes like Pradhan Mantri Krishi Sinchai Yojana (PMKSY) and Pradhan Mantri Fasal Bima Yojana (PMFBY) launched in 12th Plan have been extended to large areas to accelerate pulse production. Besides, Accelerated Crop Production Programme (ACPP) was initiated to take up demonstration of production and protection technologies in a cropping system based mode in large blocks of crop area. The minimum support price (MSP) of pulses was increased considerably in 2019-20 with 14 percent in pigeon pea and urad bean, 21 percent in lentil and chickpea, 36 percent in mung bean over 2016-17 to promote pulse as a profitable venture.

Research and Development projects have been sanctioned to ICAR institutes, ICRISAT and ICARDA under NFSM to resolve emerging researchable concerns, validation and refinement of improved production technologies in 11th and 12th Plans. Central Government has launched Pradhan Mantri Annadata Aay Sanraks Han Abhiyan (PM-AASHA) scheme in 2018 to provide remunerative price of pulses to farmers under Price Support Scheme (PSS), Price Deficiency Payment Scheme (PDPS) and pilot of Private Procurement & Stockist Scheme (PPSS).

4. Conclusions and Policy Implications

Food legumes are rich source of proteins. Pulses require less chemical fertilizers and have the ability to fix nitrogen from atmosphere, thereby reducing subsidy cost, improving carbon content in soil and raising productivity of subsequent crops.

India achieved all time high pulse production of 25.42 million tonnes during 2017-18. The growth rate of production was 3.84 percent with an annual increase of 1.68 percent in area and boosting yield during TE 2000-03 to TE 2018-19. Madhya Pradesh and Maharashtra alone contributed about 43.81 percent of total pulses production while Uttar Pradesh and Rajasthan pooled about 25 percent in TE 2018-19. The highest growth rate of pulses production was attained in Rajasthan, Karnataka and Madhya Pradesh owing to expansion in area and higher yield (increase in irrigated area, use of quality seeds, accessibility to short duration and resistant varieties especially in chickpea) in last two decades. The net availability of pulses increased considerably due to higher production and large import from developed economies like Australia, Canada, USA, Russia and developing economies like Myanmar and African nations. Imports consisted of pulses like lentil, dry peas, pigeon pea, mung bean and urad bean. India also exported kabuli chickpea and organic pulses to African countries and nations like United Kingdom and USA.

No doubt, higher pulses production is attributed to expanding area and also to improved yield after 2000s. This is primarily due to development and adoption of high yielding cultivars, accessibility to quality seeds, incentives to pulses growers, creation and rejuvenation of irrigation structures, market support, increased use of inputs, etc. About one fourth of production is imported to meet ever rising domestic demand in India.

For achieving the production target of 39 million tonnes in 2050 and being self-reliant in pulses, the following suggestions are made:

(*i*) Development of cultivars characterised by drought, heat, disease tolerance and suitable to mechanical harvesting and appropriate for different agro-ecologies in India with sustained production technology incentives and extension of micro irrigation system under NFSM, RKVY, PMKSY, BGREI, PMFBY, etc. to improve the yield of pulses.

(*ii*) The untapped potential areas like rice fallow areas in peninsular region of India; intercropping with coarse cereals, oilseeds, widely spaced crops (cotton, sugarcane); replacement of low return crops; cultivation on farm bunds/rice bunds; summer pulses in rice-wheat system should be targeted to bring extra area under pulses for achieving higher production in India.

(*iii*) Quality seed production through seed village program, involvement of NGOs, SHGs, private sector for faster spread and better accessibility as well as adoption of cost cutting technologies (seed priming, bio-fertilizers, bio-control agents and IPM modules) should be scaled up for higher returns in pulses growing areas.

(*iv*) Insurance of pulses at minimal premium, adequate procurement arrangements, price deficiency payment mechanism (Madhya Pradesh model), lower limit of stock, proper storage facilities and creation of buffer stock are also essential elements for sustained pulses production in India.

(*v*) Public private partnership (PPP) model for pulses as implemented in some states like Karnataka, Madhya Pradesh, Maharashtra and Tamil Nadu should be replicated in other states by taking various activities through for production, branding, processing, marketing, retailing and export to improve productivity and profitability of pulses.

(*vi*) Considering environmental benefits of pulses cultivation, additional allocation as incentive should be given to the states having large area under pulses.

(*vii*) Research should also be focused to evolve higher protein, zinc and iron content cultivars to address malnutrition problems in developing economies like India.

(*viii*) The inclusion of pulses in TDPS to offer at affordable price to vulnerable section of population, mid-day meal (MDM) program and supplementary nutrition program (SNP) to address nutrient deficiency.

(*ix*) Collaboration/MoU with African countries or land abundant nations suitable for pulses cultivation should be explored for cultivation of specific pulse crop in particular region with improved production technology profiting farmers there and regulate sustained supply in India for better reach to consumers at affordable price and to reduce price instability.

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Yield and Economic Performance of Onion Cultivation in Maharashtra

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Abstract

Onion is a multi-faceted crop; it brings cheers to traders, fear to farmers and tears to consumers. Growing onion demands a set of learnt practices to establish crop. Amongst the states, comparatively farmers of southern states are well equipped with the knowledge base of production practices than the northern and central states. Costs are a key driver to ascertain net farm income. In spite of the fact that onion farming incurs huge cost, the net income from onion cultivation is fairly well in all the states except during the time when there is a glut in market. Taking this into account, the study aims to assess and quantify the yield gaps, which is vital in determining the reason for less returns, apart from price fluctuation. Much of the yield gap was evidenced in the states with highest production. This uneven production due to wider yield gap directly impacts the wholesale and retail prices of onion. Thus, the study has been taken within the demarcated objectives and the elucidation of data from the respondents in Maharashtra. The policy measures thus concluded are recommended based on the facts evidenced from the study.

Keywords: *Yield gap, price fluctuation, production*

1. Introduction

Onion (*Allium cepa*) has about 500 species of herbs, occurring throughout the northern hemisphere, with the greatest number in the USSR (Wright, 1992). Onion when compared with other fresh vegetables is relatively high in food value, intermediate in protein content and rich in calcium and riboflavin (Purse glove *et al.*, 2000). Onion is not known with certainty as a wild plant. It is believed to have originated in an area which includes Iran, West Pakistan and the mountainous countries to the North (Purse glove *et-al*, 2000). In India, onion is one of the most important commercial vegetable crops cultivated extensively for its broad culinary uses. India is the world's second-largest producer of onion, after China. India ranks third in export of onion after Netherlands and Spain (Horticulture Statistics, 2016). India accounts for 19.90 percent of the world production and ranks first in total area under onion cultivation. Onion is an important crop in all the continents and is commercially cultivated in various countries. In India, onion is grown in an area of 1305.62 thousand hectares with a production of 22,427.42 thousand million tonnes and productivity of 17.18 tonnes per hectare. India exports about 11,63,472.60 million tonnes of onion worth Rs. 1,74,155.40 lakhs. Maharashtra is one of the leading states in the cultivation of onion in the country next to Madhya Pradesh and Karnataka. Total onion production and area in Maharashtra is 6734.74 Mt and 4, 81,000 ha, respectively. During 2016-17, the state accounted for 36.84 percent of country's total area under onion cultivation and 30.03 percent of total onion output (NHRDF-2016-17). The state of Maharashtra is therefore called the onion basket of India. The principal onion growing districts in Maharashtra are Nashik, Ahmednagar, Pune, Solapur, Osmanabad, Jalgaon, Satara, etc. of which, Nashik accounts for the bulk of the total onion production.

1.1 Rationale of the study

It is widely believed that marketing of fruits and vegetables is a complex process due to their perishability, seasonality and bulkiness. It is

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Received: 03 July, 2020
Editorial Decision: 25 August, 2021

expected that measures and programme initiatives such as adoption of improved pre and post-harvest technology, and water and pest control practices will not only increase the productivity of individual horticultural crops and their quality, but also substantially minimize the post-harvest losses, increase the total crop area cover and generate adequate quality surplus for their conversion into value-added food products. Owing to inelastic demand and seasonal production of onion, the prices for onion are not stable throughout the year. Price fluctuation creates uncertainty in the income levels of onion growers and prices paid by the consumer. The low share of producer's in the consumer's rupees, particularly during high production and arrival period has been a matter of serious concern for policy makers in India. An understanding of price fluctuations is a pre-requisite for a stabilization programme. It gives some idea to the government procurement agencies regarding the suitable time for making purchases. To farmers, it is helpful in providing guidance as to when and where it will be more profitable for them to dispose off their produce. In the past, various attempts have been made to investigate the behaviour of price and arrivals and its relationship in vegetables like potato, tomato, brinjal, chillies, etc [Shiskin (1958), Acharya and Agarwal (1994), Gupta (1997), Singh *et al*. (1993), Jha (1971), Gupta (1970), Kainth and Mehra (1988), Sidhu and Chahal (1988), Parthasarathy *et al*. (1988), Agarwal and Dhaka (1998), Goswami (1991)]. Most of the studies in the onion marketing are limited to the identifying various marketing channels and measurement of their efficiencies [Thakur and Singh (1971), Neelakantaiah (1995), Shah (1999), Pajankar *et al.*(2000), Gadre *et al*. (2002)].

1.2 Objectives of the study

1. To study the demographic and socio-economic characteristics, knowledge level and adoption behaviour of recommended cultivation practices by onion growers.

2. To analyse the cost, returns and yield gap of onion cultivation of sample farmers.

3. To ascertain the problems experienced by the onion growers and their suggestions.

To analyse various objectives of the study, an appropriate methodology describing sampling design, data collection and tools of analysis for conducting the study is important. The state of Maharashtra, based on substantial area and production under onion crop, was selected for the present study. The present study relies on the data collected from 1212 sample farmers selected from four different districts *viz*., Nashik, Jalgaon, Nanded and Dhule. The primary data collection survey was conducted to know socio-economic characteristics of onion growers, knowledge and adoption behaviour of recommended cultivation practices, and problems experienced by the onion growers of the area. Primary as well as secondary data were used for the study. Primary data were collected on pre-structured schedules. The pre-testing of the schedule was done by collection of data from few farmers through personal interview method. All the data sets were analysed by using statistical package for social science (SPSS) computer software, which facilitated the generation of descriptive statistics using frequency and percentage.

The data collected for the purpose of the study were quantified, categorized and tabulated. The statistical tools such as mean, standard deviation, frequency, percentage and correlation coefficient were employed to draw valid conclusions.

Mean: The arithmetic mean is the sum of the scores divided by their number. This measure was used to categorize the dependent and independent variables into low, medium and high categories.

Frequency: This measure was used to know the distribution pattern of responses of respondent's to categorize the problems perceived by onion growers in order of importance.

Percentage: This measure was used for simple comparisons.

Standard deviation: This measure was used to categorize the dependent and independent variables into low, medium and high categories.

Karl Pearson's Correlation Coefficient (r): Karl Pearson's Correlation Coefficient (r) was computed

in order to know the nature of relationship between the dependent and independent variables. The values of the correlation coefficients were worked out as per the following formula.

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}$$

where,

r = correlation coefficient between variables X and Y

ΣX = sum of scores of variable X

ΣY = sum of scores of variable Y

ΣXY = sum of products of variable X and variable Y

ΣX^2 = sum of squares of X variable

ΣY^2 = sum of squares of Y variable

n = paired number of observations

2.2 Cost and returns of onion production

In the present study, the economics of onion cultivation was arrived at by computing per ha cost and returns structure. The total operational cost was also worked out. The gross returns, net returns and benefit cost ratio was calculated by using the formula,

$$\text{B:C Ratio} = \frac{\text{Gross return (Rs./ha)}}{\text{Total operational cost (Rs. ha)}}$$

Gross returns (Rs.) = Actual per ha yield (q) of onion x market price (Rs./q)

Net returns (Rs.) = (Gross returns (Rs.)/ha)-(total operational cost/ha)

2.3 Description of study domain and demographic profile

This section mainly deals with the socio-economic profile of sampled farmers drawn from the selected state since the socio-economic characteristics of farmers have a profound influence on the decision making process and profitability of crop enterprise. The information relating to age, education status, land holding and farming experience has been analysed and discussed for various categories of sampled farmers of selected districts. The knowledge of the background of the sampled farmers is essential since it may greatly impact the adoption of superior technical inputs or technique of production, which in turn, depends on technical skills and resource position of the farmers. Apart from providing general background information of the sampled farmers, this section also provides a general overview of the onion grower population.

3. Results and Discussion

The present study relies on the data collected from 1212 sample farmers selected from four different districts of Maharashtra *viz.*, Nashik (403), Jalgaon (277), Nanded (277) and Dhule (255). The demographic and socio-economic characteristics of farmers (Table 1) reveals that majority of the onion farmers (40% to 50%) belong to middle age group (33 to 60 years) in all the four selected districts. This is in accordance with the findings of Peter *et al.* (1996), that 45 percent of the respondents were within the active age of 30 to 55 years. Age directly affects the year of experience of farming (all other things being equal), which was shown in Table 1. Farmers in this age are physically strong and capable of making good production decisions and have potential for greater productivity, hence are more efficient in agricultural production than older farmers.

