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COMMODITY REVIEWS
Foodgrains
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AGRICULTURAL SITUATION IN INDIA

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From Editor's Desk

This release of "Agricultural Situation of India" covers two academic research articles, one on growth and instability of India's agricultural exports in reform era; and other on a new era of agriculture: role of digital technology. It also includes an agro-economic research on relevance and distribution efficiency of seed minikits in pulses in Bihar. Agricultural sector news, price trends in food grains, current procurement statistics and price indices are also incorporated in this edition.

The major farm news highlights in this edition are: India holds National Dialogue on UN Food Systems Summit 2021; interface meeting organized for kharif 2021 season; Union Agriculture Minister inaugurates National Conference on Agriculture for Kharif Campaign-2021; Union Agriculture Minister launches 'मधुक्रान्तिपोर्टल' & 'Honey Corners'; MOU between NCDC and Indian Chambers of Commerce (ICC); Ministry of Agriculture signs MoU with Microsoft for a pilot project in 100 villages of 6 states; India's agriculture trade growth during 2020-21; increasing trend in area under summer crops; DAC&FW working to identify traditional organic areas to transform them into certified organic production hubs; Agriculture Infrastructure Fund applications cross the Rs. 8,000 crores mark; Central Farm Machinery Training & Testing Institute tests the first-ever electric tractor.

For the month of March, 2021 food inflation stood at 7.39%. The Wholesale Price Index (WPI) of pulses, paddy and fruits increased by 13.14 percent, 1.38 percent and 16.33 percent, respectively, whereas for foodgrains, cereals, vegetables and wheat, it decreased by 1.06 percent, 4.08 percent, 5.19 percent and 7.80 percent, respectively, in March, 2021 as compared to corresponding period of last year. The cumulative pre-monsoon season rainfall in the country during the period 1st March, 2021 to 28th April, 2021 has been 30 percent lower than the long period average (LPA). Current live storage in 130 major water reservoirs in the country was 58.55 BCM as against 48.83 BCM of normal storage based on the average storage of last 10 years.

In the academic section's first article, the authors' try to analyze the growth and instability of India's agricultural exports. The study time period 1991-2020 forms the basis of the study. The reforms of 1991 brought a great change in the economic scenario as it led to an improved access to domestic and foreign markets. The study observes that there has been a notable change in the value and composition of agricultural exports. However, the agricultural share in the exports has declined over time and it needs focused intervention as agriculture and its allied products form a major part of India's economy and is a major source of livelihood majority of India's population.

The second article tries to deliberate over how digital technology can usher a new era in the field of agriculture. Even though the demand for food is ever increasing, factors such as diminishing farm area and agriculture being an unreliable source of income are forcing young people to switch to other work opportunities. In such a scenario, use of digital technology in farms over traditional methods may attract the younger generation back to the agricultural sector. The services provided by many startups and use of technologies such as sensors, artificial intelligence, machine learning, drones, UAV's, etc. have made it easier to detect diseases and pest attacks in crops, helped in optimization of water and fertilizer use, and provide real time information about the crops. With many private companies showing interest and government initiating many policies, the agriculture sector is slowly transforming into a tech driven field. There is a need for enhanced focus on digital initiatives to ensure wider coverage, timely information and effective decision making by farmers.

The Agro-economic research section puts forward a study on relevance and distribution efficiency of seed minikits of pulses in Bihar. The study finds that the use of seed minikits has given better quality crop, higher yield and has resulted in more profits. More awareness needs to be created among the farming community by propagating its advantages over normal seeds. With a better and transparent system in place to ensure timely distribution of minikits, this programme will go a long way in increasing the productivity of pulses and providing better returns to its growers.

Promodita Sathish

Farm Sector News

Government Intervention

Union Agriculture Minister launches 'मधुक्रान्तिपोर्टल' & 'Honey Corners'

Union Minister for Agriculture and Farmers' Welfare, Shri Narendra Singh Tomar launched "मधुक्रान्तिपोर्टल" and Honey Corners of NAFED on 7th April, 2021 in New Delhi. "मधुक्रान्तिपोर्टल" is an initiative of National Bee Board (NBB), Ministry of Agriculture and Farmers' Welfare under National Beekeeping & Honey Mission (NBHM). This portal is being developed for online registration to achieve traceability of the source of honey and other beehive products on a digital platform. The technical and banking partner for development of this digital platform is Indian Bank. A MoU between NBB and Indian Bank was signed for this project.

Addressing the launching ceremony, Shri Tomar said that the Honey Mission will lead to increase in income of farmers, employment generation and increase in exports. He added that Sweet Revolution should spread all over the country and Indian honey should meet the global standards.

Necessary functionalities are being developed on the portal to create a database of all stakeholders involved in honey and other hive products' production, sales and marketing chain. On-line registration of beekeepers is being launched in first phase, followed by registration of other stake-holders in honey trade. All sales transactions in honey trading in country shall be captured through a mobile app in second phase to achieve desired results in the area of honey source traceability. Online registration/traceability system for source of honey & other beehive products will help in checking the quality and source of adulteration of honey. The system will also enable consumers/ public to know the source of honey and assure quality of the products.

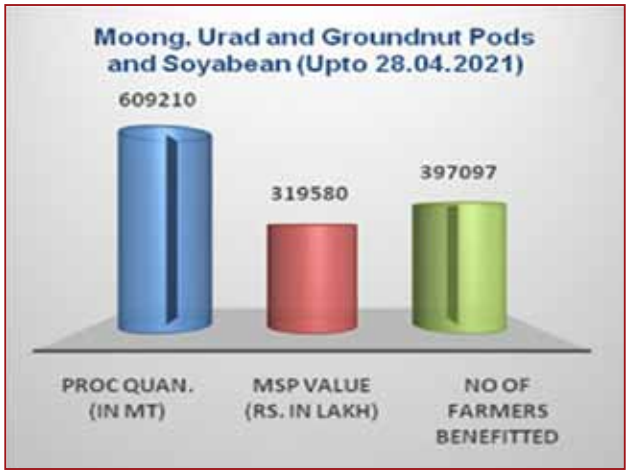
For marketing support to the FPOs, NAFED has developed 14-15 Honey Corners, one each in 5 NAFED bazaar at Ashram, New Moti Bagh and East of Kailash, Panchkula and Mussoorie in their bazaar/retail stores. More Honey Corners will be developed by NAFED in most of the upcoming 200 NAFED stores to promote market support for honey and other beehive products. Online marketing options will be explored to provide a platform for marketing and promotion of honey supplied by the FPOs.

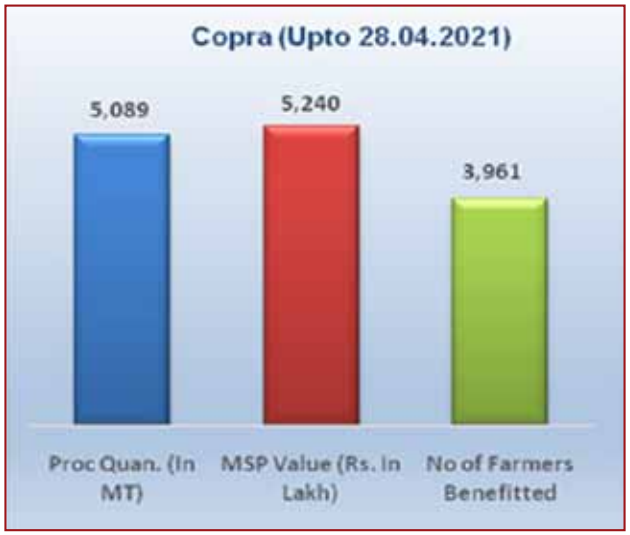
Keeping in view the importance of beekeeping, a new scheme entitled National Beekeeping & Honey Mission (NBHM) was approved by Government of India for Rs. 500.00 crores allotted under Aatma Nirbhar Bharat announcement for overall promotion and development of scientific beekeeping and to achieve the goal of "Sweet Revolution". NBHM is implemented through National Bee Board (NBB). The scheme has three Mini Missions (MM-I, II & III) under which main thrust is given on awareness, capacity building/ trainings, focus on women empowerment through beekeeping, setting up of requisite infrastructural facilities, *viz.*; Integrated Beekeeping Development Centres (IBDCs), honeybees disease diagnostic labs, setting up of/upgradation of honey testing labs, beekeeping equipment manufacturing units, custom hiring centres, Api therapy centres, development of quality nucleus stock centres & bee breeders, etc., digitization/online registration, etc. under MM-I; processing, value addition, market support, etc. under MM-II and R&D under MM-III.

MSP operation during Rabi Marketing Season 2021-22

Procurement of wheat was undertaken in Rabi Marketing Season RMS 2021-22 in the states of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Rajasthan, Uttarakhand, Chandigarh, Himachal Pradesh, Delhi, Gujarat and Jammu & Kashmir at MSP, as was done in previous seasons. Till 28.04.2021, a quantity of 258.74 LMT of wheat was procured benefitting 25,08,619 farmers with MSP value of Rs. 51,100.83 crores.

Upto 28.04.2021, the Government through its nodal agencies has procured 6,09,210.53 MT of moong, urad, toor, gram, masoor, groundnut pods, mustard seed and soyabean having MSP value of Rs. 3,195.80 crores benefitting 3,97,097 farmers in Tamil Nadu, Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Uttar Pradesh, Telangana, Haryana and Rajasthan under Kharif 2020-21 & Rabi 2021.





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

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. The respective state/UTs Governments are making necessary arrangements for commencement of procurement from the date as decided by the respective states based on the arrivals of pulses and oilseeds.

Procurement operations of seed cotton (kapas) under MSP are going on smoothly in the states of Punjab, Haryana, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Telangana, Andhra Pradesh, Odisha and Karnataka. Till 28.04.2021, a quantity of 91,89,310 cotton bales valuing Rs. 26,719.51 crores has been procured benefitting 18,86,498 farmers.

Meetings and Events

India holds National Dialogue on UN Food Systems Summit 2021

The United Nations Secretary General has called for the first ever UN Food Systems Summit to be held in September, 2021 to strategize the actions for positive change in agri-food systems in the world to realize the vision of the 2030 Agenda for Sustainable Development. The Summit will focus on levers and pathways to shape food systems nationally and globally to accelerate progress in the SDGs. The Summit 2021 is planned to be essentially participatory and consultative and needs the game changing ideas from the experiences through the national, sub-national (state) and independent consultation for the five Action Tracks related to safe and nutritious food, sustainable consumption patterns, nature-positive production, advance equitable livelihoods and resilience to vulnerabilities, shocks and stress. The COVID-19 pandemic led vulnerability and challenges faced by the humanity in food and related system has further added to the need for reorienting our actions and strategies beyond specific cropping or farming systems to entire agri-food systems covering production, distribution and consumption.

India with close to 18% humanity on the globe owes paramount stake in this Food System Summit. India has volunteered, but not limited to, the Action Track 4: Advance Equitable Livelihoods for the UN Food System Summit 2021. To take the process further, the Government has constituted a high level inter-departmental group under the Chairmanship of Prof. Ramesh Chand, Member, NITI Aayog along with the representatives from Ministries of Agriculture and Farmers' Welfare (MOA&FW), Rural Development and others. The

prime function assigned to this group is to conduct National Dialogues with all the stakeholders of agri-food systems for exploring national pathways towards creating sustainable and equitable food systems in India and suitably contribute to transformation in global food systems to meet the needs of present and future. The consultative processes shall culminate in the Food System Summit in September, 2021 in which Hon'ble Prime Minister is likely to participate along with other global leaders.

The first National Level Dialogue on Agri-Food Systems-Advancing Equitable Livelihoods was conducted on 12th April, 2021. The National Dialogue was facilitated by the inter-departmental group constituted by Department of Agriculture, Cooperation & Farmers' Welfare and the representatives from UN Agencies in Delhi. The day long deliberations were attended by farmers' organisations, farmer producer organisations, civil society organisations, research institutions & experts and the government agencies.

Chairman of the Group and National Convenor for the dialogue, Prof. Chand urged the participants to share their ideas, experiences, success stories, transformative innovations, evidence based suggestions relating to policies, infrastructure, institutions and the commitments India should be making to align food system to achieve SDGs towards 2030. He added that we should plan for the elimination of poverty, zero hunger, nutrition security and health for all, raising incomes across food value chains and ensuring economic, social and environment sustainability. Several game changing ideas for reimagining India's agriculture like agro climate based farming, agro-ecology based farming, farmers owned and managed value chain systems, statutory backing for sustainable innovations, adopting best practices from the states, linking production incentives to nutrition goals, nutrition sensitive production and diets, regulatory framework for food safety of low income consumers, selective biofortification, FPOs of women farmers, etc. were suggested by participants.

On the pattern of National Dialogues, the State Governments have also been requested to conduct the state-level dialogues with all the stakeholders involved directly or indirectly in the agri-food systems in India. Such grass root dialogues offer a unique opportunity to various stakeholders to involve and provide inputs for sustainable food systems in India. The Ministry of Agriculture & Farmers' Welfare has created a website for this purpose to seek the inputs and ideas of all the stakeholders and the public on the Action Track 4 and other Action Tracks of the UN Food System Summit-2021.Chairman of the group appealed to the stakeholders, experts and public to contribute their ideas and thoughts on the web page *https://farmer.gov.in/fss/index.aspx* specially created for this purpose.

Interface meeting for Kharif 2021 season held

Ministry of Agriculture and Farmers' Welfare, the Department of Agriculture, Cooperation & Farmers' Welfare (DAC&FW) jointly with ICAR organized interface meeting for Kharif 2021 on 20th April, 2021 through video conference. Divisions of Department of Agriculture, Cooperation & Farmers' Welfare (DAC&FW) in consultation with their counterparts in ICAR formulated Group Recommendations on researchable issues for the pre-seasonal interfaces held twice annually before kharif & rabi seasons**.** These Group Recommendations are then discussed in detail at the joint plenary session of DAC&FW-ICAR interface.

The effort is aimed at understanding the key issues - both from research and development perspective in agriculture and allied sectors and evolving joint strategies to address those issues in the coming kharif season. The issues warranting actions by states are then flagged in the National Conference on Agriculture and are discussed threadbare with the states in respective sessions to avoid any gap in their implementation.

In the pre-kharif interface workshop, the divisions of DAC&FW such as Crops, Seeds, Horticulture, Plant Protection, Mechanization and Technology, Integrated Nutrient Management, Natural Resources Management & Rainfed Farming System and Extension, formulated Group Recommendations in response to emerging issues

and identified issues based on deliberations with ICAR for the Kharif Season 2021

Secretary (DAC&FW), Shri Sanjay Agarwal emphasized on reducing the cost of cultivation by using appropriate pest and disease resistant varieties of crops along with cultivation of bio-fortified varieties; enhancement of productivity of kharif crops especially pulses and oilseeds; reducing the varietal mismatch, use of drones in agriculture especially in pesticide application, adequate use of mechanization technologies; soil health management practices; management of invasive insect pests, etc. for improving production and productivity in agricultural and horticultural crops. In order to address the issue of nutritional security along with food security, it has been decided to promote biofortified varieties of food grains including pulses through National Food Security Mission (now Ministry of Agriculture has decided to change name to National Food and Nutritional Security Mission). He also appraised about the preparatory steps taken by Ministry of Agriculture for observance of International Year of Millets and requisite convergence modalities. He mentioned that frequent effective research-extension interfaces in agricultural sector are of paramount importance. He expressed that the solution provided to current issues will be passed on to states for further strategizing their action plan for augmenting the production and productivity through better prepositioning of inputs, new seed varieties, pre-decided seed rolling plan, nutrient management, pest management and modern machineries. He also informed that a National Virtual Conference on Kharif Crops-2021 is being organized by DAC&FW on 30th April, 2021 to discuss kharif season plan of sowing with all states Additional Secretaries, Principal Secretaries of Agriculture and Horticulture to achieve the food production targets and take full benefit of favorable monsoon forecasted recently by IMD.