This study reveals that most of the respondents were well experienced in onion farming. The operational land holding of the respondents was the size of the land owned and cultivated by them. The table depicts that majority of the onion growers are marginal farmers (61% to 65%) followed by the small farmers (25% to 30%) and medium farmers (6% to 10%). Regarding the educational attainment, a major proportion (about 30%) of the farmers have primary education, whereas around 25 percent of the farmers were illiterate. The proportion of graduate farmers were highest in Nashik (15.88%), followed by Nanded (13.72%), Jalgaon (11.55%) and Dhule (5.49%) and only 3 to 6 percent farmers of the selected districts had completed their post-graduation.

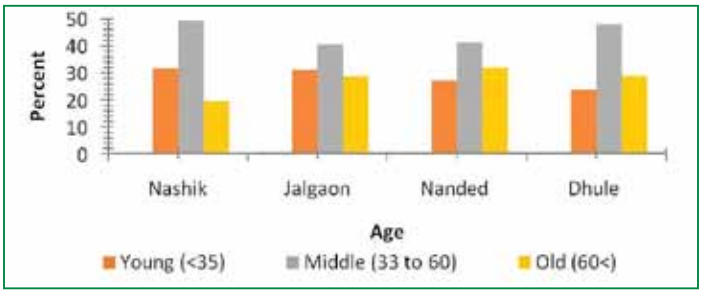
TABLE 1:DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS

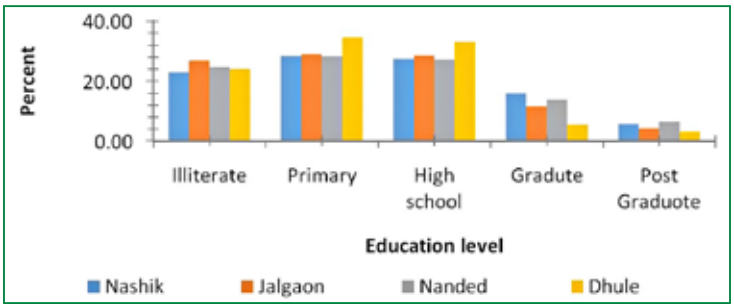
S.No.	Category	Nashik (N=403)	Jalgaon (N= 277)	Nanded (N= 277)	Dhule (N= 255)
A	**Age**				
1.	Young (<33)	127 (31.51)	86 (31.05)	75 (27.08)	60 (23.53)
2.	Middle (33 to 60)	198 (49.13)	112 (40.43)	114 (41.16)	122 (47.84)
3.	Old (>60)	78 (19.35)	79 (28.53)	88 (31.77)	73 (28.63)
B	**Education level**				
1.	Illiterate	92 (22.83)	74 (26.71)	68 (24.55)	61 (23.92)
2.	Primary	114 (28.29)	80 (28.88)	78 (28.16)	88 (34.51)
3.	High school	110 (27.30)	79 (28.52)	75 (27.08)	84 (17.1)
4.	Graduate	64 (15.88)	32 (11.55)	38 (13.72)	14 (5.49)
5.	Post Graduate	23 (5.71)	12 (4.33)	18 (6.50)	8 (3.14)
C	**Land holding**				
1.	Marginal(up to 1 ha)	258 (64.02)	170 (61.37)	174 (62.82)	168 (65.88)
2.	Small (1 to 2 ha)	101 (25.06)	81 (29.24)	78 (28.16)	68 (26.67)
3.	Medium (2 to 4 ha)	37 (9.18)	22 (7.94)	18 (6.50)	17 (6.67)
4.	Large (> 4 ha)	7 (1.74)	4 (1.44)	7 (2.53)	2 (0.78)
D	**Farming experience**				
1.	Low	98 (24.32)	70 (25.27)	67 (24.19)	81 (31.76)
2.	Medium	247 (61.29)	128 (46.21)	134 (48.38)	127 (49.80)
3.	High	58 (14.39)	79 (28.52)	76 (27.4)	47 (18.43)

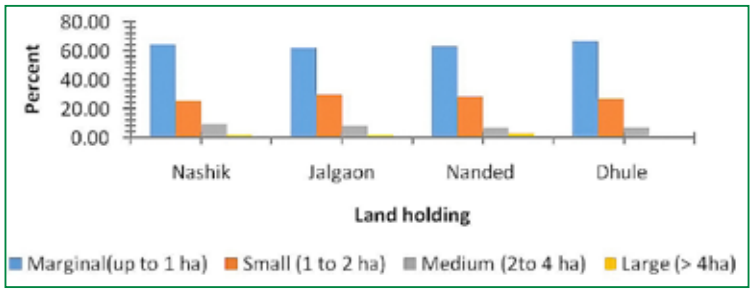
Source: Primary Data

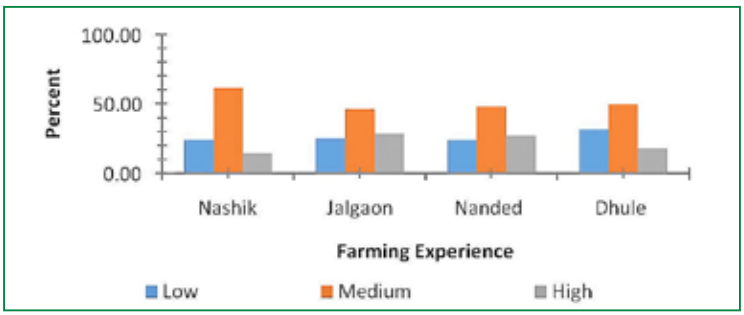
Note: Percentage figures are given in parentheses

Figure 1: Graphical Representation of Distribution of Respondents according to their Personal and Socio-Economc Characteristics









3.1 Knowledge level of onion farmers

In the present study, knowledge refers to the body of information understood and retained by the respondents about onion cultivation practices. It is evident from the data in Table 2 that about 75 percent to 95 percent farmers have information about improved variety. In Nashik, 41 percent farmers did not have this knowledge. This was also true in case of knowledge about the source of improved seed. The majority of farmers did not have enough knowledge about selection of varieties and balanced crop nutrition. Selection of varieties and balance crop nutrition are very important aspects operations to get higher yield.

TABLE 2: CULTIVATION PRACTICES KNOWLEDGE LEVEL OF ONION FARMERS IN SELECTED DISTRICTS

Sr. No.	Practices	Nashik (N=403)		Jalgaon (N=277)		Nanded (N=277)		Dhule (N=255)	
		No	Yes	No	Yes	No	Yes	No	Yes
1.	Improved variety	234 (58.06)	169 (41.94)	70 (25.27)	207 (74.73)	70 (25.27)	207 (74.73)	11 (4.31)	244 (95.69)
2.	Source of improved seed	266 (66.00)	137 (34.00)	70 (25.27)	207 (74.73)	70 (25.27)	207 (74.73)	75 (29.41)	180 (70.59)
3.	Selection of varieties	379 (94.04)	24 (5.96)	238 (85.92)	39 (14.08)	238 (85.92)	39 (14.08)	232 (90.98)	23 (9.02)
4.	Balance crop nutrition	383 (95.04)	20 (4.96)	198 (71.48)	79 (28.52)	275 (99.28)	2 (0.72)	22 (8.63)	233 (91.37)
5.	Recommend-ed dose of fertilizer	220 (54.59)	183 (45.41)	154 (55.60)	123 (44.40)	80 (28.88)	197 (71.12)	90 (35.29)	165 (64.71)
6.	Fertilizer requirement	219 (54.34)	184 (45.66)	165 (59.57)	112 (40.43)	180 (64.98)	97 (35.02)	1 (0.39)	254 (99.61)
7.	Fertilizer scheduling in onion	216 (53.60)	187 (46.40)	170 (61.37)	107 (38.63)	158 (57.04)	119 (42.96)	1 (0.39)	254 (99.61)
8.	Pests & diseases and its control measure	183 (45.41)	220 (54.59)	70 (25.27)	207 (74.73)	170 (61.37)	107 (38.63)	2 (0.78)	253 (99.22)

Source: Primary data

Note: Percentage figures are given in parentheses

Only in Dhule district, almost all the farmers have some knowledge about fertilizer dose, requirement and scheduling in onion. The survey also reveals that nearly 55 percent respondents in Nashik, 75 percent in Jalgaon, 99 percent in Dhule and 39 percent in Nanded had the knowledge of pests and diseases, and their control measures.

3.2 Relationship between independent variables and level of knowledge in onion farming

The correlation coefficients of each of the demographic and socio-economic characteristics with the knowledge level of onion growers have been presented in Table 3. The findings reveal that all the five independent variables, *viz.*, age, education, land holding, farming experience and scientific orientation show significant relationship with the knowledge of onion growers, with education level having the correlation coefficient of 0.412, followed by farming experience (0.227) and land holding (0.218).

TABLE 3: RELATIONSHIPS BETWEEN INDEPENDENT VARIABLES AND LEVEL OF KNOWLEDGE IN ONION FARMING

S.No.	Independent Variable	Correlation Coefficient
1	Age	0.187**
2	Education level	0.412**
3	Land holding	0.218**
4	Farming experience	0.227**
5	Scientific orientation	0.198**

Source: Author's own computation

Note: ** Significant at 1% level

3.3 Adoption level of onion farmers in selected districts

A perusal of Table 4 shows adoption level of different onion cultivation practices by the farmers such as improved varieties, soil testing and fertilizer use, etc. Majority of the farmers in all the selected districts have neither adopted improved varieties nor used fertilizers. A very negligible proportion of farmers have adopted soil testing practices. Soil testing helps the farmers to reduce the cost of cultivation and to get higher income. It is very interesting that all the farmers have used tractors and other machineries for growing onion. Besides, it is clear that more than 90 percent of the farmers have mechanized their farm, which is 100 percent in case of Nashik. This reiterates the increasing scarcity of labour for timely sowing and the role of mechanization in farm operations including marketing.

TABLE 4: CULTIVATION PRACTICES ADOPTION LEVEL OF ONION FARMERS IN SELECTED DISTRICTS

Sr. No.	Cultivation Practice	Nashik (N=403)		Jalgaon (N=277)		Nanded (N=277)		Dhule (N=255)	
		No	Yes	No	Yes	No	Yes	No	Yes
1	Improved varieties	255 (63.28)	148 (36.72)	253 (91.34)	24 (8.66)	253 (91.34)	24 (8.66)	225 (88.24)	30 (11.76)
2	Soil testing	367 (91.07)	36 (8.93)	272 (98.19)	5 (1.81)	272 (98.19)	5 (1.81)	253 (99.22)	2 (0.78)
3	Fertilizer use	329 (81.64)	74 (18.36)	273 (98.56)	4 (1.44)	273 (98.56)	4 (1.44)	200 (78.43)	55 (21.57)
4	Mechanization	0.00	403 (100)	17 (6.14)	260 (93.86)	253 (91.34)	24 (8.66)	3 (1.18)	252 (98.82)
5	Organic manure	2 (0.50)	401 (99.50)	10 (3.61)	267 (96.39)	10 (3.61)	267 (96.39)	5 (1.96)	250 (98.04)
6	Bio fertilizers	263 (65.26)	140 (34.74)	243 (87.73)	34 (12.27)	245 (88.45)	32 (11.55)	93 (36.47)	162 (63.53)
7	Micronutrient	390 (96.77)	13 (3.23)	272 (98.19)	5 (1.81)	262 (94.58)	15 (5.42)	88 (34.51)	167 (65.49)
8	Water soluble fertilizer	371 (92.02)	32 (7.94)	247 (89.17)	30 (10.83)	227 (81.95)	50 (18.05)	78 (30.59)	177 (69.41)
9	Foliar application of WSF	387 (96.03)	16 (3.97)	248 (89.53)	29 (10.47)	258 (93.14)	19 (6.86)	148 (58.04)	107 (41.96)
10	Weedicide use	380 (94.29)	23 (5.71)	200 (72.20)	77 (27.80)	190 (68.59)	87 (31.41)	254 (99.61)	1 (0.39)

Source: Primary Data

Note: Percentage figures are given in parentheses.

3.4 Relationship of independent variables with the adoption behaviour of onion farmers

It is observed from Table 5 that level of education and land holding shows a significant positive relationship (0.01 level of probability) with adoption behaviour of the respondents, whereas farming experience and scientific orientation exhibit significant positive relationship at 0.05 level of probability. On the other hand, age does not establish any significant relationship with the adoption level.

TABLE 5: RELATIONSHIP OF INDEPENDENT VARIABLES WITH ADOPTION BEHAVIOUR OF ONION FARMERS

S.No.	Independent Variables	Correlation Coefficient (r)
1	Age	0.021NS
2	Education level	0.217**
3	Land holding	0.283**
4	Farming Experience	0.118*
5	Scientific Orientation	0.164*

Source: Author's own computation

Note: NS -Non-significant * Significant at 5% level of significance

** Significant at 1% level of significance

3.5 Extent of problems faced by respondents in improved cultivation practices of onion:

3.5.1 On-farm problems:

Table 6 shows on-farm constraints in the selected districts of Maharashtra. The major on-farm constraints as revealed by respondents are poor water quality, labour scarcity for cultural practices, non-availability of organic manure and non-availability of effective pest control measures. This may be due to poor technical knowledge on management aspects. Water quality is defined by certain physical, chemical and biological characteristics. The issue of water quality is a major problem in the study area that needs immediate attention by the government, NGOs and agencies, because agricultural sector is by far the biggest user of freshwater.

TABLE 6: ON FARM PROBLEMS FACED BY RESPONDENTS IN IMPROVED CULTIVATION PRACTICES OF ONION

Sr. No.	Problem	Nashik (N=403)		Jalgaon (N=277)		Nanded (N=277)		Dhule (N=255)	
		No	Yes	No	Yes	No	Yes	No	Yes
1	High cost/Poor quality of seeds	125 (31)	278 (69)	87 (31)	190 (69)	97 (35)	180 (65)	105 (41)	150 (59)
2	Non-availability of fertilizer in time	113 (28)	290 (72)	92 (33)	185 (67)	110 (40)	167 (60)	98 (38)	157 (62)
3	Insufficient water availability	211 (52)	192 (48)	129 (47)	148 (53)	129 (47)	148 (53)	10 (4)	245 (96)
4	Poor water quality	12 (3)	391 (97)	8 (3)	269 (97)	0 (0)	277 (100)	0 (0)	255 (100)
5	Lack of drip / sprinkler irrigation facility	365 (91)	38 (9)	279 (101)	4 (1)	273 (99)	4 (1)	66 (26)	189 (74)
6	Labour scarcity for cultural practices	17 (4)	386 (96)	6 (2)	271 (98)	6 (2)	271 (98)	1 (0)	254 (100)
7	Non-availability of organic manure	3 (1)	400 (99)	77 (28)	200 (72)	17 (6)	260 (94)	7 (3)	248 (97)
8	Non-availability of Bio-fertilizers	1 (0)	402 (100)	47 (17)	230 (83)	60 (22)	217 (78)	26 (10)	229 (90)
9	Non-availability of effective pest control measures	8 (2)	395 (98)	15 (5)	262 (95)	27 (27)	250 (90)	254 (100)	1 (0)
10	Non-availability of effective disease control measures	31 (8)	372 (62)	19 (7)	258 (93)	57 (21)	220 (79)	1 (0)	254 (100)
11	Lack of knowledge about curing and drying of onion	257 (64)	146 (36)	152 (55)	125 (45)	147 (53)	130 (47)	114 (45)	141 (55)

Source: Primary data

Note: Percentage figures are given in parentheses.

3.5.2 Off-farm problems

The off-farm problems are related to marketing functionary, which is also as important as the production techniques in case of agricultural commodity. Until and unless marketing systems are improved, incentives to increase the production will not benefit the growers. The present study shows that shortage of storage facility is a major constraint for onion marketing as it is highly perishable in nature. A high fluctuation in market price is the second major problem followed by lack of awareness about crop insurance. The details of the off-farm problems with their values have been presented in table 7.

TABLE 7: OFF FARM PROBLEMS FACED BY THE RESPONDENTS IN IMPROVED CULTIVATION PRACTICES OF ONION

Sr. No.	Off-farm Problems	Nashik (N=403)		Jalgaon (N=277)		Nanded (N=277)		Dhule (N=255)	
		No	Yes	No	Yes	No	Yes	No	Yes
1	Shortage of storage facilities	85 (21)	318 (79)	75 (27)	202 (73)	87 (31)	190 (69)	100 (39)	155 (61)
2	High fluctuations in market price	44 (11)	359 (89)	54 (19)	223 (81)	78 (28)	199 (72)	35 (14)	220 (86)
3	Govt agency like NAFED/ MSAMB not purchasing onion regularly	76 (19)	327 (81)	65 (23)	212 (77)	70 (25)	207 (75)	42 (16)	213 (84)
4	Lack of awareness about crop insurance	105 (26)	298 (74)	81 (29)	196 (71)	107 (39)	170 (61)	98 (38)	157 (62)

Source: Primary Data

Note: Percentage figures are given in parentheses.

3.6 Costs and returns

The knowledge of cost and return structure is essential to examine economic viability of the crop enterprise. Thus, this section evaluates the cost of production and profitability analysis of onion cultivation in the selected districts of Maharashtra. Table 8 shows cost and return per hectare of onion produced in the study area, which reveals that the total cost of cultivation is Rs. 75016.00 per hectare. Furthermore, the cost of fertilizer is Rs. 14234.00 per hectare, Rs. 6192.00 for transplanting, Rs. 4322.00 for weeding and hoeing, and Rs. 7825.00 per hectare for harvesting. This could be due to labour intensive nature of the enterprise. The results indicate that land preparation and raising nursery are also cost intensive operations in growing onion.

TABLE 8: COSTS AND RETURNS COMPONENTS FOR ONION FARMING

S. No.	Item	Cost and Returns (Rs./ha)
1	Land preparation	4200.00
2	Seeds	7129.00
3	Nursery raising	1539.00
4	Manures	12000.00
5	Fertilizers	14234.00
6	Pesticides	6543.00
7	Irrigation	5600.00
8	Transplanting	6192.00
9	Weeding and hoeing	4322.00
10	Harvesting and curing	7825.00
11	Transportation and marketing cost	5432.00

S. No.	Item	Cost and Returns (Rs./ha)
12	Total cost of cultivation	75016.00
13	Production in q / ha.	213.60
14	Gross return @ Rs. 600/q	128160.00
15	Net Return (Rs./ha)	53144.00
16	Cost of production per q/ha.	351.20
17	Profit per quintal	248.80
18	Benefit cost Ratio	1.71

Source: Author's own computation

The average output per hectare of onion among the farmers in the study area is found to be 213.60 q/ha and the average price of Rs. 600 per quintal. The analysis shows that gross returns of Rs. 128160 were realized and net return is Rs. 53144.00/ha. The net return per rupee invested is found to be 1.71. Hence, the cost and return analysis indicates that onion production in the study area is profitable. These findings are in conformity with the finding of Barakade and Lokhande (2011).

3.7 Yield gap analysis

In Maharashtra, there is a wide gap between productivity and yield potential of the improved onion technologies developed by various research institutes. The available agricultural technology does not serve the very purpose until it is successfully adopted by the farmers. Crop Cutting Experiment (CCE) is one of the important programmes to evaluate and demonstrate the production potential of the crop in the farmers' fields. The study was carried out during 2016 in four districts of Maharashtra state namely Nashik, Jalgaon, Nanded and Dhule. All the Crop Cutting Experiment (CCE) was carried out in an average area of 0.38 ha in these districts. The improved technologies consisted of use of improved variety, seed treatment, balanced fertilizer use, green manure application and integrated pest management. The yield data were collected from both the demonstrated and control plots (farmers' practices) by crop cutting experiment. CCE recorded higher yield as compared to farmers' practice yield. It was observed from the results of CCEs data with improved production technologies that there exists a wide yield gap in onion under real farm situations across the onion growing areas of Maharashtra. Analysis based on CCE data showed that the yield gap I was 46.47 percent at the demonstration level (Table 9).

TABLE 9A. YIELD GAP ANALYSIS I

District	Area (ha)	No. of Demonstrations	Demonstration yield (q/ha)	Farmers practice yield (q/ha)	Yield gap (q/ha)
Nashik	0.40	36	219.85	209.07	10.78
Jalgaon	0.39	31	185.45	138.14	47.31
Nanded	0.23	27	249.75	153.71	96.04
Dhule	0.51	40	190.78	157.00	33.78
Overall	0.38	134	211.45	164.48	46.97

Source: Primary data

The yield gap II was 34.29 percent. This may be due to the adoption of improved variety by the resource endowed farmers of the state. Yield gap II has decreased by about 10 percent. These results are in conformity with the findings of Hiremath *et al*. (2007) in other crops. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agriculture practices and local climatic conditions.

TABLE 9B. YIELD GAP ANALYSIS II

District	Area (ha)	No. of Demonstrations	Demonstration yield (q/ha)	Farmers practice yield (q/ha)	Yield gap (q/ha)
Nashik	0.39	36	224.82	210.24	14.58
Jalgaon	0.38	31	146.05	135.12	10.93
Nanded	0.23	27	251.83	153.71	98.12
Dhule	0.51	40	191.71	178.15	13.56
Overall	0.37.	134	203.60	169.30	34.29

Source: Primary data

4. Conclusions and Policy Implications

The study was planned to analyse yield gap, constraint and performance of onion crop in the study area. The primary data for the study were collected through quantitative survey and secondary data was assimilated from various published sources. The main findings are listed below:

(a) In the study area, farmers continue to use traditional farming methods thereby not been able to reap remunerative price of their crop (due to poor quality of produce). So it is suggested that technical backstopping along with the several capacity building on enhancing the produce, harvesting, and post-harvest handling of onion may be given.

(b) Adoption level of cultivation practice has immense potential in increasing the production and yield of the onion crop. It was found that farmers across the states out-performed in soil analysis, due to soil health card scheme. Level of education has direct influence in adoption level of cultural practices. Hence there is a need of concerted effort from all the stakeholders to enhance adoption level and reduce yield gaps.

(c) The results from the study inferred that better transfer of technology in onion cultivation would enable the farmers in increasing their yields of onion.

(d) Majority of sample farmers are dissatisfied with various factors for cultivation of onion production. Inputs like fertilizer availability and its adequate supply were major constraints in the study area. There is need for ensuring constant supply of inputs and to check hoarding by the various intermediaries. Hence it would be better if the fertilizer subsidy is brought under DBT (Direct benefit transfer scheme) in all the states.

(e) There is shortage of storage facilities in the study area. Therefore, it is suggested that proper storage facilities need to be created at major production centres so as to have storage facilities available during peak production season.

(f) State and central cooperative agricultural marketing agencies in the states should go for staggered/phase wise purchase as onion is consumed throughout the year.

(g) Cost and returns are viable options to know profitability of an enterprise. Amongst various costs, the cost of harvesting and curing were found to be highest in the state.

(h) Returns per hectare are quite good in all the districts and is found to be profitable in cost and return analysis. The present study reveals that some districts experience higher cost of production due to higher labour and input costs. However in most of the districts, farm operations are efficient.

(i) It is found that various factors like physical, biological, socio-economic and institutional are responsible for yield gaps. This can be

effectively improved through participatory research at different levels, contract farming and government attention. With greater push towards eNAM and digital literacy, markets can also be a driver for technological dissemination.

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Agro-Economic Research

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

RAJIV KUMAR SINHA

1. Introduction

Agriculture is the mainstay of economy of Bihar. Its continued importance lies in the fact that more than 70 percent of the population is engaged in agricultural operations. Therefore, a vibrant agricultural system forms a crucial part of the development strategy of the overall economic growth of Bihar. Achieving high and sustained growth in agricultural sector is crucial for improving farm income. However, on the basis of NSSO data for 2012-13, after applying CAGR of 8.2 percentin the nominal GVA component of agriculture and allied sector, the nominal average income of a farmer in 2018-19 increased to Rs. 10329 per month, while the average weighted income of the beneficiary group increased to Rs. 8422 per month. The effects of input prices and input-use on increase in cost of cultivation turned exponential after mid-2000, which declined cost of saving for the farmers and thereby erosion of farm profitability.