National Conference on Agriculture for Kharif Campaign-2021

Union Minister of Agriculture & Farmers' Welfare, Shri Narendra Singh Tomar inaugurated 'The National Conference on Agriculture for Kharif Campaign-2021' on 30th April, 2021. During the conference, discussion was held to review and assess the preparedness for management of kharif crops and ensuring availability of seeds, pesticides, fertilizers, machinery and their prepositioning at block levels. Besides this, discussion also took place on preparedness for drought like situation if it occurs in any district, integrated nutrient management and integrated pest management, crop diversification and increasing farmer's income; focused strategy for production of oilseeds and pulses; marketing of rabi crops and procurement at MSP, action plan and advisory/ guidelines for agriculture management in the wake of Covid pandemic.

Inaugurating the conference, the Union Minister appreciated the efforts of farmers for the record production for food grains (303.34 million tonnes), which is over 1.96% higher than the previous year's output (297.50 million tonnes). The pulses and oilseed production are 24.42 million tonnes & 37.3 million tonnes, respectively. Agriculture and allied sectors registered a continuous growth in GDP contribution. The share of agriculture in GDP increased from 17.8% in 2019-20 to 19.9% in 2020-21 as per Economic Survey 2020-21. He also complimented the State Governments for effective implementation of Centrally Sponsored Schemes for the welfare of farmers.

Shri Tomar announced the setting of higher production targets of food grains from 301.92 million tonnes to 307 million tonnes for the year 2021-22 in comparison to production targets for previous corresponding year 2020-21. As per 2nd advance estimate, the achievements are likely to be 303.34 million tonnes for year 2020-21.

Expressing the concern over the shortage of oilseeds and pulses, Shri Tomar requested State Governments to work on mission mode to overcome the shortage situation. He also requested the State Governments to identify such places which are following organic farming and are free from chemicals so that they can be certified as organic and can be linked with the market.

The Secretary (DAC&FW), Shri Sanjay Aggarwal informed that the Department has decided to distribute seed mini-kits for kharif crops

with the active involvement of State Agriculture Department. The State Agriculture Departments should project their demands of farm inputs to the Centre for its intervention to ensure the timely availability of seeds and fertilizers to the farmers at crucial stages of crop production. The Secretary, DARE, Dr. Trilochan Mohapatra informed that the bio-fortified varieties have been released with better quality aspects of enhanced nutrients and proteins.

General Agriculture Sector News

ICAR-IVRI transfers technology - CSF & Sheep Pox vaccine through Agrinnovate

The ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh has transferred the technology - CSF & Sheep Pox Vaccines to M/s Hester Biosciences through Agrinnovate India Limited in a ceremony held on 7th April, 2021.

In his address, Dr. Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR) congratulated ICAR-IVRI for moving in the direction of providing the country with two important vaccines at a cheaper price and longer immunity. Dr. Mohapatra applauded the Agrinnovate India for commercializing around 150 technologies during 2021 and fetching a gross realization of over Rs. 4 crores. He stated that the development of vaccines using indigenous strains is a step towards AtmaNirbhar Bharat. He emphasized that due to the cheaper prices of the vaccines, a greater return can be achieved with lesser investment which will enable production enhancement in animals. He also urged for looking out the ways for supplying the indigenous vaccines to other countries as well.

Live Attenuated Indigenous CSF Cell Culture Vaccine (IVRI-CSF-BS)

The Classical Swine Fever (CSF) is an important disease of pigs that causes 100% mortality. In India, the disease is controlled by a lapinized CSF vaccine (Weybridge Strain, U.K.) produced by killing large numbers of rabbits. To avoid this, the ICAR-IVRI earlier developed a cell culture CSF vaccine using the lapinized vaccine virus from foreign strain.

An indigenous CSF cell culture vaccine (IVRI-CSF-BS) developed by using an Indian field isolates has a huge export potential. Due to its very high titre (1x109.5 TCID50 /ml), the vaccine can produce a large number of doses (60 lakh approx.) easily from only one 75 cm^2 tissue culture flask. The country's yearly requirement of 22 million doses can be prepared in just four 75 cm^2 tissue culture flasks.

Costing around less than Rs. 2/- per dose as against Rs. 15 to Rs. 25/- of lapinized CSF vaccine, the high titre vaccine would be the most economical CSF cell culture vaccine. The vaccine has been extensively tested for safety and potency. The vaccine has been found to induce protective immunity from day 14 of the vaccination till 18 months.

Indigenous Live Attenuated Sheep Pox Vaccine [SPPV Srin 38/00]

Sheep pox is a severe viral disease in sheep which is economically important in small ruminants. A live attenuated sheep pox vaccine using indigenous strain was developed by the Institute for preventive vaccination in the sheep population.

The developed vaccine uses indigenous sheep pox virus strain [SPPV Srin 38/00] and is adapted to grow in the vero cell line which makes the vaccine production to be easily scalable. The vaccine is innocuous, safe, potent, and immunogenic [efficacious] for sheep aged more than six months of age. It has been evaluated both in-house and field. It protects the vaccinated animals for a period of 40 months.

MOU between NCDC and Indian Chambers of Commerce (ICC)

The National Cooperative Development Corporation (NCDC) has secured Euro 68.87 million (Rs. 600 cr) loan from Deutsche Bank, Germany's largest bank, for onward lending to cooperatives in the country. An agreement was inked between NCDC and the German bank in this regard in presence of the Union Agriculture Minister, Shri Narendra Singh Tomar in New Delhi on 13th April, 2021. The Minister also presided over signing of an agreement between

the Indian Chamber of Commerce and NCDC to boost farmers' linkages with markets.

The Agriculture Minister said that the Farmer Producer Organizations being set up in the country would be able to access easier credit and market through the NCDC agreements with ICC and Deutsche Bank which will help small and marginal farmers.

Set up in 1963, the NCDC is a development finance statutory institution under the Ministry of Agriculture and Farmers' Welfare. It has extended loans to the tune of Euro 16 billion to cooperatives of various sizes since 2014. With zero net NPA, NCDC has pan India presence with its 18 regional directorates catering to all the states.

Union Ministry of Agriculture signs MoU with Microsoft for a pilot project in 100 villages of 6 states

Union Ministry of Agriculture and Microsoft India on 13th April, 2021 inked a Memorandum of Understanding (MoU) for a pilot project in 100 villages of 6 states. Microsoft has come forward to start a pilot project in 100 villages selected from 10 districts of 6 states (Uttar Pradesh, Madhya Pradesh, Gujarat, Haryana, Rajasthan and Andhra Pradesh) to develop farmer interface for smart and well-organized agriculture, including post-harvest management and distribution. For this project, Microsoft has joined in with its local partner CropData. This project will carry out various tasks for the betterment of farmers in the selected 100 villages, which will enhance their income. This project will reduce the input costs for farmers and make farming easy. It is proposed to undertake similar pilot projects with other public and private players to create a vibrant digital agro-ecosystem in the country.

India's agriculture trade grows during 2020-21

India has consistently maintained trade surplus in the agricultural products over the years. India's agricultural and allied exports during 2019-20 were Rs. 2.52 lakh crores and imports were Rs. 1.47 lakh crores. The export of agri and allied commodities during April, 2020 - February, 2021 were Rs. 2.74 lakh crores as compared to Rs. 2.31 lakh crores in the same period last year indicating an increase of 18.49%.

The commodities which posted significant positive growth in exports were wheat, other cereals, rice (other than basmati), soya meal, spices, sugar, raw cotton, fresh vegetable, processed vegetables, alcoholic beverages, etc. On specific demand from countries, NAFED has exported 50,000 MT wheat to Afghanistan and 40,000 MT wheat to Lebanon under G2G arrangement.

India has witnessed significant growth of 132% in export of (non-basmati) rice. This increase in exports is on account of multiple factors, mainly being India capturing new markets namely, Timor-Leste, Papua New Guinea, Brazil, Chile and Puerto Rico. Exports were also made to Togo, Senegal, Malaysia, Madagascar, Iraq, Bangladesh, Mozambique, Vietnam, Tanzania Rep and Madagascar.

The imports of agri and allied commodities during April, 2020 – February, 2021 were Rs. 141034.25 crores as compared to Rs. 137014.39 crores in the same period last year witnessing a slight increase of 2.93%.

Despite COVID-19, balance of trade in agriculture has favorably increased during April, 2020 – February, 2021 to Rs. 132,579.69 crores as against Rs. 93,907.76 crores during the same period in 2019-20.

Commodity	Exports 2019-20 (in Rs. crores)	Exports 2020-21 (in Rs. crores)	Percentage increase
Wheat	425	3283	727
Other Cereal	1318	4542	244.61
Non-basmati rice	13030	30277	132

Commodity	Exports 2019-20 (in Rs. crores)	Exports 2020-21 (in Rs. crores)	Percentage increase
Soya meal	3087	7224	132
Spices	23562	26257	11.44
Sugar	12226	17072	39.64
Raw cotton	6771	11373	67.96
Fresh Vegetables	4067	4780	17.54
Processed Vegetables	1994	2846	42.69

Source: DGCIS, Kolkata.

Area under summer crops shows an increasing trend in India

The Ministry of Agriculture and Farmers' Welfare has taken new initiatives for the scientific cultivation of summer crops such as pulses, coarse cereals, nutri-cereals and oilseeds.

As on 23rd April, 2021, summer sowing in the country is 21.5% higher than it was last year during the corresponding period. The total summer crop area has increased to 73.76 lakh hectares from 60.67 lakh hectares a year ago during the corresponding period.

A noteworthy increase has been seen in the area of pulses. As on 23rd April, 2021, the area sown under pulses has increased to 12.75 lakh ha from 6.45 lakh ha, this is nearly a 100% increase. The increased area is mainly reported from the states of Tamil Nadu, Madhya Pradesh, West Bengal, Uttar Pradesh, Gujarat, Bihar, Chhattisgarh, Maharashtra, Karnataka, etc.

Oilseeds have increased to 10.45 lakh ha from 9.03 lakh ha, which is an increase of around 16%. The increased area has been reported from West Bengal, Karnataka, Gujarat, Maharashtra, Uttar Pradesh, Tamil Nadu, Andhra Pradesh, Chhattisgarh, etc.

Rice has increased to 39.10 lakh ha from 33.82 lakh ha, which is an increase of around 16%. Summer rice has been reported from the states of West Bengal, Telangana, Karnataka, Assam, Andhra Pradesh, Odisha, Chhattisgarh, Tamil Nadu, Bihar, etc.

Summer sowing is likely to be completed by the first week of May and the area has increased significantly. Summer crops not only provide extra income but also create employment opportunities. A major gain by the cultivation of summer crops is the improvement in soil health, particularly through the pulses crop.

Encouraging water levels in almost all reservoirs helped in protecting both the rabi crop as well as summer crops. As a whole, productivity & production is expected to increase significantly.

Growing summer/zaid crops based on the availability of soil moisture and other climatic conditions is an old practice in India, particularly for meeting the additional domestic requirement of food grains and feeding livestock. Farmers also cultivate summer paddy crops in some states for their domestic use based on water availability. By using scientific cultivation practices, farmers have started sowing summer crops through seed drill/zero till after treating the seeds. Farmers have started cultivating high yielding varieties and using post-harvest value addition technologies for higher productivity and economic gains.

To develop a road map, the Zaid National conference was held in January, 2021 in which discussion with states was held on the challenges, prospects and strategies. Thereafter, for maximising production, timely arrangement of inputs like seeds and fertilizers mobilization along with deployment of extension staff was ensured. For technical support, close coordination between State Agriculture Universities (SAUs) and Krishi

Vigyan Kendras (KVKs) was ensured, which are vital at the district and grassroots level.

Harvesting of rabi crops on schedule in the country

Amidst the current pandemic situation, farmers and agriculture labourers are sweating and toiling against all adversities to make sure that food reaches our homes. Their silent efforts, coupled with timely intervention by the Central and State Governments, has ensured that there is minimal or no disruption to harvesting activities. As a result of the proactive steps taken, harvesting of rabi crop is on schedule and timely procurement is also being ensured for the benefit of the farmers.

Of the rabi crop harvesting, out of total wheat sown in 315.80 lakh ha, 81.55% has already been harvested in the country. State-wise harvesting has also increased and reached 99% in Rajasthan, 96% in Madhya Pradesh, 80% in Uttar Pradesh, 65% in Haryana and 60% in Punjab. Harvesting is at its peak in Haryana, Punjab and Uttar Pradesh and is likely to be completed by the end of April, 2021.

Of the pulses sown in 158.10 lakh ha, harvesting has been completed for gram, lentil, urad, mung and field pea.

For sugarcane, out of the total sown in 48.52 lakh ha (sugar season 2020-21), harvesting has been completed in Chhattisgarh, Karnataka and Telangana. For the states of Bihar, Andhra Pradesh, Maharashtra, Gujarat, Haryana, Madhya Pradesh, Uttarakhand and West Bengal, 92-98% harvesting has been completed. In Uttar Pradesh, 84% has been completed and this will continue till mid-May, 2021.

If the rice (winter) sown in 45.32 lakh ha over the states of Andhra Pradesh, Assam, Chhattisgarh, Karnataka, Kerala, Odisha, Tamil Nadu, Telangana, Tripura and West Bengal, 18.73 lakh ha has been harvested. Rabi rice harvesting is almost complete in Andhra Pradesh, Karnataka and Tamil Nadu.

Amongst the oilseed crops, rapeseed mustard which was sown in around 70 lakh ha, 100% has been harvested in the states of Rajasthan, Uttar Pradesh, Madhya Pradesh, West Bengal, Jharkhand, Gujarat, Chhattisgarh, Odisha and Assam. It is almost complete in Haryana (99.95%) and in Punjab, around 77% has been harvested. For groundnut which has been sown in 7.34 lakh ha, 62.53% has been harvested.

DAC&FW working to identify Traditional Organic Areas

Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW) is working to identify Traditional Organic Areas to transform them into certified organic production hubs. The Government of India has certified 14,491 ha of such area under Car Nicobar and Nancowry group of islands in UT of A&N Islands. This area becomes the first large contiguous territory to be conferred with organic certification under the 'Large Area Certification' (LAC) scheme of the PGS-India (Participatory Guarantee System) certification programme.

Car Nicobar and Nancowry group of islands have been traditionally organic for ages. The administration has also banned the sale, purchase and usage of any chemical inputs of GMO seeds in these islands. The administration of UT in collaboration with local communities prepared the island-wise and farmer-wise database of land holding, practices being adopted, input usage history, etc. An expert committee has verified their organic status and recommended for declaration of the area as certified organic under the PGS-India certification programme.

Besides these islands, agriculture areas in states like Himachal Pradesh, Uttarakhand, North Eastern states and tribal belts of Jharkhand and Chhattisgarh, and desert districts of Rajasthan which are essentially free from the use of chemical inputs can be transformed to certified organic. Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW) in consultation with the states is working to identify such areas, transform them to certified organic, and facilitate the marketing of area-specific niche products through branding and labelling.