As regards to the product market in the state, it is to note here that cereals dominate the cropping pattern, occupying more than 86 percent of the GCA followed by pulses (6.94%), oilseeds (1.46%), fibre crops (1.24%) and cash crops (3.6%). The marketed surplus of food grains ranges between 20-30 percent and around 35-40 percent in case of pulses. As per earlier studies (Sinha, 2004), the marketed surplus of paddy and wheat were 42.2 percent and 68.8 percent, respectively, and the producer's share in consumer's rupee for paddy and wheat were about 80.15 percent and 78.40 percent,respectively. In case of maize produce, the marketed surplus was 90.2 percent. Besides, prices received by the producers for the major cereals particularly, trail behind the MSPs of the respective produces, as revealed in our recent studies. The quantities of procurement of paddy during last five years were about 23.06 percent in 2014-15, 26.94 percent in 2015-16, 22.35 percent in 2016-17, 14.63 percent in 2017-18 and 23 percent in 2018-19 against the total production of paddy in the respective years. In case of wheat, less than one percent *i.e.*, 0.81 percent was procured in the state by the Central and State Government agencies in the rabi marketing season of 2020-21, against the estimated production of wheat of 61 lakh metric tonnes. The Government has repealed its APMC Act (1960), *w.e.f.* 2006 as the functioning of the markets during the APMC regime was not very efficient and therefore, trade innumber of markets could not be fully shifted till date. As of now, a significant part of the marketable surplus is being traded outside the market yards in free market regime. As the seed market in the state is concerned, it is hardly met by the government agency*i.e.*, Bihar State Seed Corporation. During last four years, *i.e.*, 2015-16 to 2018-19, there was a wide gap between the demand and supply of seeds in the state. Among major kharif crops, the demand and supply gap stood between 25 to 33 percent for paddy and about 80 percent plus for maize. However, in case of rabi crops, the demandand supply gap for wheat crop has improved significantly and it was surplus of 1.28 percent in 2018-19. Similarly, the surplus was noticed in case of gram pulse. Besides, huge gap was noticed in case of lentil pulse (-75.97%) during 2018-19, the most important pulse crop in the state. These gaps are fulfilled either from the farmer's last year's retained stock for seeds or from local seeds market, which are exploitative both in terms of prices and quality. Per hectare consumption of fertilizer (NPK) in the state during 2018-19 was 227.30 kg

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(the second highest in the country after Telangana) as compared to 133.12 kg/ha for the all-India figure. The sale of fertilizers has been made mandatory for the whole country through POS machine since March, 2018 in go-live mode, which is monitored under iFMS. More than 90 percent fertilizers are sold by licensee fertilizer retailers who charge 10 to 20 percent higher prices over the MRPs of respective grade of fertilizers. Besides, 56 percent fertilizers are sold without Aadhar or other id's and 46 percent transactions are made on false/dummy identifications, State Government's enquiry report revealed. Recently, to check the menace of black marketing of fertilizers, the government raided 1300 licensee retailers of fertilizers and of them, 318 licenses have been cancelled and 217 dealers were served with show cause notices. A study (Sinha, 2020) conducted in Bihar on 60 retailers and 250 fertilizer buyer farmers in two sample districts of Bihar reveals that on the day of visit, the opening stock of total fertilizers was 2459 MTs and out of it, the receipt of the stock in the PoS was just 0.03 percent and sale (3.9%). The closing stock, as per PoS was (-) 3 percent, physical stock 10.8 percent and stock as per manual records (-) 16.17 percent. This shows that the selling of fertilizers was being made without following the mandated norms of fertilizers' sale in the state, despite sufficient supply of all the grades of fertilizers.

The advent of technology has led to increased demand for modern inputs, which requires credit support particularly when nearly 42.5 percent farm households in the state are indebted as compared to 51.9 percent in the country. In fact, the indebted farmers borrowed 28.9 percent from institutional sources and 71.1 percent from non-institutional sources.

During the past 25 years, the average annual inflation in cost A1+FL (Family Labour) was about 10 percent per annum. The decomposition of cost inflation among various factors revealed that labour alone contributed 53 percent to the increase in cost of cultivation during 2007-08 to 2014-15. Labour cost contributed 16 percent to the cost inflation during the same period. Thus, the labour cost is the predominant contributor of cost inflation, particularly in recent years and managing this factor of production alone can substantially reduce the cost of cultivation and increase the farm profitability. Agriculture labour market in the state, like other states, is in unorganized form. No institutions, be it formal or informal sector, are in active mode for ensuring the supply of agricultural labour and monitor the cause of farm labour, despite many welfare programmes and existence of Minimum Wages Act. In fact, there is farm labour scarcity in the state. The percentage of people employed in agriculture has reduced by 17 percent during 1999-2000 to 2019-20. Major factors responsible for reduction of farm labourers are low labour productivity and low real wages, increase in wages in non-farm sector (65%) compared to farm sector (15%), seasonality in agriculture, presumption of having low esteemed work, distress migration, threat of lives and livelihood due to recurring floods and frequent droughts, highly subsidized distribution of food grains through PDS in recent past and subsidy of farm machineries to some extent. It is also to be noted here that despite about 25 lakh reverse migrants in the state during Covid–19 lockdowns, laborers have again started to return their respective work places, leaving the farm economy of the state in pre-Covid-19 situation.

Agricultural land constitutes a substantial part of Bihar in total geographical area (9360 thousand hectares), as nearly 56 percent is under net sown area in 2018-19, which declined from 60.5 percent in 2001-02 (after bifurcation of the state in November, 2000). As per 2011 Census, more than 85 percent of the population lives in rural areas and their most important source of livelihood are their own landholdings. There are evidences which indicate very small size of land holdings in India, and Bihar is no exception. Small and marginal landholdings, which are less than two hectares, account for nearly 97 percent of the landholdingsin the state. The average size of land holdings in Bihar during 2015-16 was just 0.39 hectare, while it was 1.08 hectares at all-India level. The average agricultural density in the state was 238 per square hectare in 2011, against the all-India figure of 110 per square hectare.

1.1 Objectives of the Study

With this background in view, the following objectives were addressed in this study:

1. To analyze the product markets (output) including price(s) received (market as well as MSP if any), marketing channels, market structure and bottlenecks;

2. 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;

3. Analyze the government support structure including access to credit, and;

4. Analyze the coping strategies of farmers during economic hardships and their social networks.

2. Data source and methodology

A multi-stage sampling has been adopted for the study. Three districts one each from the three agro-climatic regions, *i.e.*; zone I, II and III have been chosen with sufficient consideration of the cropping pattern. The three selected districts are: Begusarai, Katihar and Bhagalpur from zone – I, II and III, respectively. A sample of 100 farmers from each selected district has been taken with representation from each land size category (LSC), totaling to 300 farm households.

3. Major findings of the study

3.1 Overview of the study region

- Out of the total 300 farm HHs surveyed, 130 (43.33%) belonged to marginal category followed by 91 small (30.34%), 49 medium (16.33%), 25 large (8.33%) and 5 very large (1.67%). No surveyed farm HH belonged to landless category. Average size of total land holding of the surveyed farm HHs was 4.55 acres and for marginal, small, medium, large and very large farmers, the average size was 1.57 acres, 3.80 acres, 6.74 acres, 13.94 acres and 27.44 acres, respectively.

- Per household total net income at overall farms was Rs. 50544 constituting 50.88 percent from cultivation (Rs. 25719), 23.89 percent from animal husbandry activities (Rs. 12077) and 25.23 percent from wage labour (Rs. 12750). Across the farms, the total net income varied between Rs. 36723 to Rs. 173562. In fact, it increased with the increase of farm sizes. Analysis reveals that marginal farmers' net income from agriculture was just 19.3 percent as compared to 71 to 75 percent for medium, large and very large farmers.

- Of the total livestock possessed by the sample households, milch cows accounted for 83.92 percent followed by milch buffaloes (11.89%) and goats (4.19%). Of the total milch cows possessed by the sample HHs, 32.89 percent belonged to marginal farmers followed by small (25.17%), medium (13.99%) large (8.39%) and very large (3.50%).

- On overall level, 100 percent of the surveyed HHs possessed tube wells. Bore well and diesel pumps were equally owned and shared by 57.67 percent of the respondents.

- Tractors and threshers were possessed by only 10 percent of the farm HHs. It is interesting to note that all sample households of very large farms and 84 percent of large farm HHs possessed tractors and threshers, respectively, while 8.16 percent of the medium farm HHs were found to possess tractors and threshers.

3.2 Crop and Input Markets

- The survey information/data in regard to 8 crops, coded as: (i) crop – 1 (paddy) – 0101, (ii) crop – 2 (maize, kharif) – 0104, (iii) crop – 3 (maize, rabi) – 0104, (iv) crop – 4 (wheat) – 0106, (v) crop – 5 (gram) – 0201, (vi) crop – 6 (masur) – 0205, (vii) crop -7 (potato) – 0701 and (viii) crop – 8 (onion) – 0708. All of the surveyed farm HHs belonging to all the five Land Holding Categories (LHCs) did undertake growing four major crops,

viz., crop – 1 to crop – 4, namely; paddy, maize (kharif), maize (rabi), and wheat, respectively. On overall level, besides the four cereal crops, crops 5, 6, 7 and 8 namely gram, masur, potato and onion were grown by 78.33 percent, 65.33 percent, 13.33 percent and 8.33 percent, respectively. Maximum areas undertaken for growing different crops were found to have been covered by crop-2 (552.88 acres) followed by crops – 4, 1, 3, 5, 6, 7, 8 (531.38 acres,379.18 acres, 361.78 acres, 222.22 acres, 98.44 acres, 28.04 acres and 12.46 acres), respectively.

- The productivities of crops 1, 2, 3, 4, 5, 6, 7 & 8 on overall level were 17 qtls/acre, 15.73 qtls/acre,18.02 qtls/acre, 19.56 qtls/acre, 6.54 qtls/acre, 6.04 qtls/acre, 49.33 qtls/acre and 51.09 qtls/acre, respectively. Conspectus on overall data did help to ascertain that highest average value was obtained by producing crop-5 (Rs. 3493/qtl) followed by crops - 6, 3, 8, 2, 4, 1 & 7 (Rs. 2899/qtl, Rs. 1559/qtl, Rs. 1512/qtl, Rs. 1335/qtl, Rs. 1335/qtl, Rs. 1300/qtl and Rs. 901/qtl), respectively.

- All the surveyed farmers across LHCs reported to have sold paddy to local private traders/middlemen except 4 (1.33%) and 1 (0.33%) HHs (belonging to medium and large farmers,) respectively. Cent percent of the surveyed farm HHs sold crops, namely: maize (kharif), wheat and maize (rabi) through local private traders. Potato and onion were sold by only 40 (13.33%) and 25 (8.33%) farm HHs taken together from all LHCs.

- Out of the total 300 farm HHs, 282 (94%) belonging to all LHCs reported lower than market price and faulty weighing and grading as reasons for dissatisfaction in case of disposal of paddy.

- Reasons for unreasonable prices received have been considered for analyses are: (i) very few buyers, (ii) no government purchase, (iii) private buyers collude, (iv) no minimum fixed price. On overall level, 228 farm HHs (76%) and 300 HHs (100%) ascertained no government purchase, and private buyers collude, are prominent reasons for price received from paddy to be unreasonable. Cent percent of the surveyed farm HHs reported the same reasons as most prominent factors for the price of maize (kharif) being unreasonable. 130 farm HHs (43.33%) including all LHCs viewed the same reasons are responsible for price of wheat not being reasonable. Same two reasons were quoted by cent percent of the farmers to be valid reasons for price of maize (rabi) being unreasonable. An equal of 235 farm HHs (78.33%) felt reasons (ii) and (iii) responsible for lentil (masur) price not being reasonable. Reasons (ii) and (iii) were again held responsible for price of gram being unreasonable as felt by 196 farm HHs (65.33%) for each, respectively. At aggregate level, the number of farm HHs who mentioned reasons (ii), (iii) and (iv) for potato and onion were: 40, 40, 19 and 25, 25, 17 *i.e.*, 13.33 percent, 13.33 percent, 6.33 percent and 8.33 percent, 8.33 percent, 5.67 percent, respectively.

- Responses in regard to (i) own farm, (ii) local trader, (iii) input dealer, and cooperative and government agency were obtained for analysis. Seed, fertilizers, and plant protection chemicals (PPCs) were found to have been procured through agencies namely local trader and input dealer. On overall level, the number of farm HHs who procured seeds from agencies namely local trader and input dealer were 64 (21.33%) and 236 (78.67%), respectively. Fertilizer was procured through agencies namely local trader and input dealer by 64 (21.33%) and 236 (78.67%) farm HHs, respectively. Manure was found to have been procured through agencies namely own farm and local trader by 85 (28.33%) and 13 (4.33%) HHs, respectively. In case of PPCs, agencies through which procurement was done were local trader and input dealer. This was availed by 92 (30.67%) and 208 (69.33%) farm HHs out of total 300 surveyed. Manure was indicated to have been procured through agencies coded as (i) and (ii) by173 (57.67%)

and 127 (42.33%) farm HHs, respectively. In case of repairing and maintenance, and interest, local trader was the only agency as reported by 17 (5.67%) and 19 (6.33%) HHs, respectively, for the two. 50 (16.67%) farm HHs,out of the total 300 surveyed, procured amount for leased-in land out of their own farm source.

- Expenses on human labour ranged with little differences between marginal, small, medium, large and very large HHs in Rs./acre terms (calculated at Rs. 4307, Rs. 4308, Rs. 4179, Rs. 4203 and Rs. 4220), respectively. Medium farm HHs were at top in expenses made for irrigation, whereas large HHs were ahead in ROMs (Rs. 5713/acre and Rs. 60/acre), respectively. Small farmers, evidently being the most resource-poor ones, made highest expense on interest payment (Rs. 89/acre). On overall level, out of the total expense of Rs. 29791/acre, highest share of expenses made for purchase of inputs was found on lease-in rent for land (30.95%). It was followed by expenses on irrigation (17.22%), fertilizers (16.25%), human labour (14.24%), seeds (13.50%), PPCs (5.14%), manures (2.45%), interest (0.15%) and, repairing and maintenance of machines (0.10%).