Additionally, to bring isolated individual farmers to the certified organic fold, DAC&FW has also launched an organic certification support scheme under PKVY (Paramparagat Krishi Vikas Yojana). Under the scheme, individual farmers can avail financial assistance for certification under any of the prevailing certification systems of NPOP or PGS-India. Assistance will be available as reimbursement of certification cost directly to certification agencies through the states.

After A&N Islands, UTs of Lakshadweep and Ladakh are proactively taking steps for the transformation of their traditional organic areas to certified organic. Armed with organic certification, these hitherto unexplored areas will have direct access to the emerging organic food market of the country.

Targeting Traditional Agricultural Area to organic through Large Area Certification

Despite deep inroads of modern agricultural practices, still, there are large contiguous areas in hills, tribal districts, desert and rained areas in India that continue to remain free from chemical input usage. With little efforts, such traditional/default organic areas can be brought under organic certification almost immediately. Department of Agriculture and Farmers' Welfare under its flagship scheme of Paramparagat Krishi Vikas Yojna (PKVY) has launched a unique quick certification programme "Large Area Certification" (LAC) to harness these potential areas.

As per the established norm of organic production systems, the areas having chemical input usage history are required to undergo a transition period of minimum 2-3 years to qualify as organic. During this period, farmers need to adopt standard organic agriculture practices and keep their farms under the certification process. On successful completion, such farms can be certified as organic after 2-3 years. The certification process also requires elaborate documentation and time to time verification by the certification authorities. Under LAC, requirements are simple and the area can be certified almost immediately. LAC is a quick certification process that is cost-effective and farmers do not have to wait for 2-3 years for marketing PGS organic certified products.

Under LAC, each village in the area is considered as one cluster/group. Documentations are simple and maintained village-wise. All farmers with their farmland and livestock need to adhere to the standard requirements and on being verified, get certified en-mass without the need to go under conversion period. Certification is renewed on annual basis through annual verification by a process of peer appraisals as per the process of PGS-India.

Agriculture Infrastructure Fund applications cross the Rs. 8,000 crore mark

Agriculture Infrastructure Fund has crossed the Rs. 8000 crores mark after receiving 8,665 applications worth Rs. 8,216 crores. The largest share of the pie is contributed by Primary Agricultural Credit Societies (PACS) (58%), agri-entrepreneurs (24%) and individual farmers (13%). These investments are for a wide range of projects which will unlock value for farmers across the country. States leading the front are Andhra Pradesh (2,125 applications), Madhya Pradesh (1,830), Uttar Pradesh (1,255), Karnataka (1,071) and Rajasthan (613). While most of these states are leveraging their strong cooperatives network to take the lead, Madhya Pradesh stands out with the highest non-PACS applications. Agriculture Infrastructure Fund will bring together the collective power of all stakeholders in the agricultural ecosystem.

The Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW) is undertaking a host of initiatives to accelerate on-ground investments. The department has directly reached out to 150+ FPOs and livelihood organisations, along with IFFCO, HAFED, NAFED & others. The department hosted an agribusiness conclave, supported by CII & FICCI, with 90+ agribusiness participants; where key players like Arya CMA, Mahindra Agri, Tata Consumer, IFFCO and Escorts Cropping Solutions gave presentations on their role in building infrastructure under AIF through partnership with farmers, farmer groups and local entrepreneurs.

The Department has been regularly conducting reviews of states to monitor progress & promote cross learnings. In addition to it, a state conclave was conducted with 190+ participants

from state departments, where Andhra Pradesh demonstrated its PACS led model & Madhya Pradesh demonstrated its local entrepreneurship led model. States have in turn engaged with a large number of farmers and local entrepreneurs.

These initiatives have led to not only an overall increase in applications but an increase in interest in innovative infra types such as custom hiring centers & farm machinery banks (130 applications worth nearly 25 crores) and infra for smart & precision agriculture (200 applications worth nearly 1,300 crores). AIF has brought farmers & agribusinesses together with newer partnership models emerging for the creation of distributed infra near farm-gate in a hub & spoke model. The agribusinesses are increasing awareness about AIF & newer agri-tech amongst FPOs and supporting them in application & adoption. A portal for the scheme has been created with the URL *https://agriinfra.dac.gov.in*, where applicants can submit applications and all stakeholders can also monitor the progress of the applications.

About Agriculture Infrastructure Fund

The Agriculture Infrastructure Fund is a medium - long term debt financing facility for investment in viable projects for post-harvest management infrastructure and community farming assets through interest subvention and credit guarantee. The duration of the scheme is from FY 2020 to FY 2029 (10 years). Under the scheme, Rs. 1 lakh crores will be provided by banks and financial institutions as loans with interest subvention of 3% per annum and credit guarantee coverage under CGTMSE for loans up to Rs. 2 crores. Eligible beneficiaries include farmers, FPOs, PACS, Marketing Cooperative Societies, SHGs, Joint Liability Groups (JLG), Multipurpose Cooperative Societies, Agri-entrepreneurs, start-ups, and Central/State agency or local body sponsored Public-Private Partnership projects.

Central Farm Machinery Training & Testing Institute tests the first-ever electric tractor

Central Farm Machinery Training & Testing Institute, Budni (Madhya Pradesh) has tested the first-ever electric tractor in the Institute. The Institute received the application for an electric tractor under confidential test initially. Accordingly, the institute tested the tractor and released the draft test report in February, 2021. After the release of the draft test report, the manufacturer requested for conversion of the nature of the test from "Confidential to Commercial" which the competent authority has accepted. Accordingly, the test report was released as a commercial test report. Electric tractor will be more environment friendly than other types of tractors.

General Survey of Agriculture

Trend in Food Prices

The rate of inflation, based on monthly WPI, stood at 7.39% (provisional) for the month of March, 2021 as compared to 1.57% during the corresponding period of last year.

Based on Wholesale Price Index (WPI) (2011-12=100), WPI in case of foodgrains decreased by 1.06 percent in March, 2021 over March, 2020.

Among foodgrains, WPI of pulses and fruits increased by 13.14 percent and 16.33 percent, respectively, whereas for cereals and vegetables decreased by 4.08 percent and 5.19 percent in March, 2021 over corresponding period of last year.

Among cereals, WPI for paddy increased by 1.38 percent and for wheat decreased by 7.80 percent in March, 2021 over March, 2020.

The WPI in case of foodgrains increased by 0.44 percent in March, 2021 over February, 2021.

Among foodgrains, WPI of fruits, cereals and pulses increased by 5.11 percent, 0.19 percent and 1.42 percent, respectively, WPI of vegetables decreased by 10.56 percent in March, 2021 over February, 2021.

Among cereals, WPI for paddy decreased by 0.12 percent and WPI for wheat increased by 0.47 percent in March, 2021 over February, 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 increased from 153.0 in February, 2021 to 153.4 in March, 2021. The rate of inflation based on WPI Food Index increased from 3.31% in February, 2021 to 5.28% in March, 2021.

Food-vs.-Non-Food Inflation

The Inflation rate for non-food items increased by 3.70 percentage points (from 4.57% in February, 2021 to 8.27% in March, 2021) while the inflation rate of food items increased by 1.97 percentage points (from 3.31% in February, 2021 to 5.28% in March, 2021) resulting an increase in WPI based inflation rate for all commodities from 4.17% in February, 2021 to 7.39% in March, 2021.

The Consumer Price Index (CPI) based inflation rate has increased to 5.52% in March, 2021 on point to point basis (i.e. March, 2021 over March, 2020) as it was a month ago 5.03%, according to data released by the Central Statistics Office (CSO) on 12th April, 2021. The Consumer Food Price Index (CFPI) for All-India Combined has increased to 4.94% in March, 2021 from 3.87% in February, 2021.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative pre-monsoon season (March-May), 2021 rainfall for the country as a whole during the period 1st March, 2021 to 28th April, 2021 has been 30% lower 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 3% in South Peninsula but lower than LPA by 45% in East & North East India, by 27% in North-West India and by 17% in Central India.

Out of 36 meteorological sub-divisions, 08 meteorological sub-divisions received large excess/excess rainfall, 08 meteorological sub-division received normal rainfall and 20 meteorological sub-divisions received deficient/ large deficient rainfall.

Current live storage in 130 reservoirs (as on 29th April, 2021) monitored by Central Water Commission having Total Live Capacity of 174.23 BCM was 58.55 BCM as against 72.08 BCM on 29.04.2020 (last year) and 48.83 BCM of normal storage (average storage of last 10 years). Current year's storage is 81% of last year's storage and 120% of the normal storage.

Articles

Growth and Instability of India's Agricultural Exports in Reform Era

Joby Thomas[1] and Dr. N. Karunakaran[2]

Abstract

India's agriculture exports have changed significantly over the years. They have shown noteworthy rise since the trade reforms of 1991. Increasing demand over the world for Indian agricultural commodities offers great opportunity and has resulted in manifold increase in exports. Besides changes in volume and value, agricultural exports have experienced transformation in its composition also. The present paper attempts to study the performance of agricultural export of India, its growth and degree of instability during 1991-92 to 2019-20.

Keywords: *Agriculture export, growth, instability, reform era, India.*

1. Introduction

India is primarily an agrarian country, with agriculture serving as the primary source of income for majority of the population. In the country, agriculture contributes about 16 percent of total GDP, making use of 60 percent of the land area (Paramasivan and Pasupathi, 2017). Agriculture sector plays a vital role in development of economy since it provides employment to 50 percent of the total population.

Since the very beginning, Indian agriculture has contributed to foreign trade and has been a major supplier of agriculture and allied commodities in the international market. Agriculture export is considered as the backbone of export sector because it helps increased the income of the rural people. Both directly and indirectly, it plays a crucial role in solving the problem of unemployment, particularly in the rural areas. Due to the rapid growth of world economy, the demand and supply situation has undergone a drastic change and faces severe competition from the other major players in the field.

In India, both domestic and external changes in economic environment can be seen since 1991, with a number of policies being implemented to liberalize and globalize the economy. The reform policies in 1990s led to an increase in agricultural exports and improved access to domestic and foreign markets (Tamizharasan, 2018). Liberalization of international trade led to rapid transformation of the export and import conditions. WTO helped the countries to grow up and realize their proper export potential which brought huge opportunities to grow. India's approval of the Agreement on Agriculture led to transformation in the levels of comparative advantage for various agricultural commodities exported in the foreign markets (Kumar *et.al*, 2005). From mid of the nineties, some measures were introduced towards liberalization in external trade in agriculture to face the domestic requirements and in the latter part of the nineties, the measures were to meet the requirements under the WTO which helped to make great impact on trade in agriculture.

But in recent years, there has been a decline in India's share of agricultural exports because of low productivity, low yields and large domestic demand. Indian agricultural exports face domestic constraints in production, storage, processing and marketing. Higher domestic prices in comparison to international prices of export

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products make agricultural exports less competitive.

1.1. Objectives of the study

The main objectives for which the study is carried out are:

(i) To analyze the performance of India's agricultural exports during 1991-1992 to 2019-20.

(ii) To estimate the growth and instability in the export of agricultural commodities during the period of study.

2. Materials and Methods

This study is based on the time series secondary data on export earnings of agriculture and allied products of India during the period 1991-92 to 2019-20. For analyzing the growth and instability of agricultural exports, the total period has been split into three parts, *viz.*, period I (1991-92 to 2000-01), period II (2001-02 to 2010-11) and period III (2011-12 to 2019-20). The secondary data is sourced from various issues of the Handbook on Statistics by Reserve Bank of India, Economic Surveys of the Government of India and Foreign Trade Statistics of India by DGCIS.

Average annual growth rate, compound growth rate and Coppok's Instability Index have been used for data analysis. Trend and growth rates were estimated by using a semi-log growth model. The compound growth rate (CGR) is calculated by using the formula;

$$y = ab^t$$

where, y = export earnings,
a = constant,
t = time element,
b = regression coefficient which shows the rate of change

$$\log y = \log a + t \log b;\ b = \log (1+r)$$

Compound growth rate (r) is computed as [Antilog (b)-1] * 100

Instability in export earnings of agricultural and allied products is estimated by using Coppok's Instability Index (CII) which is calculated as the antilog of the square root of the logarithmic variance using the following formula;

$$CII = \text{Antilog}\left(\sqrt{V \log} - 1\right) *100$$

$$\log V = \frac{\Sigma\left(\log \frac{X_{t+1}}{X_t} - m\right)^2}{n-1}$$

where,

log V = logarithmic variance of the series,

X_t = export earnings,

t = year,

n = number of years,

m = mean of the difference between logs of X_{t+1} and X_t.

CII is a close estimate of the average year to year percentage adjusts for the trend. Thus variation around the trends is more pronounce than the absolute variation (Kumar *et al.*, 2005) as the CII with higher numerical value represents higher instability and vice versa.

3. Results, Analysis and Discussion

3.1. India's agricultural and allied product exports

Agricultural and allied products export of India during 1991-92 to 2019-20 shows that the average agricultural export earnings were Rs. 18919 crores in period I (Table 1). In this period, the percentage share of agriculture and allied products exports to total export declined from 17.93 to 13.4 percent. The average annual growth rate during this period was 16.05 percent. In period II (2001-02 to 2010-11), the average exports earnings of agriculture and allied products was Rs. 58631 crores. During this period, the average percentage share of agriculture and allied products exported to total export was 10.77 and the average annual growth rate was 15.55 percent.

TABLE 1: EXPORT OF AGRICULTURE AND ALLIED PRODUCTS

(in Rs. Crores)

	Year	Agriculture and Allied Products Exports	Total Exports	Percentage share of Agriculture and Allied Products Export	Annual Growth Rate of Agriculture and Allied Products
Period I	1991-92	7895	44042	17.93	
	1992-93	9082	53688	16.92	15.04
	1993-94	12633	69751	18.11	39.09
	1994-95	13269	82674	16.05	5.04
	1995-96	20344	106353	19.13	53.31
	1996-97	24363	118817	20.50	19.75
	1997-98	24626	130101	18.93	1.08
	1998-99	25387	139753	18.17	3.09
	1999-00	24301	159561	15.23	–4.28
	2000-01	27288	203571	13.40	12.29
Average		**18919**	**110831**	**17.44**	**16.05**
Period II	2001-02	28144	209018	13.46	3.14
	2002-03	32473	255137	12.73	15.38
	2003-04	34616	293367	11.80	6.60
	2004-05	38078	375340	10.14	10.00
	2005-06	45220	456418	9.91	18.76
	2006-07	57392	571799	10.04	26.92
	2007-08	74209	655864	11.31	29.30
	2008-09	80649	840755	9.59	8.68
	2009-10	84136	845534	9.95	4.32
	2010-11	111393	1273346	8.75	32.40
Average		**58631**	**577658**	**10.77**	**15.55**
Period III	2011-12	180279	1465959	12.30	61.84
	2012-13	223170	1634319	13.66	23.79
	2013-14	260953	1905011	13.70	16.93
	2014-15	240639	1896445	12.69	–7.78
	2015-16	216369	1716378	12.61	–10.09
	2016-17	226775	1849434	12.26	4.81
	2017-18	249182	1956515	12.74	9.88
	2018-19	271354	2307726	11.76	8.90
	2019-20	248385	2219854	11.19	–8.46
Average		**235234**	**1883516**	**12.55**	**11.09**
Overall Period Average		**99745**	**821949**	**13.62**	**14.28**

Source: Computed Data based on Economic Surveys (various issues), Government of India

In period III (2011-12 to 2019-20), the average export earnings of agriculture and allied products was Rs. 235234 crores, the average percentage share in total export was 12.55 and average annual growth rate was 11.09 percent. During the entire study period (1991-92 to 2019-20), the average export earnings of agricultural and allied products were Rs. 99745 crores, the average percentage share in total export earnings was 13.62 percent and the AAGR was 14.28. From the analysis of table 1, it is found that the export earnings from agriculture and allied products increased during the overall period of study. In 1991-92, the export earnings from agriculture and allied products were only Rs. 7895 crores and it increased to Rs. 235234 crores in 2019-20. However, there has been a downward trend in the percentage share of agricultural export in total export and average annual growth rate.

3.2. Trend and growth rate of export of agriculture and allied products

In order to estimate the trend value of the export of agriculture and allied products, regression coefficient were calculated by keeping agriculture and allied products exports as dependent variables and time as the independent variable. The result of trend analysis of agricultural and allied products exports of India is presented in the table 2.

TABLE 2: TREND AND GROWTH RATE OF EXPORT OF AGRICULTURAL AND ALLIED PRODUCTS

Period	Constant (a)	Coefficient (b)	SE of b	t	R^2	CGR (percent)
1991-92 to 2000-01	8.975	0.143	0.932	7.286	0.869	15.4
2001-02 to 2010-11	10.028	0.155	0.008	18.721	0.978	16.7
2011-12 to 2019-20	12.219	0.29	0.013	2.210	0.411	2.9
Overall Period (1991-92 to 2019-20)	8.989	0.131	0.005	26.215	0.962	14.0

Source: Computed data based on Economic Surveys (various issues), Government of India

The regression coefficient is 0.143, 0.155 and 0.29 during the period I, II and III, respectively. This means that India's export earnings have increased by 14.3 percent per year in period I, 15.5 percent in period II and 29 percent in period III. The compound growth rate is 15.4%, 16.7% and 2.9% for period I, II and III, respectively. In the overall period (1991-92 to 2019-20), the estimated regression coefficient is 0.131, showing export earnings increased by 13.1 percent. There has been a positive trend in India's exports of agriculture and allied products during the period 1991-92 to 2019-20 (table 2).

3.3. Instability analysis

Coppok's Instability Index is used to estimate the instability in export earnings of agriculture and allied products. Table 3 shows that the degree of instability is 58.51 percent, 59.07 percent and 41.57 percent in periods I, II and III, respectively. Among the three periods, the degree of instability is more during period II (59.07 percent) and lower in period III (41.57 percent). During the overall period, instability index is 114.68 percent, showing a high a degree of instability in India's export earnings of agriculture and allied products.

TABLE 3: COPPOK'S INSTABILITY INDEX

Period	Coppok's Instability Index (percent)
1991-92 to 2000-01	58.51
2001-02 to 2010-11	59.07
2011-12 to 2019-20	41.57
Overall Period (1991-92 to 2019-20)	114.68

Source: Author's estimation

3.4. Composition of India's agricultural exports

The composition of agriculture and allied product exports of India includes tea, coffee, rice, cotton, tobacco, cashew, spices, oil meals, fruits and vegetables, processed items, marine products, sugar and molasses, meat and meat preparations and others. The contribution of tea was 15.3 percent in 1991-92 which declined to 2.4 percent in 2019-20. The share of export earnings of rice was 9.6 percent in 1991-92 and increased to 18.3 percent in 2019-20. For cashew, the share in total export earnings of agricultural products was 8.6 percent in 1991-92 which declined to only 1.6 percent in 2019-20. The percentage share of spices exports increased from 4.7 percent to 10.3 percent during the study period. The contribution of export earnings of oil meals in total agricultural export declined to 2.4 percent in 2019-20 (Table 4). The absolute earning of all the products has increased over the years. However, its percentage share shows a fluctuating trend. It can be observed that the relative importance of tea; oil meals, etc. has declined. But some commodities like rice, spices, meat and its preparations, sugar, etc. have shown an increasing trend in contribution of total agricultural exports.

TABLE 4: COMPOSITION OF AGRICULTURAL EXPORTS

(in Rs. Crores)

Items	1991-92	2001-02	2011-12	2015-16	2016-17	2017-18	2018-19	2019-20
Tea	1212 (15.3)	1719 (6.1)	4079 (2.3)	4719 (2.2)	4906 (2.2)	5397 (2.2)	5828 (2.2)	5851 (2.4)
Coffee	332 (4.2)	1095 (3.9)	4535 (2.5)	5125 (2.4)	5646 (2.5)	6245 (2.5)	5722 (2.1)	5237 (2.1)
Rice	756 (9.6)	3174 (11.3)	24109 (13.4)	38202 (17.7)	38443 (17.0)	50308 (20.2)	53975 (19.9)	45427 (18.3)
Cotton	305 (3.9)	43 (0.2)	21624 (12.0)	12821 (5.9)	10907 (4.8)	12200 (4.9)	14628 (5.4)	7540 (3.0)
Tobacco	377 (4.8)	808 (2.9)	4006 (2.2)	6452 (3.0)	4250 (1.9)	3828 (1.5)	3985 (1.5)	3761 (1.5)
Cashew	676 (8.6)	1794 (6.4)	4450 (2.5)	5028 (2.3)	5323 (2.4)	5978 (2.4)	4606 (1.7)	4041 (1.6)
Spices	372 (4.7)	1497 (5.3)	132 (7.4)	16630 (7.7)	19111 (8.4)	20085 (8.1)	23218 (8.6)	25642 (10.3)
Oil Meal	921 (11.7)	2263 (8.0)	11796 (6.6)	3600 (1.7)	5410 (2.4)	7043 (2.8)	10557 (3.9)	5861 (2.4)
Fruits and Vegetables	349 (4.4)	1055 (3.7)	7587 (3.2)	14893 (6.9)	12043 (5.3)	11881 (4.8)	13019 (4.8)	11626 (4.7)
Processed fruits and items	190 (2.4)	1237 (4.4)	5489 (3.1)	14100 (6.5)	5687 (2.5)	5992 (2.4)	6537 (2.4)	6803 (2.7)
Marine Products	1443 (18.3)	5898 (21.0)	16585 (9.2)	31219 (14.4)	39594 (17.5)	47646 (19.1)	47665 (17.6)	47618 (19.2)
Sugar	157 (2.0)	1782 (6.3)	900 (5.0)	10481 (4.8)	8974 (4.0)	5323 (2.1)	10110 (3.7)	14499 (5.8)
Meat and Meat Preparations	231 (2.9)	1193 (4.2)	141 (7.9)	27528 (12.7)	27036 (11.9)	26896 (10.8)	25987 (9.6)	23347 (9.4)
Others	574 (7.3)	4587 (16.3)	409 (22.8)	25571 (11.8)	39445 (17.4)	40360 (16.2)	45517 (16.8)	41132 (16.6)

Source: Computed data based on Economic Surveys (various issues), Government of India

Note: Figures in the parenthesis indicate percentage share in total agricultural exports.

3.5. Growth and Instability of export earnings of agriculture products

The compound growth rates of cotton, meat and its preparations, and sugar have the highest level, that is, 21.7 percent, 20.8 percent and 18.5 percent, respectively. Commodities like cashew, oil meals and tea have a comparatively low growth rate, which is 7.0 percent, 7.6 percent and 8.5 percent, respectively. The degree of instability was high in the case of cotton (291.6 percent) and sugar (239.45 percent). The least instability is found in the case of cashew (67.5 percent), oil meals (81.45 percent) and coffee (83.67 percent). From the analysis of CII, it is found that all the items in the export of agriculture and allied products are volatile over the period of study (table 5). The study also finds that the export earnings of cotton show the highest growth rate (21.7 percent) and at the same time, it has a high degree of instability (291.16 percent).

TABLE 5: GROWTH AND INSTABILITY OF EXPORT EARNINGS OF AGRICULTURE PRODUCTS OVER THE STUDY PERIOD

(in percent)

Item	Growth (CGR)	Instability (CII)
Tea	8.5	84.05
Coffee	9.2	83.67
Rice	15.7	163.79
Cotton	21.7	291.16
Tobacco	11.2	96.78
Cashew	7.0	67.57
Spices	16.3	144.37
Oil Meal	7.6	81.45
Fruits and Vegetables	16.7	157.60
Processed fruits and items	14.4	122.82
Marine Products	12.2	101.06
Sugar	18.5	239.54
Meat and Meat Preparations	20.8	188.52

Source: Author's estimation

4. Conclusion and Suggestions

The analysis of growth and performance of export of agriculture and allied products during 1991-92 to 2019-20 reveals noticeable change in the value and composition of agricultural export. Though the volume and value of exports have increased, share of agricultural exports in total exports is declining. Agricultural exports have a high degree of instability during the study period. It is also found that there is a shift in the commodity composition in the export of agricultural and allied products. From the study it is observed that the relative importance of tea, oil meals, etc. has declined. But some commodities like rice, sugar, spices, etc. have shown an increasing trend in contribution of total agricultural exports. India's agriculture export is quite volatile and there are large year to year fluctuations in export growth.

On the basis of the study, the following suggestions and policy measures are proposed for improving export share of agricultural products from India.

- It is suggested that farmers may be encouraged to increase agricultural production and productivity. A suitable support may be provided in the form of ensuring timely supply of fertilizer at the subsidized rates and agricultural inputs that may gradually improve the share of agricultural exports.
- New markets may be explored and also e-commerce solutions such as agro-based e-portals for promoting agricultural exports may be adopted.
- More investment is needed in infrastructural development in agriculture sector such as grading facilities, storage and processing facility, market information network and so on, which have positive impact on agricultural marketing.
- Structural strengths of the agricultural sector may be improved by investing more in research and development, IoT in agriculture for improving productivity and introducing organic farming.

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A New Era of Agriculture: Role of Digital Technology

MOHIT KUMAR KOLAY[1]

Abstract

The present paper in the backdrop of traditional farming focusses on the use of digital technology to transform agriculture smart and attractive. Its relevance is highlighted here particularly when young people are shunning agriculture for other professions but at the same time, demand for food is increasing because of growth in population. It is shown here that the Digital India programme with increasing use of smartphones along with available developments in science and technology can make a big boost towards modern farming, making the farmers a direct link in the farmers-consumers food value chain. A growing number of Indian startups have proved their prowess in various facets of digital agriculture.

Keywords: *Digital Technology, digital India, startups*

1. Introduction

The Green Revolution in agriculture of the 1960s made impressive strides between 1961 and 2004. Cereal yields in East Asia improved by 2.8 percent a year or over 300 percent over the period. This was enabled by modern farming practices, including irrigation, use of fertilizers and pesticides, and the development of new and more productive crop varieties (World Development Report, 2008). Gradually, the wave of automation started spilling into the fields, the tractor was introduced, followed by new tillage and harvesting equipment, irrigation and air seeding technology, all leading to higher yields and improved quality of the food and fiber that was grown. But the average farm size in India is just 1.1 ha compared to average farm size of 180 ha in US or 60.5 ha of Germany (as per rural survey of National Bank for Agriculture and Rural Development). We see six-legged robot, Prospero roaming fields in the US and planting individual kernels of corn in exactly the right spot for the plant to take the root. Bonirob has been wandering the fields of Germany unassisted, testing the ground and picking weeds that threaten the main crop (Walter, 2016). But the scale and scope of such automation in agriculture in India may not be viable with 85 percent of farmers being in the marginal and small category. Farming in India is still mostly labor-intensive with less productivity, just 4.4 percent of Germany and 6.3 percent of USA (Suman, 2018). In the last two decades, only 10 percent of the country's investment has been in the agriculture sector despite 50 percent of the rural workforce engaged in agriculture. As per government statistics, the share of agricultural products/agriculture and allied sectors in the country's Gross Domestic Product dropped down to 16.5 percent in 2019-20 from 51.9 percent in 1950–51. The annual growth rate in real terms in agriculture and its allied sectors was 2.88 percent from 2014-15 to 2018-19 and estimated at 2.9 percent for the year 2019-20. As per the Economic Survey 2019-20, the average annual growth rate in agriculture in real terms has remained more or less static in the last six years impacting farmers' income.

China and India are large producers of food, but because of population, they tend to consume much of their own food products. India is the second largest producer of food in the world, but it has only 2 percent share in global agriculture exports. The Economic Survey 2018 annual report states that the annual per capita net availability of food grains is 180 kg in India as compared to 450 kg in China, 200 kg in Bangladesh and more than 1100 kg in US. In 2011, 70 percent of Indian

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youth lived in rural areas where agriculture was the main source of livelihood. According to the 2011 Census, 2000 farmers give up farming every day. Today, both middle-aged and young people are shunning agriculture as agriculture is a low-reward industry. The low income of farmers is mainly due to the farmers' inability to generate income from their crops and curb their growing debt. Farmers are at the mercy of drought or flood, rapidly increasing input costs, widening price swings of produce, power of middle-men and traders in the value chain and lack of direct access to markets. Farming population across the world is ageing without an adequate replacement by the next generation. The average age of an Indian farmer is 50 years, while farmer in the US is 58 years and that of a Japanese farmer is 67 years. Every third European farmer is more than 65 years old (Mohapatra, 2019). This is worrying because the next generation of the current farmers is quitting the profession. It means we are approaching a situation where one of the biggest consumers of food will be left with few farmers.

Naturally, the question arises on how to transform agriculture into a more profitable, efficient, safer and environment friendly business for the majority of marginal and small farmers. Today, with tremendous developments in agronomic sciences in all facets of plant genetics, plant physiology, meteorology and soil science, knowledge is very much available on how to improve the effectiveness of agricultural production system while conserving the soil and protecting the environment at the same time. With rapid developments in agricultural science and technology across the globe, people are now growing food even in the deserts. Instead of using fossil fuel, people have started using clean resources such as the sun and the sea water to grow food. Sony, Toshiba and Fujitsu are producing lettuce with no-wash, no-soil greens using hydroponics at more than twice the speed of normal field production with specialized LED lighting to optimize photosynthesis. Sundrop Farms in Australia are growing tomatoes for Coles supermarkets from hydroponic greenhouses, requiring no freshwater, but using desalinated sea water with the aid of solar power (Mcclelland, 2015). AGCO, the recipient of 11 major awards at the prestigious Agritechnica 2019 in Hanover, Germany demonstrates the use of Fuse Technologies in action on every aspect of precision farming to ensure the crops and soil receive exactly what they need for optimum health and productivity (Gasiorowski-Denis, 2017). To help increase farm production in the country with minimum use of inputs and make the farming climate more resilient, Indian Council of Agricultural Research has come out with record 310 new high-yield crop varieties (Mohan, 2017). The growing use of genetically modified crops is likely to improve the yield for Indian farmers. In fact, knowledge base is not a constraint, all relevant factors are known that affect crop health and yield, why the crop yield varies within a field, and year to year, what crop will fetch farmer better returns, the best time to sow, when to water, what fertilizers and nutrients to use when, how to control and arrest disease, when and how to harvest.