- The entire 300 farm HHs surveyed asserted the quality of seeds to be satisfactory. In regard to quality of fertilizers, 50 (16.67%) and 250 (83.33%) farm HHs found these to be good and satisfactory, respectively. Responses in case of quality of manure were cited as good and satisfactory by 47 (15.67%) and 51 (17%) HHs, respectively, on aggregate level. Quality of inputs, namely; plant protection chemicals (PPCs) and irrigation were pronounced to be good and satisfactory by 73 (24.33%), 215 (71.67%) and 173 (57.67%), 127 (42.33%) HHs, respectively. Quality of inputs, namely; plant protection chemicals (PPCs) and irrigation were pronounced to be good and satisfactory by 73 (24.33%), 215 (71.67%) and 173 (57.67%), 127 (42.33%) HHs, respectively. Input like interest, qualities were expatiated to be good and satisfactory by 14 (4.67%) and 5 (1.67%) HHs. In case of repairing & maintenance, qualities were perceived as satisfactory and poor and for leased-in rent payment like input, only satisfactory was told by 11 (3.67%), 6 (2%) and 50 (16.67%) HHs, respectively.

- 261 (87% of the total) and 39 (13%) farm HHs termed seed prices to be reasonable and high, respectively. Similar responses were observed in regardto prices paid for inputs, like fertilizers and PPCs (87% and 13%) mentioning it to be reasonable and high, respectively. On aggregate level, 98 farms HHs (32.67%) accepted the price of manure to be reasonable. Out of the total 300 farm HHs surveyed, 173 (57.67%) and 127 (44.33%) were of the view that price paid for irrigation to be reasonable and high, respectively. In regard to prices paid for repairing of farm machineries and interests paid, these were perceived to be reasonable and high by 11 (3.67%), 6 (2%) and 14 (4.67%), 5(1.67%) HHs, respectively. On overall level, 50 (16.67%) farms HHs told amount of leased-in rent to be reasonable.

- Reasons for prices being unreasonable were due to (i) not subsidized, (ii) very few sellers, (iii) no government sellers, (iv) private sellers collude, and (v) no price control. In case of seed, 155 (51.67%) and 300 (100%) farm HHs held reasons (iii) and (iv), respectively, as responsible for price being unreasonable.

- In case of fertilizers, on overall level, 155 (51.67%), 187 (62.33%) and 213 (71%) farm HHs informed reasons (iii), (iv) and (v), respectively, as responsible for prices being unreasonable. Reasons (iii) & (iv) were confirmed by 85 (28.33%) and 13 (4.33%) HHs, respectively, as responsible for manure price not being reasonable. On overall level, 92 (30.67%) and 208 (69.33%) farm HHs accepted absence of government sellers (iii) and, collusion of private sellers (iv) to be significant factors for price of PPCs being unreasonable. Non-availability of government sellers was the only factor

quoted responsible for price of repairing & maintenance to be unreasonable (17 farm HHs *i.e.*, 5.67%).

3.3 Animal Products and Input Markets

- As far as average per capita sale value of milk is concerned, on overall level, it was Rs. 6372 showing very large and large HHs on the top (Rs. 37986 and Rs. 8521, respectively). On overall level, 98 (32.67%) farm households reported to have sold AH product (milk) through Primary Dairy Co-operative Societies (PDCSs).

- Green and dry fodders were procured out of the farm saved stocks (29.67% and 40.33% of HHs, respectively). Number of surveyed farm HHs, who ascertained 'farm saved' and 'purchased' as means regarding procurement of dry fodder were: 15.67 percent, 12 percent, 6.67 percent, 4.33 percent, 1.67 percent and 6 percent, 4 percent, 2.67 percent, 3 percent, 0 percent, respectively. Procurement of concentrates was reported through purchasing only by 15.67%, 12%, 6.67%, 4.33% and 1.67% by marginal, small, medium, large and very large HHs, respectively. Same number of farm HHs confirmed to have availed veterinary services on purchasing basis.

- Own farm and local traders were informed to be agencies thorough which good number of farm HHs procured green fodder and dry fodder (29.67%, 10.67% and 40.33%, 15.67%, respectively). Local trader and input dealers were accessed to procure concentrates for animal husbandry (9% and 31.33% of households, respectively). As far as procurement of veterinary services is concerned, 'input dealer' and 'cooperative agencies' were main sources used by 7.33% and 33% of households, respectively.

- Aggregate per household expense incurred in purchasing inputs related to animal husbandry was calculated as Rs. 3365.00.

- Prices of animal seed were felt to be reasonable by quite a large number of surveyed households (33%), while nearly 1/4th of the farm households, who owned animal husbandry, reported it to be high (7.33%). In regard to reasonability of prices paid for reported inputs related to animal husbandry, *viz.*, green fodder, dry fodder, concentrates, veterinary charges and labour charges, 29.67%, 24.67%, 24.67%, 33% and 7%, respectively, found them to be reasonable.

- Five factors were considered for prices of inputs being unreasonable: (i) not subsidized, (ii) very few sellers, (iii) no government sellers, (iv) private sellers collude and (v) no price control. In regard to price of animal seed, 22 households (7.33%) told (v) to be cause for it being unreasonable. ' Very few sellers' was the only reason described by 32 (10.67%) and 47 (15.67%) farm households as responsible reason for prices of green fodder and dry fodder being unreasonable. While 'no government sellers' and 'no price control' were stated to be reasons for unreasonable prices of concentrates by 9.67% and 6% of households, respectively.

3.4 Labour Market

- On overall level, average number of casual male labour per household and casual female labour per household employed were 22.07 percent and 25.39 percent, respectively. Average number of days employed for farming and livestock operations were higher in case of male family labour, male farm servants and female causal labour being 1, 0.06 and 25.39, respectively. Aggregated picture of higher average hours/day of labour devoted by male family labourers, male farm labourers and male casual labourers as 9.8, 9.6 and 8, respectively was revealed.

- On overall level, average wage rates paid to male farm servants and male casual labour were much higher than female causal labour (Rs. 216, Rs. 262 and Rs. 155, respectively).

- Aggregate data reveals that 91.67 percent of the total respondents did not have any

point to ascertain that wage rates paid were unreasonable. Giving apriori, it is genuinely evident that marginal and small farm HHs being more resourceless and having an obligation of meeting various expenditures of family remained engaged as wage labour on others' farm and MGNREGA related works for 5.07 months, 4 months and 1.20 months and 1 month, respectively. Out of the surveyed HHs, those who worked as wage labour (23.67%) confirmed work availability for a very limited period and very low wage to be prominent constraints during their engagement as wage labour.

3.5 Credit Market

- It is revealed that out of the total 19 HHs (100%) who took loan during July, 2016 to June, 2018, 14 (73.69%) borrowed from government banks followedby 2 from SHGs (10.53%). Only marginal HHs did borrow money from informal sources.

- On overall level, out of the total amount borrowed by all the loanee households (Rs. 13,05,000/-), highest amount *i.e.* Rs. 12,00,000/- (91.95%) was given by government banks. Small and medium households did enjoy equally highest share of the total amount borrowed (30.65%). Government banks were prominently accessed for borrowing by farmers.

- On overall level, highest rate of interest was found to have been charged by MF/GC/NGOs (16% per annum) followed by co-operative societies and SHGs (14% per annum) and government banks (7% per annum).

- About 90 percent (Rs. 8,72,102) of the total borrowed amount by all loanee of different LHCs (Rs. 9,68,802) had been repaid in regard to government banks. Across LHCs, maximum repayment of borrowed amounts was recorded by small and large farm HHs equally (29.32%).

3.6 Asset Endowments of Households, Government Support Programmes and insurance

- The surveyed farmers of the three districts were not covered/had taken advantages of any of the two programmes/schemes, namely PM-AASHA and Bhavantar Bhugtan Yojana (BBY) during the reference period, *i.e.*, July, 2018 to June, 2019. But advantages/coverage of PM-Kisan was witnessed in the study area.

- On overall level, 73 farms HHs (24.33%) accessed different sources of technical advice. Extension agents were the most instrumental and were accessed by 40 HHs (13.33%). In regard to extension agents, 26 (8.67%) and 14 (4.67%) HHs (including all LHCs) got technical advice on seasonal and need based basis, respectively. Only 12 (4%) and 5 (1.67%) farm HHs reported to have accessed to KVK for technical advice on need based and casual contact basis, respectively. Radio/TV/newspaper/internet like sources of technical advice was accessed on need-based by 16 HHs (5.33%), among whom medium farmers (2.67%) were more eager.

- Out of the total 73 (24.33%) farm HHs who accessed sources for technical advice, highest number of HHs (40) adopted advices given by extension agents (54.79%) followed by KVK and RTVNI - 17 and 16 (23.29% and 21.92%), respectively. Out of the total 300 HHs, majority of the farmers, *i.e.*, 156 (52%) told they could not access sources of technical advice due to non-availability, whereas 144 (48%) were not aware. On overall level, the 73 (24.33%) farm HHs who had accessed technical advice through EA, KVK and RTVNI, found it useful.

- Out of the total 73 farm HHs (24.33%) who confirmed to have accessed some sources of technical advices, 11 percent, 5.67 percent and 5.33 percent of HHs felt the advices provided by EA, KVK and RTVNI,

respectively, to be beneficial. Only 7 (2.33%) HHs experienced the advices provided by EA to be moderately beneficial. On overall level, 5 (1.67%) farmers reported PACSs as the agency to procure paddy at MSP. The same 5 farm HHs (1.67%) ascertained PACS as the agency, to whom paddy was sold. On overall level, the largest quantum of crops sold at price lower than MSPs were found in case of maize (rabi, 9188.20 qtls). It was followed by maize (kharif), wheat and paddy (7431.24 qtls., 5105.72 qtls. and 4703 qtls., respectively).

- All the surveyed HHs belonging to marginal and small LHCs received two installments of their payment under PM-KISAN totaling Rs. 10,38,000/- in 9 months.

- On the overall level, only 14 HHs (4.90%) out of 300 surveyed, reported to have been insured when they received loan showing remaining 286 HHs (95.33%) to have not been insured. Overall, 'not aware about availability of facility' was reported as the most prominent reason for not insuring the crops by 169 HHs (59.09%). It was followed by 'not satisfied with terms and conditions', 'not aware' and 'not interested' (15.73%, 13.99% and 11.19%, respectively).

- On overall level, average premium per HH (having considered 14 *i.e.*, 4.67% HHs only) paid for paddy and wheat were calculated as Rs. 1714.29 and Rs. 1285.71, respectively.

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

- Data imparts knowledge to an interesting fact that 100 percent of the surveyed HHs found income from farming to be inadequate. It is expatiated that declining yield, small landholdings, high temperature and non-availability of desired government support were equally prominent reasons (97.67%) responsible for income from farming being inadequate.

- Lowest severity of problems was faced by maximum HHs - 242 (80.67%) followed by moderate and high. Moderate and high severity of the reported problems were experienced in farming by 53 and 5 HHs (17.67% and 1.66%), respectively.

- Analysis has been made in ranking terms (1-8) based on economic risks faced. Rank-1 shows the risk to be most intense, whereas 8 indicate least important risk. Across LHCs, lack of finance/capital, and sharp fluctuations in output prices were the most intense risks. Majority of marginal farm HHs, *i.e.*, 84 (28%) placed lack of finance/ capital at rank 1 and sharp fluctuations in output prices at rank 3. Same risks were found to have been reported by majority of small HHs 59 (64%) each ranks 1 and 4, respectively. Similar responses about the two above mentioned economic risks were ranked 1 and 4 by 32 medium HHs (65.31%). Cent percent of the surveyed farm HHs belonging to all LHCs (except medium ones) reported to have faced other economic shocks with least rank rating of 8.

- On overall level, 158 farms HHs, *i.e.*, 52.67 percent of the total 300 house holds undertook one or the other type of coping strategies with respect to economic risks. The coping strategy adopted by most HHs (76) was reduction in household consumption expenditure. Some other coping strategies undertaken by HHs in regard to economic risks faced were storage of crops for better price (60 HHs/ 37.97%), deferment of social and family functions, and worked as wage labour in the village (11 each/ 6.96 percent).

- On overall level, out of the total farm HHs (300) surveyed, highest number of HHs, *i.e.*, 97 (32.33%) were found to be the member of Dairy Co-operative Societies (DCSs) followed by political parties and SHGs (8.67% & 6%, respectively). Very large farm HHs were not found to be the members of GPs, SHGs and caste-based Associations.

4. Suggestions

1. Rising prices of inputs is attributed to a large share of increase in the cost of cultivation of crops, so there is need to check input prices, which usually increase during the peak seasons of respective crops.

2. More than half of the cost inflation is contributed by the rising labour cost, besides its scarcity; so managing agricultural labour, from out of MGNREGA job card holders, would alone bring substantial reduction in the crop budget of farmers.