But here, the main issue is how to percolate down the knowledge base of agricultural scientists and technologists to each and every marginal and small farmer in India, and how to guide them to use such information in their day to day farming operations. Indian farmers need assistance and advisory services on how to farm their small holding farms. In order to assist farmers in pursuit of sustained agricultural produce, the Government of India has introduced the Soil Health Card system in 2014-15. To make them aware of ecological hazards of the use of chemical fertilizers, the Government is encouraging the use of more and more organic and other innovative manures, as announced in the 2020-21 national annual Budget. To encourage the production of organic food, the government recognized Sikkim as the first organic state of India in 2018. What is important for small farmers is the need for the periodic alerts starting from sowing date to post-harvest on early diagnosis of pest infestation, disease outbreaks and supports in cultivation. Technology and tools apart, the single greatest challenge is enabling farmers to realize fair prices for their produce. Farmers must be included into the economic mainstream of the agricultural production-logistics-consumers total value chain. The contribution of farmers in the total agri-food value chain needs to be made transparent. The traders and the multinationals dealing with

consumers should not be in a position to dominate. It is not only important how farmers farm their land but also how the various links in the value chain behave; the input providers, the processing and wholesalers, the retailers' market. All aspects of the agri-food systems need to be connected for system approach for management of resources and optimization. Digital agriculture offers new opportunities through the ubiquitous internet connectivity and ever-increasing penetration of smartphones towards connecting smallholder farmers in the agri-food value chain now (Basco & Antle, 2020; Schwab, 2016). The spread of mobile technologies, and lately the remote sensing services and distributed computing are making farming in India smart. This goes very much in line with the Digital India program launched by the Government of India in July, 2015.

1.1 Objective of the Study

In the context of agricultural scenario in India when the country's younger generation is shunning agriculture while the country needs to produce more food to meet the needs of its increasing population, the present study examines,

1. The need for digital revolution in agriculture.

2. Assessment of the ground realities of the present digital scenario.

3. The progress made till now to assess how the Indian tech-startups are proving their worth in various facets of digital agriculture.

2. Methodology and Data Sources

The study uses indirect method of collection of data, facts and figures using a thorough internet survey spanning over the last ten years. Research papers from referred journals and popular articles, news items from various recent reports, World Bank Development Report, websites of various digital agricultural startups, statistical data bases in various areas like food and agriculture, internet services, data computing, remote sensing, agronomy, soil conservation and sustainability have been scanned for gathering relevant information, facts and figures.

3. Findings and Discussion

The findings and discussion are presented on three relevant issues as follows:

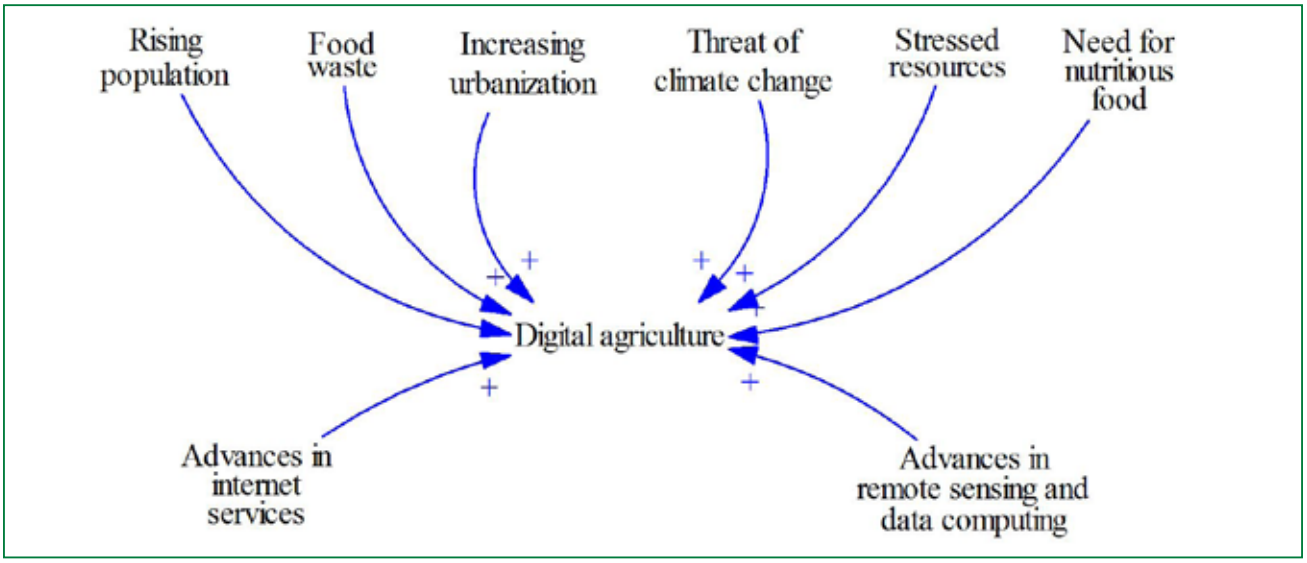
3.1 Need for digital revolution in agriculture

Farming good-quality, nutritious and affordable food for the world with 7.7 billion people is a huge challenge. As per UN Report of 2020, nearly 690 million people or 8.9 percent of global population are hungry, up by nearly 60 million in five years (World Health Organizations, 2020). India stands at 102nd position out of 117 countries as per Global Hunger Index, 2019. Again, global population is expected to grow from 7.7 billion in 2019 to 9.8 billion in 2050 (UN Report, 2019). This has received a great deal of attention on the total global demand for food. India is also likely to add another 230 million by 2050 to its current population of 1380 million to occupy the number one position before China. To meet the food demand of increasing population, farmers will have to produce 70 percent more food by 2050 as per UN Food and Agriculture Organization. This needs to be done using roughly the same arable land with the world's fresh water seeing a rapid decline. Young people are shunning the low reward industry like agriculture and prefer to leave the rural areas and switch over to other professions. In fact, urbanization is increasing; global urbanization between now and 2050 could lead to a net addition of 2.4 billion people to towns and cities. Food will need to be customized to the needs of growing urban population, a factor that encompasses the entire agriculture value chain. Another important area of concern is the nutrition content of food production. With productivity as the primary focus of the food production system, the race to produce and deliver cheap calories has caused collateral damage, mainly in terms of malnutrition and health hazards.

Such a scenario of agriculture in the midst of constraints and challenges needs decisive action at each and every link of the farmer to consumer value chain. Policymakers must foster regenerative production systems that promote biodiversity and improve soil and water quality, which would contribute significantly to climate-change adaptation.

Food security is a great challenge not only for India but for the whole world. Digitization and automation have made incredible inroads in aerospace and electronics for quantum jump in productivity levels. No doubt, the agricultural sector remains the 'Cinderella' compared to other primary sectors when it comes to digitalization (Basso and Antle, 2020). But to face the challenge in a world of limited resources, a new hi-tech era of digital agriculture needs to be ushered in along with advances in internet services, remote sensing technologies and distributed computing to face the challenge of food security as presented in the Figure 1.

Figure 1: Casual factors leading to Digital Agriculture

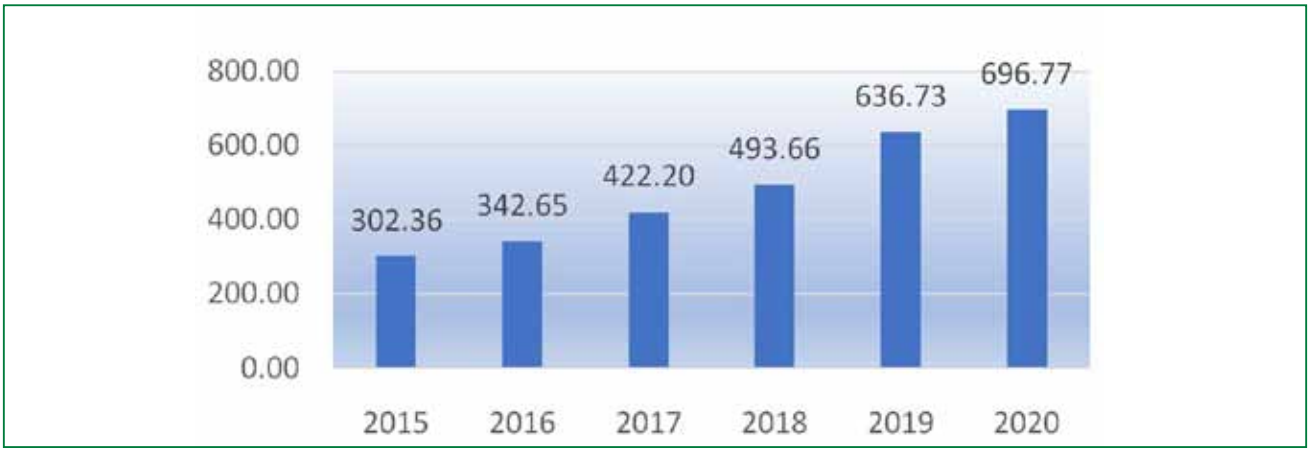


Source: Author's compilation

3.2 Digital scenario in India

The present population of the world is 7700 million of which 4834 million people are using internet. This means that the global internet penetration rate is 62 percent as of June, 2020 (as per internetworlds). The total internet users in India have been increasing over the years from 302 million in 2015 to 697 million in 2020 (Figure 2).

Figure 2: Internet Users in India (million)



Source: Keelery (2020).

The internet penetration rate in India (Figure 3) has reached 50 percent now, an increase from 27 percent five years earlier (Keelery, 2021) as against 88 percent in the US and 61 percent in China.

Figure 3: Internet Penetration Percent in India

Source: Keelery (2021)

Internet users in the rural India have in fact surpassed the urban area by 10 percent (227 million as against 205 million users). That is very encouraging for facilitating the digitalization of agriculture in India. The Indian economy is predominantly rural with over two-thirds of its population and workforce residing in rural areas. The penetration rate of internet users in rural India is now on the halfway mark of the overall penetration rate of 50 percent. The younger generations of Indian population who are shunning agriculture constitute the majority of mobile users (67 percent users up to 29 years of age) who are generally very apt in mobile use. This strength of the digital power of the younger generation can possibly help to arrest their shunning attitude to agriculture, as the sector gradually switches over from labor intensive to more mechanized one.

3.3.1. Digitalization of agriculture

To achieve the UN Sustainable Development Goals and going beyond to a world with zero hunger by 2030, the digital agricultural transformation is crucial for a more productive, efficient, sustainable, inclusive, transparent and resilient agri-food systems as per FAO's report of 2017. The art and science of connecting and integrating objects, people, information and systems through the Internet of Things (IoT) for intelligent production and services is now set to push the future of farming to the next level, be it termed as Digital, Smart, Precision, Numerical or Agriculture 4.0. The digital agriculture began since the early nineties when GPS was first mounted on tractors. It comprises of both hardware and software of technologies which span from devices sensing the environment from a close distance or thousands of miles in the skies to chips monitoring food systems. Sensors placed in fields allow farmers to obtain detailed maps of both the topography and resources in the area, as well as variables such as acidity and temperature of the soil. Moisture sensors in the ground are able to communicate information about the level of moisture present at certain depths in the soil. Crop sensors help apply fertilizers in a very effective manner, maximizing uptake, reducing the potential leaching and runoff into ground water. Instead of making a prescription of fertilizer map for a

field, crop sensors tell application equipment how much to apply in real time. By using the correct sensors, drones can provide today's farmers with real-time information regarding their crops, soil deterioration, dry regions, fungal infections, etc. Digitalization has also enabled farmers to use their phone camera to identify a pest or a disease. Artificial Intelligence (AI) and Machine Learning (ML) too has made great strides in detecting plant diseases and receiving advisory from authorized sources and prevent crop loss. IoT enables farmers to be much more precise, with centimeter-level accuracies, making the old scattergun approach a thing of the past.

With support from the United Nations International Fund for Agriculture Development, remote sensors have been deployed to help almost 8,00,000 farmers in the state of Odisha to optimize water and fertilizer levels for their crops with drones being used to identify plants in poor health so that remedial action can be taken. Microsoft in collaboration with International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) developed an AI Sowing App powered by Microsoft Cortana Intelligence Suite. The app sends text message on sowing date for groundnut crops to thousands of farmers across Andhra Pradesh and Karnataka. The farmers don't need to install any sensors in their fields or incur any capital expenditure. All they need is a mobile phone capable of receiving text messages.

Microsoft in collaboration with United Phosphorous Limited (UPL), India's largest producer of agrochemicals, led to the creation of the Pest Risk Prediction API that again leverages AI and ML to indicate in advance the risk of pest attack. In the first phase, about 3,000 marginal farmers with less than five acres of land holding in 50 villages across Telangana, Maharashtra and Madhya Pradesh are receiving automated voice calls for their cotton crops. The calls indicate the risk of pest attacks based on weather conditions and crop stage in addition to the sowing advisories (Microsoft News Center, 2017). As online crop doctor, Plantix of German company PEAT uses AI to help identify diseases in crops. Farmers are able to upload a picture using their smartphones to get a diagnosis and treatment plan. It also offers online guidelines on the uses of pesticides, fertilizers and nutrients. The company's 80 percent active 1.1 million users are in fact from India. The app is currently able to identify more than 450 diseases in around 50 different crops and the numbers are growing rapidly. ICRISAT's Digital Seed Roadmap tools use AI and shows how to monitor the fall armyworm. This has a user base of over 2 million farmers in India alone (ICRISAT, 2019). Accenture's Digital Agricultural Service (DAS) aggregates granular, real-time data from a variety of sources, including environmental sensors in the field, the Normalized Difference Vegetation Index (NDVI) images as the indicator of plant health from Unmanned Aerial Vehicles (UAVs) that show crop stress before it's visible to the naked eye. By combining telemetry from these different sources and leveraging a proprietary decision support engine encoded with crop-specific business rules, the DAS provides operational guidance to farmers in India to improve their farms' economic output.

On the marketing front, the e-Choupal of ITC, launched in 2000 has already become the largest initiative among all internet-based interventions in rural India empowering farmers an efficient supply chain aimed at delivering value to its customers around the world on a sustainable basis. Its services today reach out to over 4 million farmers growing a range of crops like soyabean, coffee, wheat, rice, pulses and shrimp in over 35000 villages through 6100 kiosks across 10 states of India. Appreciating the imperative of intermediaries in the Indian context, e-Choupal leverages IT to virtually cluster all the value chain participants, delivering the same benefits as vertical integration does in mature agricultural economies like the USA. To promote uniformity in agriculture marketing by streamlining procedures across markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply, the Government of India launched the electronic National Agricultural Market (eNAM) in April, 2016 by networking existing Agricultural Produce Market Committees (APMCs). This online platform is transforming the way India trades in farm produce in 585 markets across various states in India, linking 16.6 million farmers, 131000 traders and 65000 commission agents. Over 1000

mandis in India are already linked to e-NAM and 22000 additional mandis are expected to be linked by 2021-22.

Mobile technology along with various remote sensing devices and modern marvels of computing science offer much promise to farmers with digital innovations for buffering against all sorts of risk, be it from seed, soil, weather or farming practices. Mobile also keeps the digital record of both receipt of supplies and deliveries of the produce and payment made or received through digital wallet with the touch of a few buttons now. Farmers' financial records can act as an indicator of his or her credit worthiness and even can make them attractive customers for easy access to credit, insurance and other financial tools that can help them to build resilience against any potential setbacks.

3.3.2 Start-ups in digital agriculture

The agricultural industry has undergone a tectonic shift in the last decade owing to the rampant adoption of technologies, both in agricultural science as well as in sophisticated computational and data analysis techniques. In the global scenario, startups in this sector attracted nearly $17 billion investments, 43 percent increase from the previous year, as per AgFunder. In India, with deepening digital penetration and with the help of high-tech drones, IoT devices and data analytics, its digital startups are now lending a helping hand to the growth of India's agriculture economy. There are 450 digital agri-startups now in India as compared to global figure of 3105. This means that in the agricultural field, every 9th digital startup in the world is from India. There has been huge growth in funding in digital agri-startups in India, $245 million in 2019 compared to $53 million in 2018.

TABLE 1: STARTUPS IN DIGITAL AGRICULTURE

Startup & founder	Working system	How it Supports
AgNext Taranjeet Singh	Qualix Platform does instant analysis of food quality (physical, chemical and ambient) using computer vision, spectroscopy and AI-enabled IoT devices.	Supports plantation companies, agricultural processors and food chain participants with quality food traced to the source.
Aibono Vivek Rajkumar	AI-powered seed-to-plate platform for fresh fruits and vegetables giving farmers precise insights what and how to produce.	Gives higher yield and less wastage, also enables retailers and consumers to source produce all the year round from a traceable source.
Aquaconnect Rajmanohar	Its mobile app, FarmMOJO predicts diseases in aquatic animals and suggests measures to enhance water quality for shrimp and fish farmers.	Helps to decide on water quality parameters, and feed consumption pattern of shrimp and fish farmers to improve output quantity and quality.
BharatRohan Amandeep Panwar and Rishabh Chaudhary	Its CropAssure does early diagnosis of pest infestation and disease outbreaks using hyperspectral remote sensing based decision support system.	Provides support to the farmers from sowing to post-harvest, with periodic alerts on early diagnosis and supports in cultivation.
Crophunt Agritech Nishant Dubey	A tech-enabled e-commerce platform connecting farmers, FPOs, traders with businesses, exporters, and pan-India buyers.	Helps better visibility of crops to reach its destination easily and early.

Startup & founder	Working system	How it Supports
Farmonaut Ankur Omar	Monitors multiple fields using latest satellite imagery for crop health status, vegetation water level and visible atmospheric resistant index.	Bridges technological gap between farmers and strives to bring state-of-the-art technologies in the hands of each and every farmer.
Fasal Ananda Prakash Verma	Monitors horticulture farms' critical parameters like micro-climate, soil, and crop conditions, data analyzed and predicted using cloud platform.	Farmers notified on requirements like irrigation, sprays, fertigation and other preventive measures.
FOODPRINT Anil Nadig	Captures information of the produce at various points in the supply chain such as production, processing and distribution using blockchain tech.	Provides complete transparency and traceability of the food value chain to consumers.
Freshokartz Rajendra Lora	Does soil tests and consequent crop analytics, also operates physical centers in villages to deliver quality seeds, pesticides, and fertilizers.	Supports farmers integrating farms, farmers, suppliers and customers on a common platform.
Frutunes Food Products Prathap Selvan	Offers tech-driven supply chain model for delivery of quality fresh vegetables, fruits, spices, pulses, and millet varieties to the national and international market.	By removing middlemen in the fruits and vegetables supply chain, it increases farmers' income.
Gobuzzr Kapil Dev	IoT based beehive monitoring system that regularly measures weight, temperature, position, location and humidity of the hives to improve living conditions of bees.	Helps beekeepers to assess the quantity of honey that bees have accumulated to decide the time to extract honey.
GR Agritek Raghu Burli Narayanamurthy	Uses drone assisted nano-sensor for detection and remediation of automated pesticide spraying, instead uses slow-release type semio-chemicals to trap the pests.	Protects crops from pests eliminating the use of harmful pesticides as much as possible, protecting humans and the nature.
Gramophone Tauseef Khan, and Nishant Mahatre	App developed with agronomic and climatic intelligence database for more than 30 crops for selection of seeds, crop protection and nutrient products.	Takes an advisory and mobile commerce route to sell seeds, crop protection and nutrition products directly to farmers.
Grow Smart Greens Manisha Tidke	Being a partner of Click & Grow, its Wall Farm uses fully automated smart soil technology, keeping the level of oxygen, water, pH and nutritional ingredients at an optimum level.	Contributes to Mother Nature and spread the goodness and benefits of indoor gardens in India.
Intello Labs Milan Sharma, Nishant Mishra, Himani Shah and Devendra Chandani	Uses AI-based image processing and machine learning to assess food quality at the source and cuts down food waste.	Supports food growers, processors, retailers, food service companies in food production and supply chain.

Startup & founder	Working system	How it Supports
Jai Kisan Arjun Ahluwalia	Leveraging technology and value chain from farmers to consumers, uses comprehensive credit scoring platform.	Offers a suite of financial products against equipment, inputs, and invoices in rural India.
O4S (Original4Sure) Divay Kumar	Follows the movement of each product with a unique identification using a SaaS platform and integrates the warehouses, distributors and retailers.	Portrays Original for Sure the supply chain visibility across manufacturers of seeds, pesticides, and fertilizers.
SourceTrace Venkat Maroju	Its mobile application provides complete visibility from field to market and tracks the value chain at the source even in remote, low bandwidth environments.	With complete visibility and traceability, it helps smallholder farmers to work directly with cooperative societies, NGOs, commodity & govt. companies.
Vyoda Vishnu Ranga	Provides smart irrigation solutions through solar powered pump, replacing expensive diesel generator.	This significantly increases crop yield, utilization of farmland and reduce carbon footprint.
Way2Grow Anto Irudhayaraj	Energy & water-efficient hydroponics optimized system connected to IoT for growing leafy greens with better quality and higher yield.	Besides improved quality and productivity gains, anyone can monitor the growth 24x7 from their mobiles as connected to IoT.

Source: AgNext: An ICT revolution that can shapeup the world of farming. www.foodinfotech.com, March 23, 2021; Aibone: Agricultural startups are changing the agriculture industry. www.startuptalky.com. April 28, 2021; Aquaconnect:Bags FICCI's Best Agri Startup Award. www.siliconindia.com. Feb 11, 2021; BharatRohan: Empowering communication between farms & farmers. www.bharatrohan.in; Fasal: Agricultural startups are changing the agriculture industry. www.startuptalky.com. April 28, 2021; FOODPRINT: Building the safe food ecosystem through Trace X Technologies. www.agrifoodprint.com; Freshokartz: Agri. startups are changing the agriculture industry. www.startuptalky.com. April 28, 2021; Gramophone: Agritech startups to watchout out for in 2020. www.inc42.com; Jai Kisan: https://jai-kisan.com; O4S (Original 4 Sure): Agritech startups to watchout out for in 2020. www.inc42.com;Source Trace: Achieved profitability from fin. services to sustainable agri. www.yourstory.com. Oct. 2019; Crophunt, Farmonaut, Frutunes Food Products, Gobuzzr, GR Agritek, Grow Smart Greens, Intello Labs, Vyoda, & Way2Grow: Top 10 Best Agritech Startups-2020. www.startup.siliconindia.com. April, 2020.

4. Policy Suggestions and Conclusions

Digitalization is proving its effectiveness in the agriculture value chain. But still, there is lot of scope for improvement in this sector. With the majority of the younger generation being highly skilled in the use of digital technology, the policy planners need to explore ways and means to attract this generation to the agriculture sector which will also help to ease out country's unemployment problem. With digital power in the hands of marginal and small farmers, they can now assess their value to the market place. Possibly, the new education policy needs to put still more emphasis on the Digital Agri-tech. If the objective is to increase biodiversity, reduce nitrogen fertilizer, use or grow less resource-intensive bioenergy perennials, all the stakeholders need to rethink on ways and means to not only produce more and making the food value chain effective but also to consume less of the country's natural resources for sustained viability.

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Agro-Economic Research*

Relevance and Distribution Efficiency of Seed Minikits in Pulses in Bihar

RAMBALAK CHOUDHARY

1. Introduction

Considering the importance of pulses for nutritional security of the people and self-reliance of nation in pulses, the Government of India has taken several initiatives in recent past and out of these, the distribution of seed minikits of pulses is one. It was launched in 2016-17 with a view to ensure varietal replacement of HYV pulses within 10 years of its release. Since the programme is completing almost 3-4 years of its launching, so its impact study is inevitable for further success of the programme. With this background in view, this study was entrusted to the Agro-Economic Research Centre, T M Bhagalpur University, Bhagalpur (Bihar) by the Ministry of Agriculture & Farmers Welfare, Government of India under the co-ordination of ADRTC, ISEC, Bengaluru.

1.1 Objectives of the study

The following objectives were addressed in this study:

1. To assess the relevance and the requirement of seed minikits among the farmers.

2. To compare the productivity of pulse crops using seed minikits with the control farmers/non-users.

3. To suggest policy measures to address efficiency issues in application/distribution of seed minikits.

2. Data source and Methodology

The present study relied on both the primary and secondary data. Primary data have been collected with a sample of 300 farmers comprising 200 beneficiaries and 100 non-beneficiaries/control farmers selected from two sample districts *viz*., Patna (irrigated) and Muzaffarpur (dry land) on highest seed minikits distributed during the reference period of 2017-18/2018-19.

3. Major findings of the study

- Bihar has 4.79 lakh ha of total pulses' area with production of 4.53 lakh tonnes during 2018-19, which were 1.62 percent and 1.85 percent of the country's total area and production of pulses, respectively.

- The secondary data based results indicate that after bifurcation of the state in November, 2000, the area and production of total pulses decreased by about 47 percent and 29 percent, respectively, during the TE 2000-01 to 2016-17.

- Area and production under total pulses in the state decreased by 18.93 percent and 4.36 percent, respectively, in TE 2016-17 over TE 2006-07. State's total lentil area and production increased to 4.17 percent and 15.45 percent, respectively, in TE 2016-17 over TE 2006-07. Except lentil, arhar and gram showed negative growth in regard to area and production both during the same period.

- The yield rates of total pulses increased till 2013-14 and thereafter, it fell substantially. Across pulses, moong's yield rate was found to have increased in recent years only. Other pulses' yield rates are still gloomy in the state.

- About 83 percent of the total respondents were dependent on agriculture and allied activities for their livelihood followed by mainly agricultural labourer (7%). Average annual income of the total respondents was recorded at about Rs. 42608 constituting 78.6 percent from agricultural & allied activities and 21.4 percent from non-agricultural sources.

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- The average Gross Cropped Area (GCA) & Net Operated Area (NOA) of the total respondents were at 5.06 acres and 2.61 acres, respectively. Average rental value per acre of land was found at Rs. 3792 and their cropping intensity was recorded at 194 percent. Above 99 percent of NOA was found irrigated. Bore well irrigation highly prevailed in the study areas and the average cost of irrigation was indicated at Rs. 763/acre.

- Average productivity of the rain-fed crops for all respondents was calculated at 5.20 quintals per acre and in regard to irrigated crops, it was recorded at 10.43 quintals per acre. The value of output of main plus by-product for total respondents was at Rs. 16053 per acre.

- Net returns for total respondents were estimated at Rs. 8090 per acre. Gross farm income per household from cultivated area for total respondents was calculated at Rs. 21115 and for marginal, small and medium farmers was at Rs. 10922, Rs. 28820 and Rs. 40986, respectively.

- In regard to per acre cost of production and net return among the aggregate average of seed minikit farmers (SMK), positive impression was created by way of reduced per acre cost of production and increased returns over the 'with SMK farmers'. The per quintal net price received by both the categories of farmers is almost similar which might be directly related to the prevailing market prices and using almost same marketing channels for the pulse crops in the study area.

- Online registration on department's portal for availing the benefits of seed minikits was the major instrument adopted by the selected households.

- Of the total beneficiaries in the state in 2018, sample households availed only 0.35 percent of kits, which were largely distributed by the State Agriculture Department without any charge.

- About 59 percent of the farmers received the information relating to distribution of minikits from farmer facilitators, such as SMS & Kisan Salahkar (KS). It is important to note here that cent percent sample farmers opined that the scheme is advantageous mainly because of fetching more profit, better quality and high yield, though it's sufficient or desirable quantities are not disbursed, besides untimely disbursement.

- The study tried to understand the issues faced by the farmers in availing seed minikits. The sample beneficiary households narrated two major issues. First, the distribution of seed minikits was mainly made to kith and kin farmers (81%) since its availability was limited. Second, they faced network hindrances in receiving the OTP on their respective mobiles (19%).

- A number of problems were also faced by the farmers in availing the seed minikits such as limited availability of seed minikits (40.5%), delay in re-imbursement of the assistance (22.5%), procedural preconditions (22%) and lack of timely information about the scheme (15%).

- To overcome the major issues/problems faced and to increase the effectiveness of the scheme, some measure were suggested by the sample beneficiary farm households like ensuring application of seed minikits (32.5%), real time supervision and monitoring (RTSMP) by the local officials (29.5%), extending awareness among the beneficiaries in regards to its core purpose (26%), and ensuring timely re-imbursement by way of linking the confirmation of sowing of seeds issue in the fields (12%).

- Further, to improve the reach of the scheme, following the eligibility criteria in transparent manner (65%) was largely endorsed by the sample beneficiary farmers followed by check and balance on proxy distribution of seed minikits (35%).

4. Policy Suggestions

The following policy suggestions have been drawn based on the findings of the study:

1. In order to achieve full benefits of seed minikit for pulses, awareness may be created among farmers regarding its core objective of realizing maximum value of output by way of adopting optimal package of practices.

2. The criteria for the distribution of seed minikits should be based on mapping of respective crop fields and identification of respective crop growers, following the mandated criteria rather than considering 'any interested farmer', so that realization of the programme could be made with equity aspect.

3. A help desk for online registration on department's portal at block/tehsil level may be instituted to help the poor or needy farmers.

4. Reimbursement of seed minikit value to the respective beneficiaries may be made immediately after verification of the sowing plot, preferably during the mid-period of the respective crop. It is desired for better and timely application of inputs.

5. Special efforts on the part of the government are needed for ensuring timely distribution of seed minikits, as expressed by the sample farmers.

6. To ensure multiplication of seeds, field visits of the KVK scientists are needed for extending field level advices to the beneficiary farmers along with capacity building of the field level staff.

7. There is need to address the concerns raised by the beneficiary farmers about inadequacy, kith & kin approach of distribution, OTP hindrance, untimely distribution, etc. by proper monitoring of the concerned.