3. Negative and inelastic demand for farm inputs leads to sharp increase in the cost of cultivation, so there is need for proper use of agricultural inputs, besides following suitable agro-economic practices for cultivation of the respective crops.

4. Substitution between human labour and machine is quite important in influencing the cost of cultivation, so mechanization of agricultural activities in mission mode is of utmost importance across the farms to enhance the farm profitability.

5. Motivation for institutionalization of custom hiring services (CHSs) at the farm levels by building Farmers Groups (FGs), Farmer Production Organizations (FPOs), Farmer Clubs (FCs), etc., may be initiated for fair profit margins in crop cultivation.

6. To ensure ultimate benefits of the agricultural development programmes, like; demonstration, distribution of minikits, extension backstopping, transferring of technology, relief under natural disasters, providing credit, insurance and many others, factors like; timelines, transparency and mandated provisions should be strictly followed by the programme implementing agencies.

7. Agricultural marketing infrastructure in the state is overwhelmed despite repealment of BAPMC Act (1960) in 2006, so it needs to be developed in time bound manner for better price realization, as acclaimed, while repealing the referred Act.

8. Free agricultural markets, as such did not really break up local trader monopolies, reduce the control of intermediaries or improve market access, and provide alternatives for farmers in the state, so to fetch the benefits of free agricultural markets, investment, particularly private, needs to be allowed along with sound institutional mechanism for greater participation of farmers.

9. Procurement exercise in the state has miserably failed in terms of volume (against the marketable surplus), prices (delayed payment) and procedures. So, the procurement canvas needs to be increased following equity, accessibility and transparency issues in the system for realization of MSPs by the farmers.

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Commodity Review

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2020-21 up to 30.06.2021 is 57.63 million tonnes as against 50.49 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 30.06.2021) 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

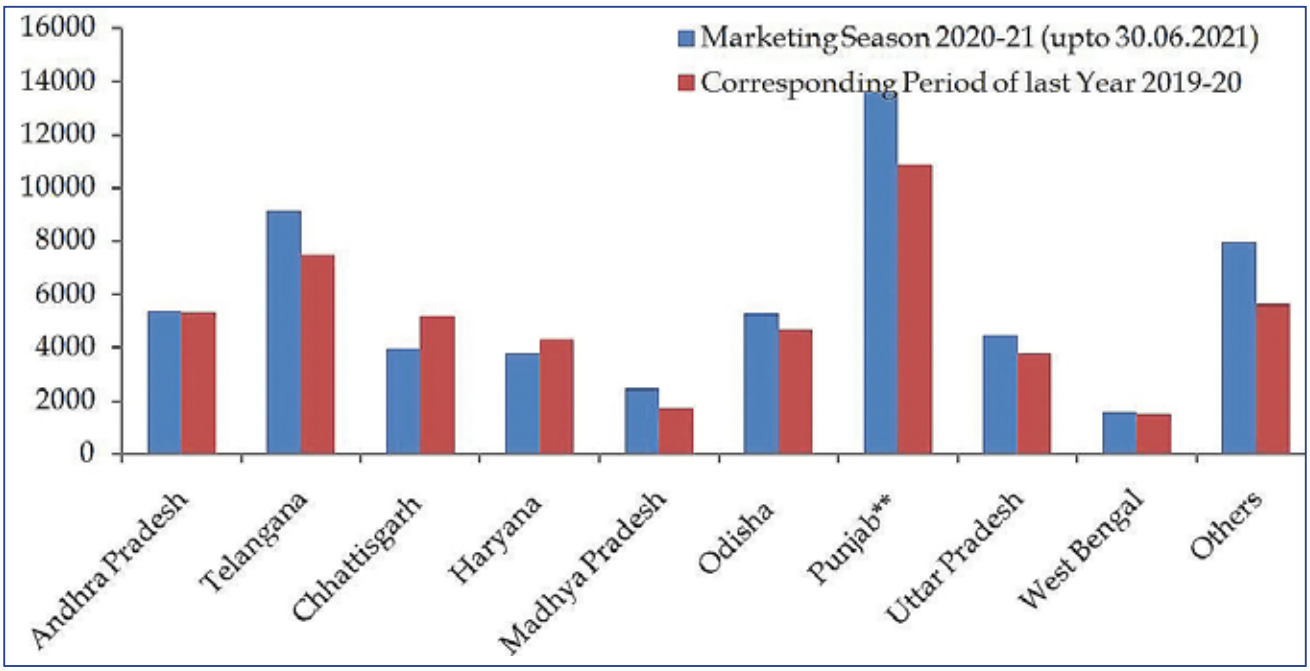
(In thousand tonnes)

State	Marketing Season 2020-21 (upto 30.06.2021)		Corresponding Period of last Year 2019-20	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5
Andhra Pradesh	5349	9.3	5318	10.5
Telangana	9151	15.9	7454	14.8
Chhattisgarh	3976	6.9	5185	10.3
Haryana	3789	6.6	4307	8.5
Madhya Pradesh	2497	4.3	1740	3.4
Odisha	5260	9.1	4669	9.2
Punjab**	13589	23.6	10876	21.5
Uttar Pradesh	4478	7.8	3790	7.5
West Bengal	1583	2.7	1494	3.0
Others	7957	13.8	5659	11.2
All India Total	57629	100.0	50492	100.0

Source: Department of Food & Public Distribution.

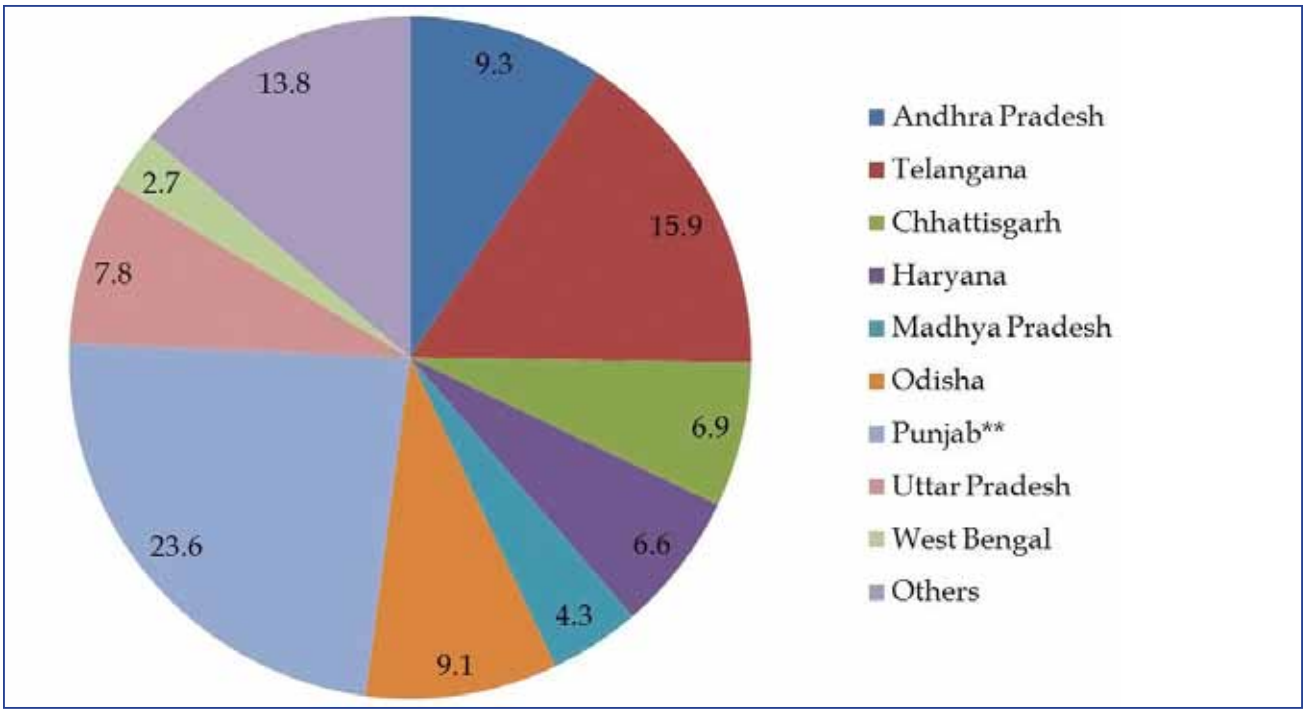
Figure 1: State-wise Procurement of Rice

(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 30.06.2021)



Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat during rabi marketing season 2021-22 up to 30.06.2021 is 43.30 million tonnes as against 38.72 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 2021-22 (up to 30.06.2021) 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

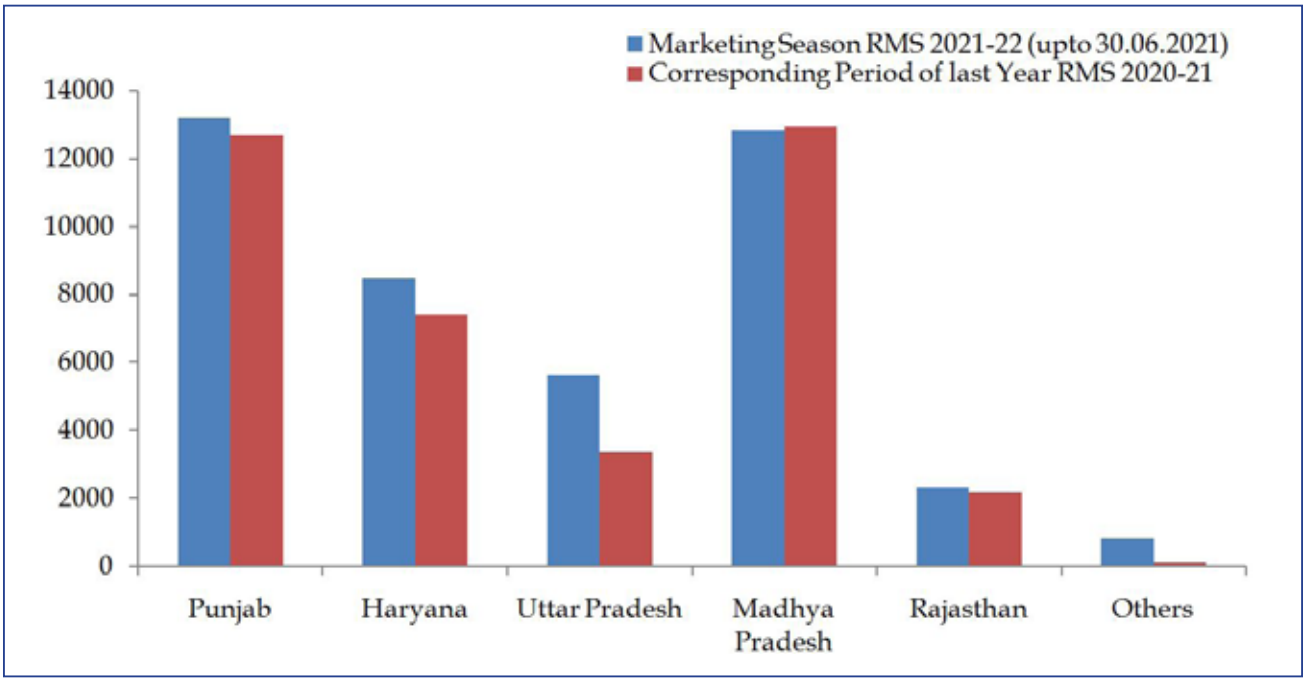
(In thousand tonnes)

State	Marketing Season RMS 2021-22 (upto 30.06.2021)		Corresponding Period of last Year RMS 2020-21	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5
Punjab	13210	30.5	12712	32.8
Haryana	8493	19.6	7400	19.1
Uttar Pradesh	5641	13.0	3361	8.7
Madhya Pradesh	12808	29.6	12935	33.4
Rajasthan	2328	5.4	2187	5.6
Others	824	1.9	121	0.3
All India	43304	100.0	38716	100.0

Source: Department of Food & Public Distribution.