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

Commodity Review

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2020-21 up to 26.04.2021 is 47.61 million tonnes as against 42.95 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 26.04.2021) 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

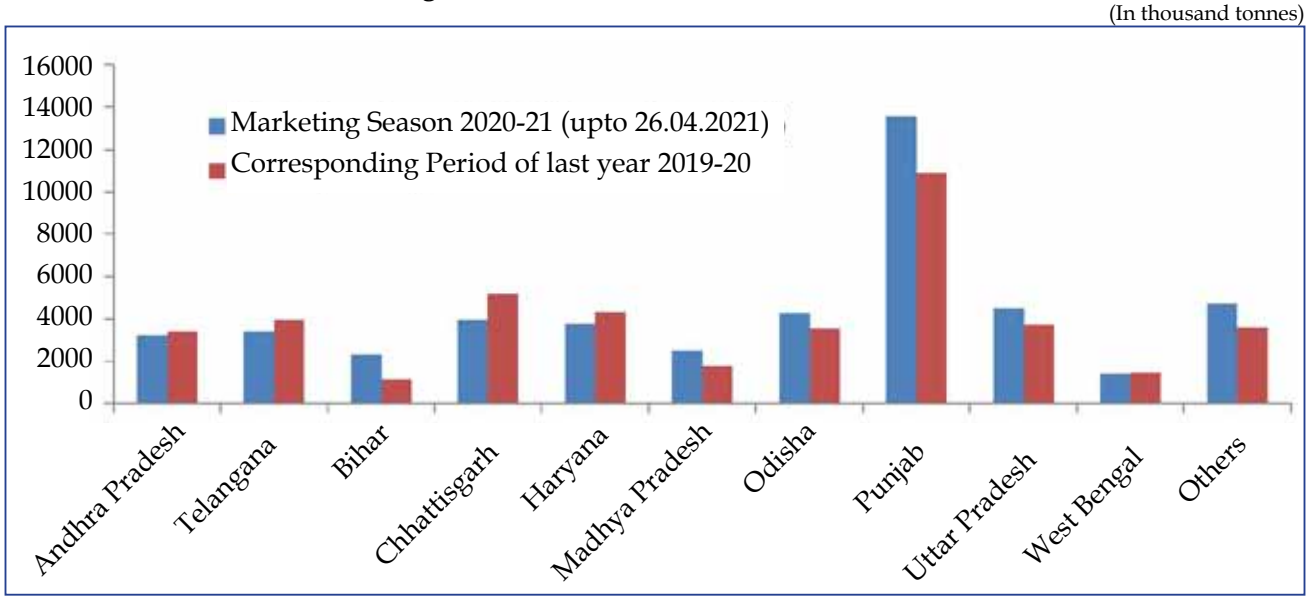
(In thousand tonnes)

State	Marketing Season 2020-21 (upto 26.04.2021)		Corresponding Period of last Year 2019-20	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5
Andhra Pradesh	3212	6.7	3363	7.8
Telangana	3370	7.1	3963	9.2
Bihar	2340	4.9	1149	2.7
Chhattisgarh	3976	8.4	5185	12.1
Haryana	3789	8.0	4307	10.0
Madhya Pradesh	2497	5.2	1740	4.1
Odisha	4280	9.0	3572	8.3
Punjab	13589	28.5	10876	25.3
Uttar Pradesh	4478	9.4	3717	8.7
West Bengal	1388	2.9	1468	3.4
Others	4687	9.8	3612	8.4
All India Total	47606	100.0	42952	100.0

Source: Department of Food & Public Distribution.

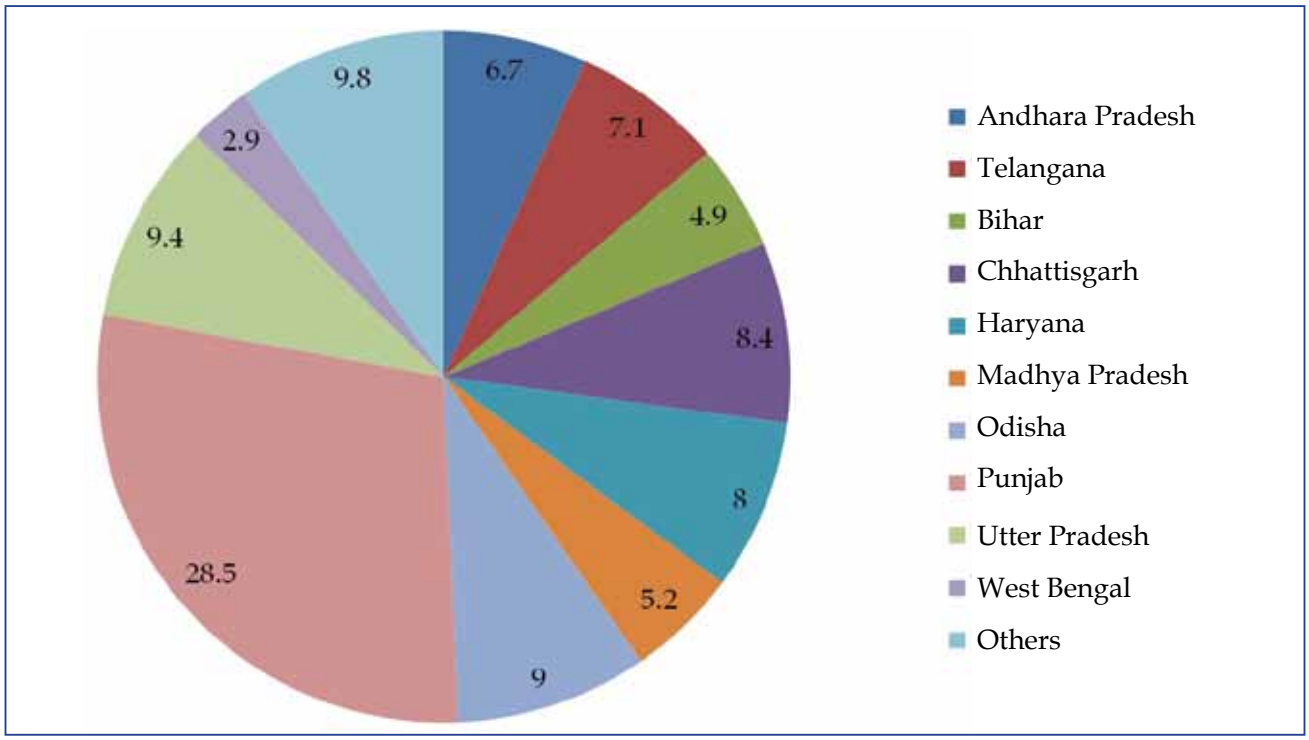
Figure 1: State-wise Procurement of Rice

(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 26.04.2021)



Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat during rabi marketing season 2021-22 up to 26.04.2021 is 22.23 million tonnes as against 7.8 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 26.04.2021) 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

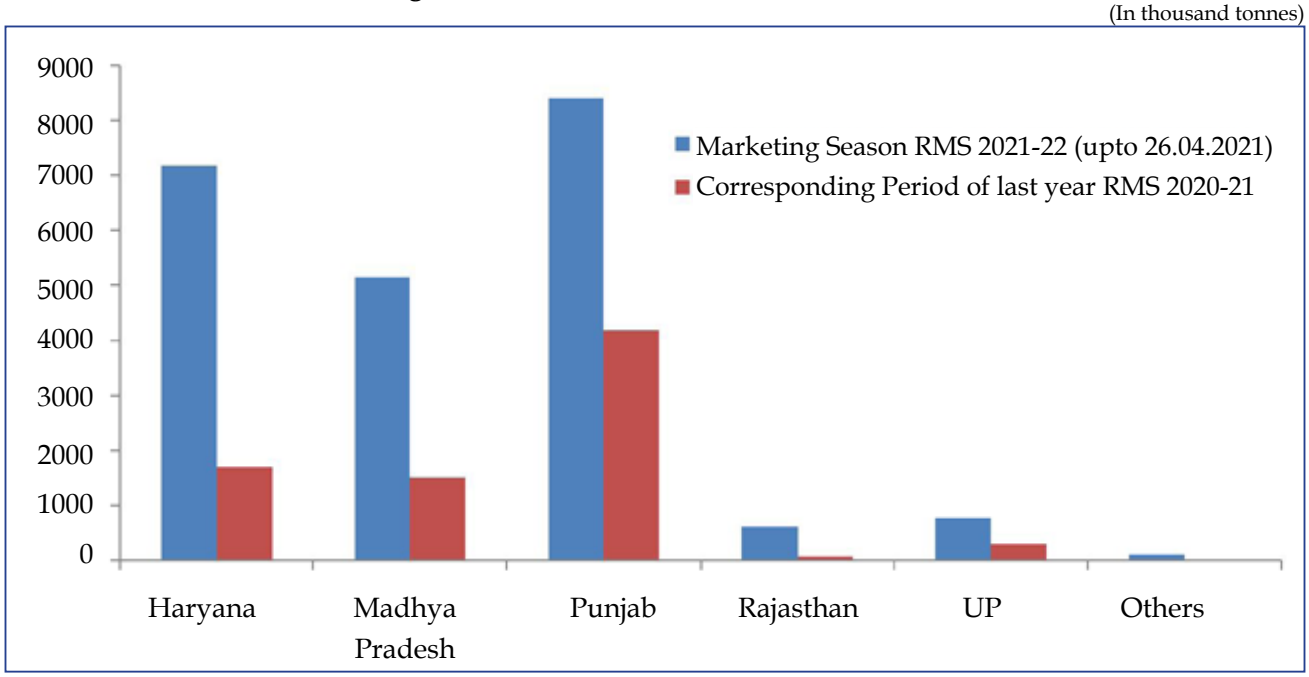
(In thousand tonnes)

State	Marketing Season RMS 2021-22 (upto 26.04.2021)		Corresponding Period of last Year RMS 2020-21	
	Procurement	Percentage to Total	Procurement	Percentage to Total
1	**2**	**3**	**4**	**5**
Haryana	7176	32.3	1695	21.9
Madhya Pradesh	5157	23.2	1511	19.5
Punjab	8415	37.8	4180	53.9
Rajasthan	605	2.7	63	0.8
Uttar Pradesh	774	3.5	298	3.8
Others	106	0.5	11	0.1
Total	22233	100.0	7758	100.0

Source: Department of Food & Public Distribution.

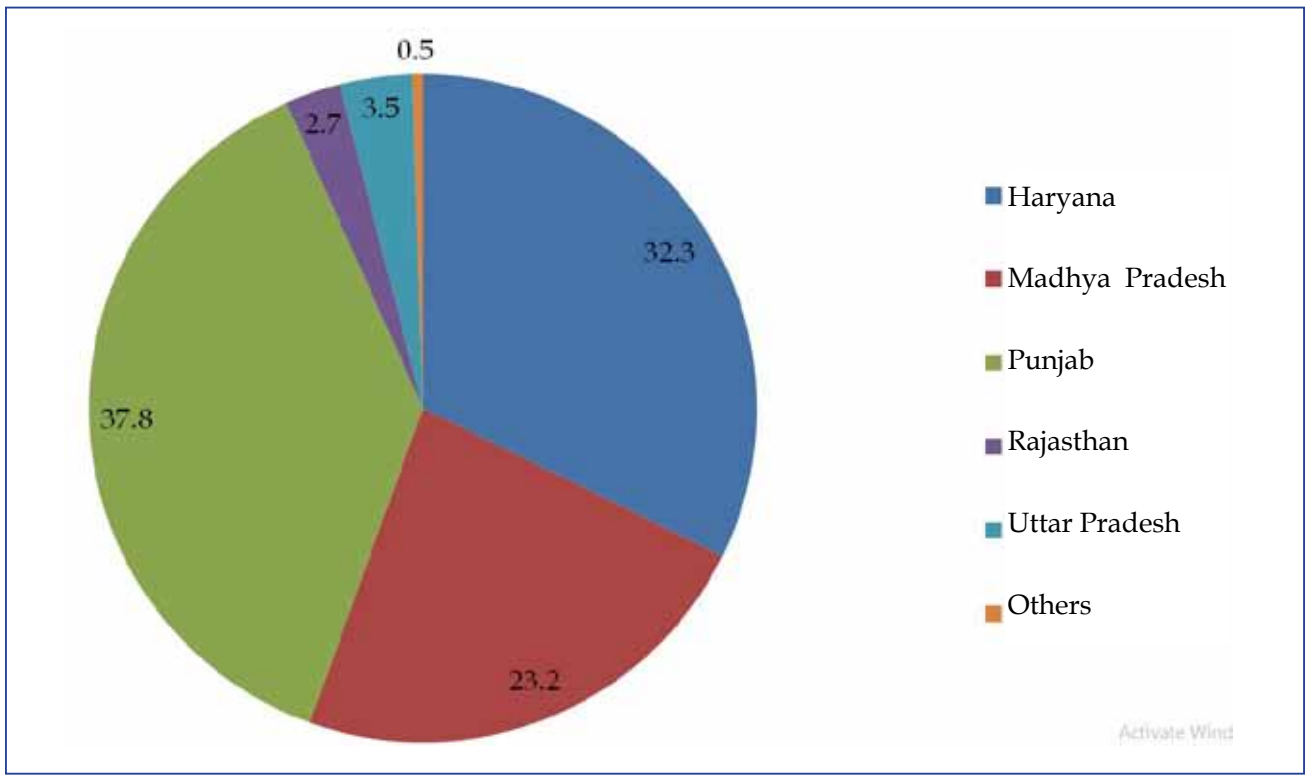
Figure 3: State-wise Procurement of Wheat

(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 26.04.2021)



Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 195.7 in April, 2021 showing an increase of 5.78 percent over the previous month and increased by 29.95 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 (4.74 percent), cotton seed (0.31 percent), gingelly seed (sesamum) (1.48 percent), niger seed (10.21 percent), safflower (7.34 percent) and soyabean (12.36 percent) increased over the previous month. However, the WPI of groundnut seed (1.58 percent), copra (0.50 percent) and sunflower (2.41 percent), decreased 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 181.1 in April, 2021 which shows an increase of 4.99 percent over the previous month. Moreover, it also increased by 43.28 percent over the corresponding months of the previous year. The WPI of mustard oil (12.02 percent), soybean oil (6.18 percent), sunflower oil (3.32 percent), groundnut oil (1.39 percent), rapeseed oil (6.62 percent), copra oil (0.30 percent) and cotton seed oil (4.70 percent) increased over the previous month.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 172.8 in April, 2021 showing an increase of 11.77 percent over previous month and an increase of 7.06 percent over the corresponding month of the previous year.

Potato

The WPI of potato stood at 161.3 in April, 2021 showing an increase of 12.17 percent over the previous month. Moreover, it decreased by 30.44 percent over the corresponding months of the previous year.

Onion

The WPI of onion stood at 164.1 in April, 2021 showing a decrease of 31.94 percent over the previous month and a decrease of 19.72 percent over the corresponding months of the previous year.

Condiments & Spices

The WPI of condiments & spices (group) stood at 150.7 in April, 2021 showing a decrease of 0.79 percent over the previous month and an increase of 2.45 percent over the corresponding months of the previous year. The WPI of black pepper increased by 2.68 percent, chillies (dry) decreased by 2.00 percent and turmeric increased by 1.50 percent over the previous month.

Raw Cotton

The WPI of raw cotton stood at 114.9 in April, 2021 showing a decrease of 1.03 percent over the previous month and an increase of 7.58 percent over the corresponding months of the previous year.

Raw Jute

The WPI of raw jute stood at 289.9 in April, 2021 showing an increase of 2.58 percent over the previous month and an increase of 38.64 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 April, 2021 and March, 2021 is given in figure 5 and the comparison of WPI during the April, 2021 with the corresponding month of last year has been given in figure 6.