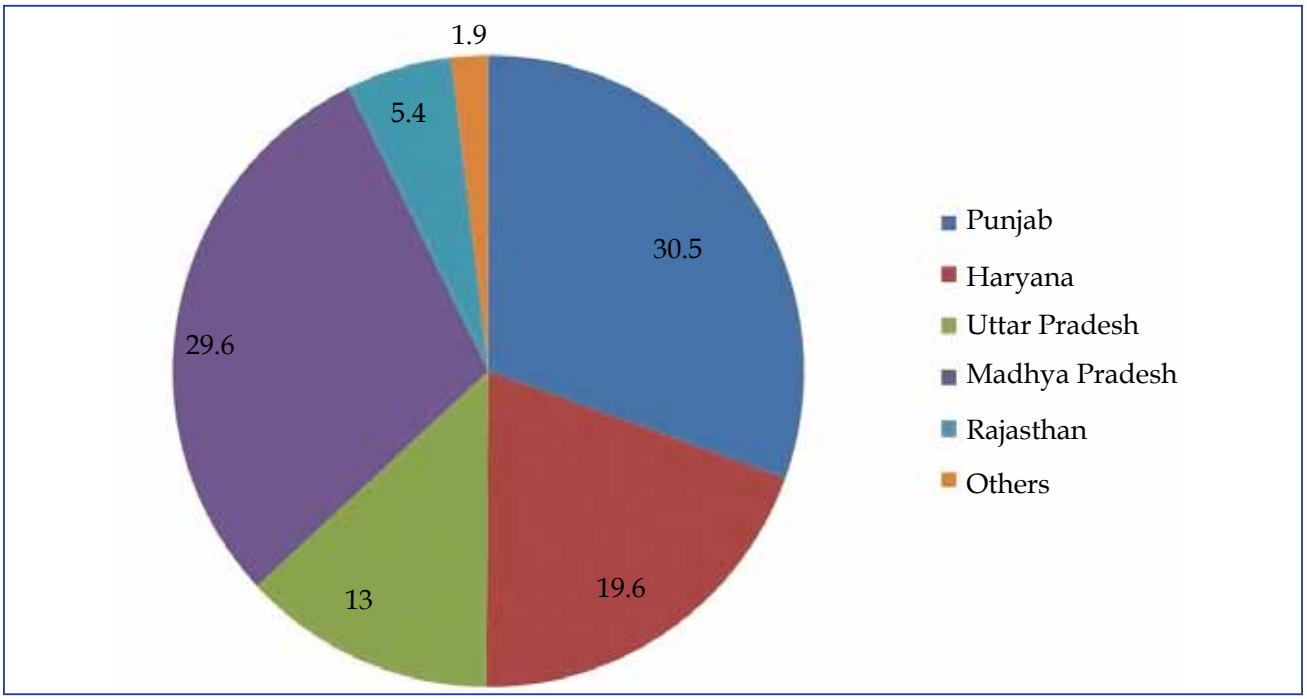
Figure 3: State-wise Procurement of Wheat

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 4: Percentage Share of Different States in Procurement of Wheat during Marketing Season 2021-22 (up to 30.06.2021)



Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 212.9 in June, 2021 showing an increase of 1.96 percent over the previous month and increased by 37.53 percent over the corresponding months of the previous year.

The WPI of all individual oilseeds showed a mixed trend. The WPI of rape & mustard seed (2.19 percent), copra (0.74 percent), gingelly seed (sesamum) (1.76 percent), niger seed (0.77 percent), safflower (1.11percent) and soyabean (2.21 percent) increased over the previous month. However, the WPI of groundnut seed (0.06 percent) and sunflower (9.18 percent) decreased over the previous month. However, the WPI of Cotton Seed remained constant over the previous month.

Manufacture of Vegetable and Animal Oils and Fats

The WPI of vegetable and animal oils and fats as a group stood at 185.4 in June, 2021 which shows a decrease of 2.78 percent over the previous month. Moreover, it also increased by 44.28 percent over the corresponding months of the previous year. The WPI of rapeseed oil (16.23) and copra oil (0.79 percent) increased over the previous month. However, the WPI of mustard oil (1.16 percent), soybean oil (1.42 percent), sunflower oil (5.49 percent), groundnut oil (4.20 percent) and cotton seed oil (1.15percent) decreased over the previous month.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 162.5 in June, 2021 showing an increase of 1.88 percent over previous month and an increase of 2.01 percent over the corresponding month of the previous year.

Potato

The WPI of potato stood at 183.4 in June, 2021 showing an increase of 5.58 percent over the previous month. Moreover, it also decreased by 30.97 percent over the corresponding months of the previous year.

Onion

The WPI of onion stood at 219.7 in June, 2021 showing an increase of 25.54 percent over the previous month and an increase of 64.32 percent over the corresponding months of the previous year.

Condiments & Spices

The WPI of condiments & spices (group) stood at 151.1 in June, 2021 showing an increase of 0.87 percent over the previous month and an increase of 3.78 percent over the corresponding months of the previous year. The WPI of black pepper increased by 4.52 percent and turmeric increased by 1.84 percent over the previous month. However, the WPI of chillies (dry) decreased by 1.92 percent.

Raw Cotton

The WPI of raw cotton stood at 125.1 in June, 2021 showing an increase of 7.20 percent over the previous month and an increase of 17.91 percent over the corresponding months of the previous year.

Raw Jute

The WPI of raw jute stood at 309.3 in June, 2021 showing an increase of 3.58 percent over the previous month and an increase of 49.71 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 June, 2021 and May, 2021 is given in figure 5 and the comparison of WPI during the June, 2021 with the corresponding month of last year has been given in figure 6.

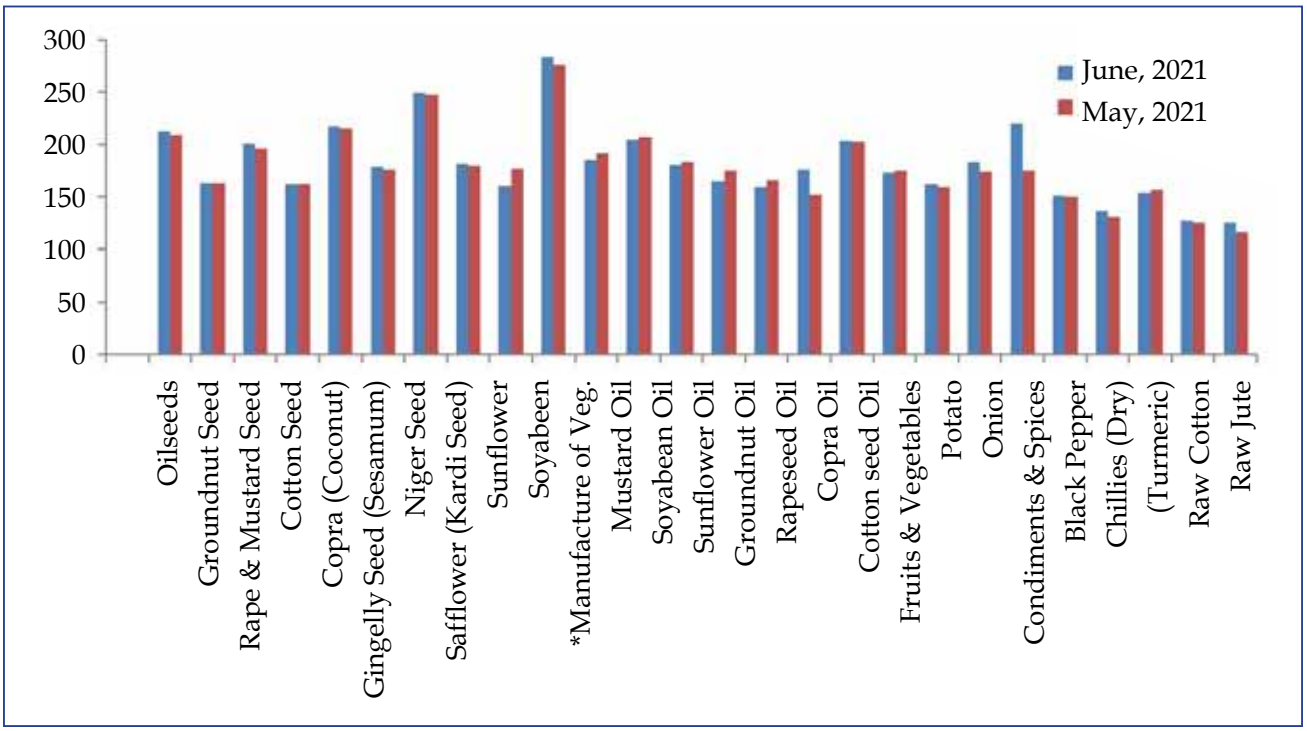
TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12=100)

Commodity	Latest June, 2021	Month May, 2021	Year June, 2020	Percentage variation over the	
				Month	Year
Oilseeds	212.9	208.8	154.8	1.96	37.53
Groundnut Seed	163.3	163.4	158.8	–0.06	2.83
Rape & Mustard Seed	200.2	195.9	151.9	2.19	31.80
Cotton Seed	162.8	162.8	160.2	0.00	1.62
Copra (Coconut)	216.8	215.2	179.1	0.74	21.05
Gingelly Seed (Sesamum)	179.0	175.9	194.0	1.76	–7.73
Niger Seed	249.0	247.1	153.1	0.77	62.64
Safflower (Kardi Seed)	181.8	179.8	160.2	1.11	13.48
Sunflower	160.2	176.4	115.1	–9.18	39.18
Soyabean	282.6	276.5	164.1	2.21	72.21
Manufacture of Vegetable and Animal Oils and Fats	185.4	190.7	128.5	–2.78	44.28
Mustard Oil	204.7	207.1	145.7	–1.16	40.49
Soyabean Oil	180.9	183.5	115.3	–1.42	56.90
Sunflower Oil	165.3	174.9	119.2	–5.49	38.67
Groundnut Oil	159.6	166.6	137.6	–4.20	15.99
Rapeseed Oil	176.2	151.6	128.3	16.23	37.33
Copra oil	203.7	202.1	168.0	0.79	21.25
Cotton seed Oil	172.6	174.6	117.1	–1.15	47.40
Fruits & Vegetables	162.5	159.5	159.3	1.88	2.01
Potato	183.4	173.7	265.7	5.58	–30.97
Onion	219.7	175.0	133.7	25.54	64.32
Condiments & Spices	151.1	149.8	145.6	0.87	3.78
Black Pepper	136.5	130.6	124.8	4.52	9.38
Chillies (Dry)	153.5	156.5	158.1	–1.92	–2.91
Turmeric	127.4	125.1	114.9	1.84	10.88
Raw Cotton	125.1	116.7	106.1	7.20	17.91
Raw Jute	309.3	298.6	206.6	3.58	49.71

Source: DPIIT, Ministry of Commerce and Industry.

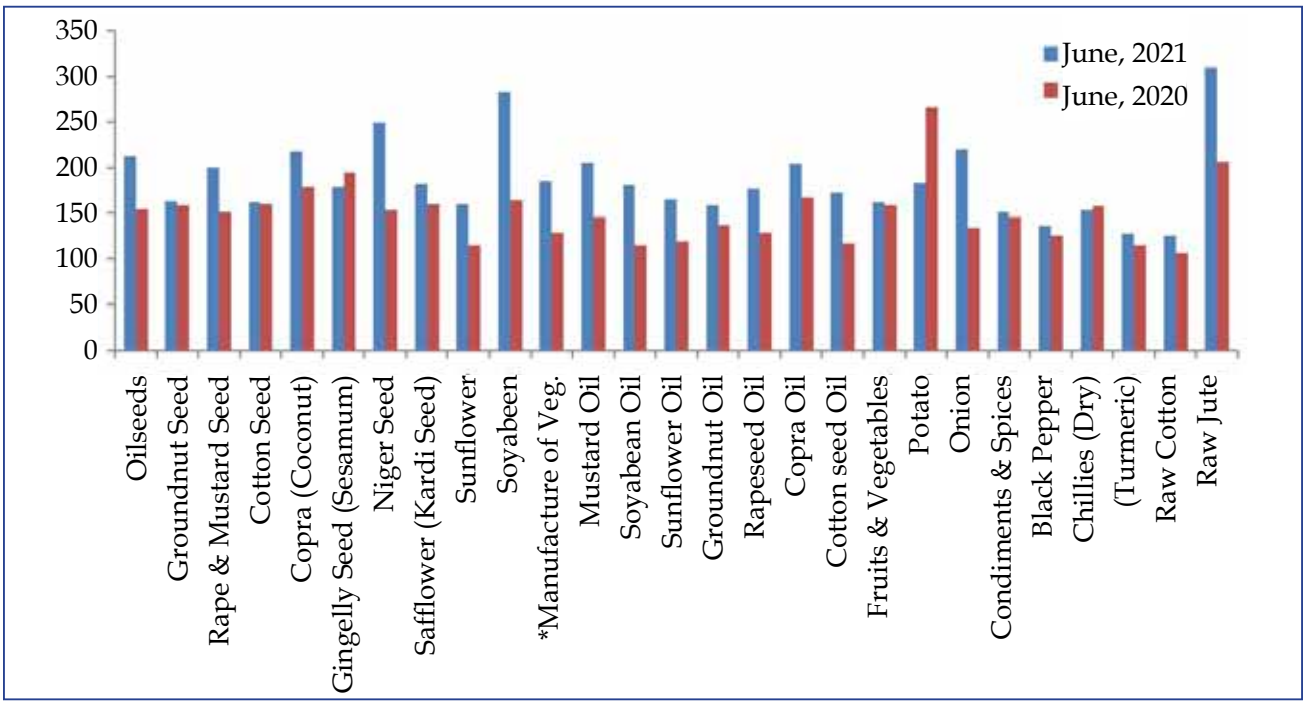
Figure 5: WPI of commercial crops during June, 2021 and May, 2021



Source: DPIIT, Ministry of Commerce and Industry.

*Manufacture of Vegetable, Animal Oils and Fats

Figure 6: WPI of commercial crops during June, 2021 and June, 2020



Source: DPIIT, Ministry of Commerce and Industry.

*Manufacture of Vegetable, Animal Oils and Fats.

Statistical Tables
Wages

1. STATE-WISE AVERAGE DAILY WAGES OF FIELD LABOURERS

(Value in Rs)

State	Month & Year	Normal Working Hours	Field Labour								Other Agri. Labour		Herdsman		* Field Labour		Skilled Rural Occupation		
			1. Ploghing		2. Sowing		3. Weeding		4. Reaping & Harvesting								Carpenter	Blacksmith	Cobbler
			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	M	M
KARNATAKA	Mar, 20	8	NA	NA	NA	NA	NA	NA	NA	NA	362	334	383	325	364	332	404	363	389
HIMACHAL PRADESH	Feb, 21	8	438	-	319	319	315	315	319	319	315	315	315	315	NA	NA	494	488	494
GUJARAT	Dec, 20	8	293	266	283	256	236	233	342	245	239	231	232	211	NA	NA	517	512	488
MAHARASHTRA (P*)	Dec,20	8	NA	NA	NA	NA	NA	NA	NA	NA	381	231	350	200	291	200	440	375	247
ASSAM(P*)	May, 21	8	350	-	350	250	350	250	NA	NA	350	250	NA	NA	NA	NA	NA	NA	NA
BIHAR	Jan, 21	8	315	279	304	271	303	263	305	268	306	284	287	227	NA	NA	482	471	-
KERALA	June, 20	8	1017		630	-	-	514	680	533	843	557	-	-	NA	NA	903	-	-
TELANGANA	April, 21	8	NA	NA	NA	NA	NA	NA	NA	NA	456	363	325	-	386	293	437	426	317
UTTARAKHAND	Aug, 20	8	448	-	300	278	362	319	357	373	358	327	300	300	NA	NA	588	-	-
WEST BENGAL	Dec, 20	8	364	-	311	271	299	266	332	280	315	270	259	246	NA	NA	-	-	-
HARYANA	Apr/21	8	523	-	495	383	457	411	452	411	450	393	-	-	NA	NA	630	598	-
JHARKHAND (P*)	Sep, 20	8	NA	NA	NA	NA	NA	NA	NA	NA	153	140	80	60	170	157	285	238	150
ODISHA	Mar/21	8	355	-	333	289	321	278	335	288	3665	302	298	259	NA	NA	511	454	412
UTTAR PRADESH	May, 21	8	309	-	303	277	301	279	302	278	298	278	250	250	NA	NA	509	500	-
RAJASTHAN	June, 21	8	427	323	432	297	339	298	339	305	-	-	333	276	NA	NA	508	466	388
ANDHRA PRADESH	May, 21	8	NA	NA	NA	NA	NA	NA	NA	NA	484	223	330	200	468	313	473	384	350
CHHATTISGARH	May, 21	8	381	-	222	185	186	167	208	178	231	192	211	188	NA	NA	414	304	284
MADHYA PRADESH	May, 21	8	314	-	271	225	262	231	274	240	284	246	258	246	NA	NA	416	398	339
PUNJAB	May, 21	8	458	-	437	352	419	357	447	371	427	362	-	-	NA	NA	531	523	-
TAMIL NADU	May, 21	8	719	-	427	219	430	208	427	207	470	207	-	-	NA	NA	627	522	-
TRIPURA	Dec, 20	8	315	-	263	180	338	243	263	180	233	173	400	300	NA	NA	340	-	-

Source: State Government

Note: 1 Other agricultural labour include field waterping,carrying load, well diggers, cleaning silt from waterways and embankment, etc

2. * States of Andhra Pradesh, Jharkhand, Karnataka, Maharashtra and Telangana do not give operation–wise details as they furnish data for the group

3. P* - Provisional

4. NA: Not Applicable

Prices

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

Commodity	Variety	Unit	State	Centre	May, 2021	April, 2021	May, 2020
Wheat	PBW 343	Quintal	Punjab	Amritsar	1850	1975	2200
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1975	1975	1925
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1925	NT	1930
Jowar	–	Quintal	Maharashtra	Mumbai	3600	3600	3400
Gram	No III	Quintal	Madhya Pradesh	Sehore	4811	5001	3981
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1625	1520	1800
Gram Split	–	Quintal	Bihar	Patna	6510	6420	6150
Gram Split	–	Quintal	Maharashtra	Mumbai	6350	6300	5800
Arhar Split	–	Quintal	Bihar	Patna	9800	9780	8600
Arhar Split	–	Quintal	Maharashtra	Mumbai	9700	9500	9000
Arhar Split	–	Quintal	NCT of Delhi	Delhi	NA	9900	7950
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	8900	9000	9000
Gur	–	Quintal	Maharashtra	Mumbai	4500	4600	4700
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4500	4500	4500
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2700	2700	2900
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	6500	6500	4100
Mustard Seed	Black	Quintal	West Bengal	Raniganj	NA	4300	4450
Mustard Seed	–	Quintal	West Bengal	Kolkata	7500	7400	4850
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	5400	5600	5200
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	5500	5600	4800
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2400	2400	2100
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3700	3700	3000
Castor Seed	–	Quintal	Telangana	Hyderabad	NT	NT	NT
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	9000	9500	10600
Copra	FAQ	Quintal	Kerala	Alleppey	11950	12100	9850
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	5700	5600	7000
Groundnut	–	Quintal	Maharashtra	Mumbai	9800	8600	9300
Mustard Oil	–	15 Kg.	Uttar Pradesh	Kanpur	2040	1975	1400
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	2515	2475	1688
Groundnut Oil	–	15 Kg.	Maharashtra	Mumbai	2230	2350	2140
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2850	2800	2175

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

Commodity	Variety	Unit	State	Centre	May, 2021	April, 2021	May, 2020
Linseed Oil	–	15 Kg.	Uttar Pradesh	Kanpur	2000	1870	1455
Castor Oil	–	15 Kg.	Telangana	Hyderabad	1775	1725	NT
Sesamum Oil	–	15 Kg.	NCT of Delhi	Delhi	NA	2300	1840
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	3425	3600	3400
Coconut Oil	–	15 Kg.	Kerala	Cochin	2670	2678	2130
Mustard Cake	–	Quintal	Uttar Pradesh	Kanpur	2500	2400	2200
Groundnut Cake	–	Quintal	Telangana	Hyderabad	NT	NT	NT
Cotton/Kapas	NH 44	Quintal	Andhra pradesh	Nandyal	6450	6350	4600
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	5900	6100	NA
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	8250	7975	NA
Jute Raw	W 5	Quintal	West Bengal	Kolkata	8550	8275	NA
Oranges	–	100 No	NCT of Delhi	Delhi	NA	NA	458
Oranges	Big	100 No	Tamil Nadu	Chennai	2200	2500	620
Banana	–	100 No.	NCT of Delhi	Delhi	NA	417	416
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	620	600	400
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	85000	87000	88000
Almonds	–	Quintal	Maharashtra	Mumbai	65000	65000	65000
Walnuts	–	Quintal	Maharashtra	Mumbai	70000	68000	67000
Kishmish	–	Quintal	Maharashtra	Mumbai	25000	24000	21000
Peas Green	–	Quintal	Maharashtra	Mumbai	6500	6000	6000
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	890	900	850
Ladyfinger	–	Quintal	Tamil Nadu	Chennai	1000	1500	1500
Cauliflower	–	100 No.	Tamil Nadu	Chennai	3200	2500	1500
Potato	Red	Quintal	Bihar	Patna	1260	1100	1700
Potato	Desi	Quintal	West Bengal	Kolkata	1160	1100	1840
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	3663	2922	3390
Onion	Pole	Quintal	Maharashtra	Nashik	1250	1000	600
Turmeric	Nadan	Quintal	Kerala	Cochin	NA	12000	11000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	12000	13000	12000
Chillies	–	Quintal	Bihar	Patna	17700	17500	13050
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	NA	35000	29000
Ginger	Dry	Quintal	Kerala	Cochin	NA	20000	27000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	NA	56200	134000
Cardamom	Small	Quintal	West Bengal	Kolkata	155000	160000	250000

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

Commodity	Variety	Unit	State	Centre	May, 2021	April, 2021	May, 2020
Milk	Buffalo	100 Liters	West Bengal	Kolkata	6000	6000	6500
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	NA	59363	73300
Ghee Deshi	–	Quintal	Maharashtra	Mumbai	40000	41500	42000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	40800	40800	40000
Fish	Rohu	Quintal	NCT of Delhi	Delhi	NA	9500	15000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	70000	60000	35000
Eggs	Madras	1000 No.	West Bengal	Kolkata	6300	4476	3645
Tea	–	Quintal	Bihar	Patna	25800	25800	21950
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	14136	12963	NT
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	33500	31000	40000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	22000	22000	29500
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	8450	8500	7800
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	4100	4350	4800
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	13300	13200	NA
Rubber	–	Quintal	Kerala	Kottayam	16000	15000	10500
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	67000	67000	63000

Source: DPIIT, Ministry of Commerce and Industry.

Crop Production

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF AUGUST, 2021

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Winter Rice, Jowar (K), Bajra Maixe (K), Ragi (K), Small Millets (K), Urad (K), Tur (K), Moong (K), Other Kharif Pulses, Ginger, Chillies (Dry), Groundnut, Castor seed, Cotton, Mesta, Sweet Potato, Nigerseed.	Autumn rice, Small Millets (K), Moong (K), Other Kharif Pulses, Sesamum
Assam	–	Autumn Rice, Maize, Jute, Mesta
Bihar	Winter Rice, Jowar (K) Bajra, Small Millets (K), Tur (K), Groundnut, Castor seed.	Jute, Mesta
Gujarat	Winter Rice, Chillies (Dry), Tobacco, Castor seed, Sesamum, Cotton.	–
Himachal Pradesh	Bajra.	Sesamum
Jammu & Kashmir	Small Millets (K).	Maize, Small Millets (K), (early) Sannhemp
Karnataka	Autumn Rice, Winter Rice, Bajra, Ragi, Small Millets (K), Urad (K), Moong (K), Other Kharif Pulses, Potato (Plains), Chillies (Dry), Tobacco, Castorseed, Groundnut, Cotton, Sweet Potato, Nigerseed.	Maize(K), Urad(K), Moong(K), Summer Potato (Hills), Tobacco Sesamum, Sweet Potato, Sannhemp, Onion, (1st Crop)
Kerala	Winter Rice, Tur(K), Other Kharif Pulses, (Kulthi) Sesamum(2nd crop), Cotton, Tapioca (3rd Crop).	Autumn Rice, Ragi, Small Millets (K) Tur(K), Urad(K), Moong(K), Other Kharif Pulses, Lemon Grass, Tapioca (1st Crop)
Madhya Pradesh	Autumn Rice, Jowar (K), Bajra, Small Millets (K), Urad (K), Moong (K), Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Castor Seed, Sesamum, Sweet Potato, Nigerseed.	Maize
Maharashtra	Tobacco, Castor Seed, Cotton.	Maize (K)
Manipur	Sweet Potato.	Autumn Rice, Maixe, Jute
Orissa	Winter Rice, Summer Potato (Plains), Chillies (Dry).	Chillies (Dry.), Jute
Punjab and Haryana	Autumn Rice, Bajra, Ragi, Castor Seed.	Small Millets, (K), Winter Potato (Hills).
Rajsthan	Autumn Rice, Jowar (K), Small Millets (K), Urad (K), Moong (K), Other Kharif Pulses, Winter Potato (Plains), Chillies (Dry), Tobacco (2nd Crop), Groundnut, Castor Seed, Sesamum, Sannhemp.	
Tamil Nadu	Autumn Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Tur (K), Moong (K), Sugarcane, Chillies (Dry), (Early) Groundnut (Late), Cotton, Sannhemp, Tapioca.	Summer Potato, Sugarcane, Chillies (Dry), Cotton (Early), Sannhemp, Onion
Tripura	Winter Rice.	Autumn Rice., Sesamum, Jute
Uttar Pradesh	Winter Rice, Bajra, Chillies (Dry), Sesamum, Sweet Patoto, Turmeric, Tapioca (1st Crop).	Maize, Chillies (Dry), Jute
West Bengal	Winter Rice, Tur (K), Ginger, Chillies (Dry), Sesamum (Early).	Autumn Rice, Maize, Chillies (Dry), Jute
Delhi	Tur (K).	–
Andaman & Nicobar	–	Autumn Rice

(K) – Kharif (R) – Rabi

The journal is brought out by the Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, it aims at presenting an integrated picture of the food and agricultural situation in India on month to month basis. The views expressed are not necessarily those of the Government of India.

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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.
(P) — Provisional.

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ISSN 0002-1679
Regn.No.:840

P. Agri. 21-07-2021
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