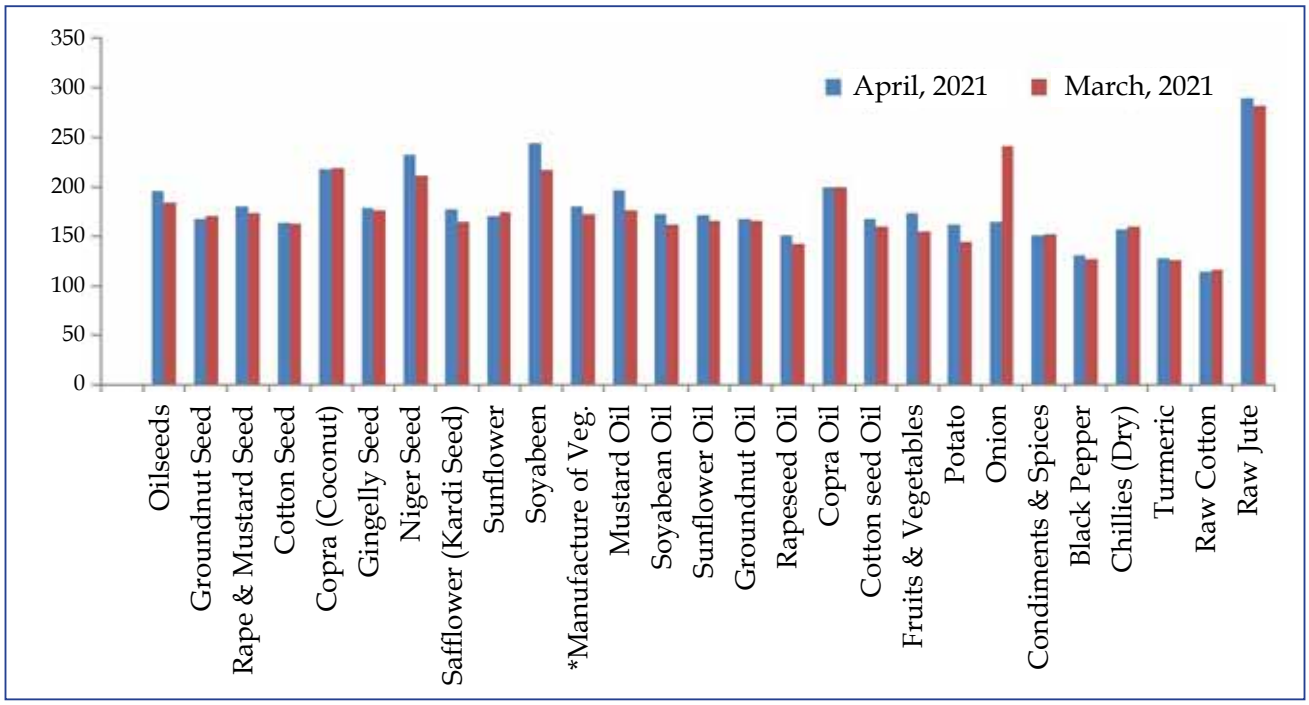
TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12=100)

Commodity	Latest April, 2021	Month March, 2021	Year April, 2020	Percentage variation over the	
				Month	Year
Oilseeds	195.7	185.0	150.6	5.78	29.95
Groundnut Seed	167.7	170.4	155.8	-1.58	7.64
Rape & Mustard Seed	181.1	172.9	147.3	4.74	22.95
Cotton Seed	163.2	162.7	152.9	0.31	6.74
Copra (Coconut)	218.5	219.6	184.2	-0.50	18.62
Gingelly Seed (Sesamum)	178.6	176.0	191.6	1.48	–6.78
Niger Seed	233.1	211.5	163.6	10.21	42.48
Safflower (Kardi Seed)	177.0	164.9	155.6	7.34	13.75
Sunflower	169.8	174.0	109.8	-2.41	54.64
Soyabean	244.6	217.7	156.5	12.36	56.29
Manufacture of Vegetable and Animal Oils and Fats	181.1	172.5	126.4	4.99	43.28
Mustard Oil	197.5	176.3	133.0	12.02	48.50
Soyabean Oil	171.9	161.9	119.3	6.18	44.09
Sunflower Oil	171.1	165.6	115.1	3.32	48.65
Groundnut Oil	167.6	165.3	137.8	1.39	21.63
Rapeseed Oil	151.4	142.0	120.4	6.62	25.75
Copra oil	200.4	199.8	167.7	0.30	19.50
Cotton seed Oil	167.0	159.5	117.7	4.70	41.89
Fruits & Vegetables	172.8	154.6	161.4	11.77	7.06
Potato	161.3	143.8	231.9	12.17	–30.44
Onion	164.1	241.1	204.4	–31.94	–19.72
Condiments & Spices	150.7	151.9	147.1	–0.79	2.45
Black Pepper	130.3	126.9	122.3	2.68	6.54
Chillies (Dry)	156.8	160.0	163.3	–2.00	–3.98
Turmeric	128.2	126.3	116.7	1.50	9.85
Raw Cotton	114.9	116.1	106.8	–1.03	7.58
Raw Jute	289.9	282.6	209.1	2.58	38.64

Source: DPIIT, Ministry of Commerce and Industry.

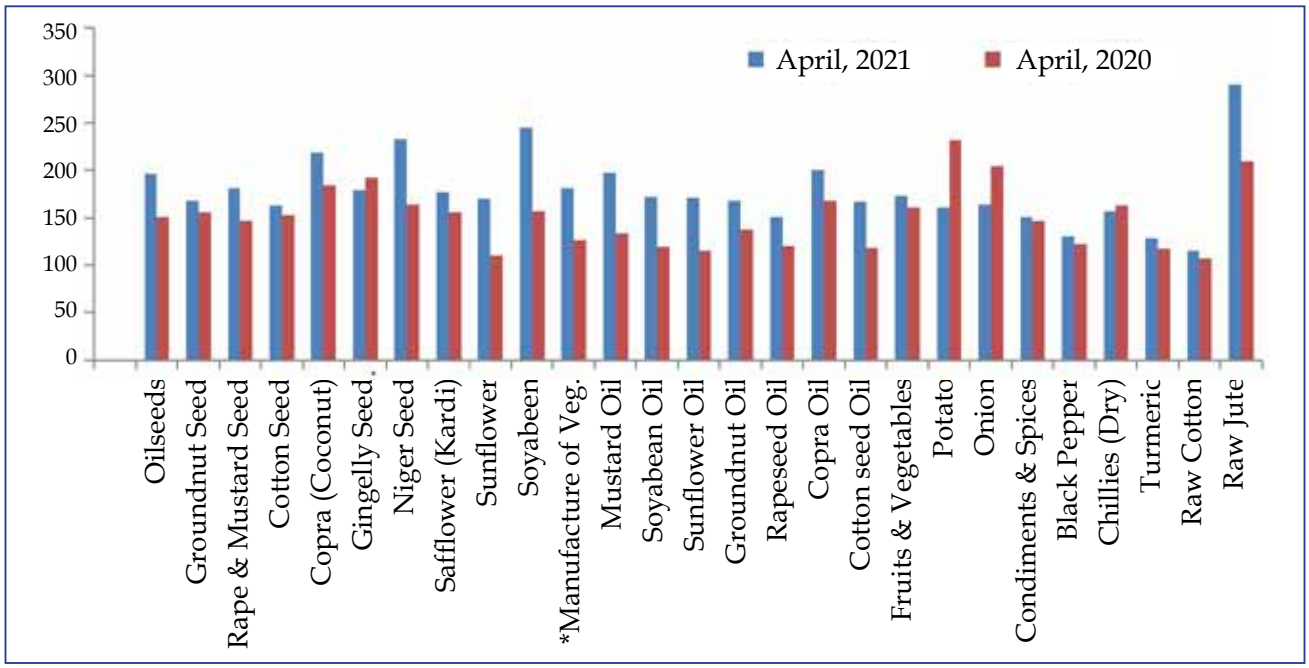
Figure 5: WPI of commercial crops during April, 2021 and March, 2021



Source: DPIIT, Ministry of Commerce and Industry.

*Manufacture of Vegetable, Animal Oils and Fats.

Figure 6: WPI of commercial crops during April, 2021 and April, 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	268	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	Apr, 20	8	278	259	276	239	220	217	229	232	230	219	199	188	NA	NA	432	373	321
Maharashtra (P*)	Dec,20	8	NA	NA	NA	NA	NA	NA	NA	NA	408	242	350	200	288	192	437	367	238
Assam	June, 20	8	325	-	317	285	303	231	335	252	303	243	272	-	NA	NA	403	369	335
Bihar	Dec,20	8	325	-	311	283	308	267	313	279	312	291	433	228	NA	NA	484	478	-
Kerala	June, 20	8	1017		630	-	-	514	680	533	843	557	-	-	NA	NA	903	-	-
Telangana	June, 20	8	NA	NA	NA	NA	NA	NA	NA	NA	449	300	328	350	445	272	433	411	300
Uttarakhand	July,20	8	473	-	379	353	357	358	347	323	357	328	300	300	NA	NA	586	625	-
West Bengal	June, 20	8	346	-	289	262	277	254	300	271	307	277	275	264	NA	NA	-	-	-
Haryana	July, 20	8	490	-	469	317	436	397	436	395	421	373	-	-	NA	NA	607	560	-
Jharkhand (P*)	Aug, 20	8	NA	NA	NA	NA	NA	NA	NA	NA	226	186	185	135	227	212	376	342	267
Odisha	Nov/20	8	348	-	329	283	318	272	331	284	361	295	294	251	NA	NA	506	446	406
Uttar Pradesh	Feb,21	8	294	-	276	261	279	262	278	263	289	271	250	250	NA	NA	495	-	-
Rajasthan	Feb/21	8	401	324	381	309	333	297	335	303	-	-	324	255	NA	NA	503	451	396
Andhra Pradesh	Jan,21	8	NA	NA	NA	NA	NA	NA	NA	NA	486	339	327	272	469	295	464	360	300
Chhattisgarh	Jan, 20	8	393	-	230	179	178	153	190	167	225	191	215	187	NA	NA	382	300	276
Madhya Pradesh	Feb,21	8	303	-	269	230	261	232	275	245	278	249	251	239	NA	NA	412	399	339
Punjab	Feb,21	8	441	-	431	365	413	357	430	358	415	350	-	-	NA	NA	525	518	-
Tamil Nadu	March,21	8	-	-	414	208	438	205	437	216	460	213	-	-	NA	NA	624	512	-
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	Mar-21	Feb-21	Mar-20
Wheat	PBW 343	Quintal	Punjab	Amritsar	1850	1900	NA
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1730	1725	2050
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1818	1789	1825
Jowar	-	Quintal	Maharashtra	Mumbai	3800	3650	3500
Gram	No III	Quintal	Madhya Pradesh	Sehore	4700	4749	NT
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1470	1600	1875
Gram Split	-	Quintal	Bihar	Patna	6280	6240	6250
Gram Split	-	Quintal	Maharashtra	Mumbai	6100	6100	5900
Arhar Split	-	Quintal	Bihar	Patna	9600	9560	8450
Arhar Split	-	Quintal	Maharashtra	Mumbai	9000	8800	8600
Arhar Split	-	Quintal	NCT of Delhi	Delhi	9900	10000	7800
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	8800	8400	7600
Gur	-	Quintal	Maharashtra	Mumbai	4500	4500	4700
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4500	4500	4500
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2700	2580	2400
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	4850	5465	4200
Mustard Seed	Black	Quintal	West Bengal	Raniganj	4250	NA	4250
Mustard Seed	-	Quintal	West Bengal	Kolkata	6100	6400	4275
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	5300	5500	5400
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	5200	5400	4850
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2500	2400	1800
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3200	3000	3000
Castor Seed	-	Quintal	Telangana	Hyderabad	NT	NT	3900
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	9050	9300	9950
Copra	FAQ	Quintal	Kerala	Alleppey	13650	13950	NT
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	6000	6000	6000
Groundnut	-	Quintal	Maharashtra	Mumbai	8700	9000	8500
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1830	1830	1390
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	2100	2100	1380
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2340	2310	1900
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2775	2250	1950
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1785	1790	1460
Castor Oil	-	15 Kg.	Telangana	Hyderabad	1875	1875	1260

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

Commodity	Variety	Unit	State	Centre	Mar-21	Feb-21	Mar-20
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	2200	2050	1830
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	3300	3150	2900
Coconut Oil	-	15 Kg.	Kerala	Cochin	3113	3158	2325
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2320	2365	2150
Groundnut Cake	-	Quintal	Telangana	Hyderabad	NT	NT	3642
Cotton/Kapas	NH 44	Quintal	Andhra pradesh	Nandyal	6150	6300	5000
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	5900	5700	4800
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	7400	7000	4850
Jute Raw	W 5	Quintal	West Bengal	Kolkata	7700	7300	4900
Oranges	-	100 No	NCT of Delhi	Delhi	NA	NA	667
Oranges	Big	100 No	Tamil Nadu	Chennai	800	600	450
Banana	-	100 No.	NCT of Delhi	Delhi	417	375	458
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	620	600	300
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	87000	100000	70000
Almonds	-	Quintal	Maharashtra	Mumbai	63000	65000	58000
Walnuts	-	Quintal	Maharashtra	Mumbai	65000	70000	60000
Kishmish	-	Quintal	Maharashtra	Mumbai	23000	25000	17000
Peas Green	-	Quintal	Maharashtra	Mumbai	7500	9500	6000
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	650	900	1500
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	1400	3000	2500
Cauliflower	-	100 No.	Tamil Nadu	Chennai	2000	1500	2200
Potato	Red	Quintal	Bihar	Patna	900	950	1720
Potato	Desi	Quintal	West Bengal	Kolkata	800	580	1300
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	1367	2904	1357
Onion	Pole	Quintal	Maharashtra	Nashik	950	3250	1400
Turmeric	Nadan	Quintal	Kerala	Cochin	11000	11000	11000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	12500	11000	10500
Chillies	-	Quintal	Bihar	Patna	15300	14600	12650
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	35000	31000	NT
Ginger	Dry	Quintal	Kerala	Cochin	20000	22500	27000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	56200	56000	144000
Cardamom	Small	Quintal	West Bengal	Kolkata	175000	190000	305000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	6000	6000	6500
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	59363	59363	70000
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	41000	42000	44000

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

Commodity	Variety	Unit	State	Centre	Mar-21	Feb-21	Mar-20
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	41500	40600	41000
Fish	Rohu	Quintal	NCT of Delhi	Delhi	9000	10000	15000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	45000	40000	30000
Eggs	Madras	1000 No.	West Bengal	Kolkata	4524	4670	3690
Tea	-	Quintal	Bihar	Patna	25800	25800	21950
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	14794	NT	NT
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	31000	32000	40000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	22000	23000	29500
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	8350	8600	7800
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	4200	4150	4800
Tobacco	Bidi To-bacco	Quintal	West Bengal	Kolkata	13200	13100	13200
Rubber	-	Quintal	Kerala	Kottayam	15000	14200	NT
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	65000	66000	63000

Source: DPIIT, Ministry of Commerce and Industry.

Crop Production

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

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Winter Rice, Jowar (K), Bajra Maize (K), Ragi (K), Small Millets (K), Tur (K), Urad (K), Mung (K), other Kharif Pulses, Ginger, Groundnut, Sesamun, Cotton, Turmeric.	Autumn rice
Assam	Winter Rice, Castorseed.	Autumn Rice, Summer Potato (Hills)
Bihar	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Sesamum, Cotton, Jute, Mesta, Sunn Hemp.	Summer Rice
Gujarat	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Chillies (Dry), Groundnut, Sesamum, Cotton, Turmeric, Sunn Hemp.	–
Himachal Pradesh	Summer Rice, Maize, Ragi, Small Millets (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Chillies (Dry), Tobacco, Groundnut, Sesamum, Turmeric.	Wheat, Winter Potato (Hills), Onion
Jammu & Kashmir	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Urad (K), Mung (K), Other Kharif Pulses, Potato Chillies (Dry), Tobacco, Groundnut, Sesamum (Late) Jute, Sunn Hemp.	Wheat, Barley, Small Millets (R) Tobacco, Rapeseed and Mustard, Onion
Karnataka	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sunn Hemp, Nigerseed, Onion, Tapioca.	–
Kerala	Autumn Rice, Ragi, Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Sweet Potato.	Tapioca
Madhya Pradesh	Autumn Rice, Jowar (K), Bajra, Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Groundnut, Potato, Turmeric, Sunn Hemp.	Onion
Maharashtra	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry) Groundnut, Castorseed, Sesamum, Cotton, Mesta, Turmeric, Sunn Hemp, Nigerseed.	–
Manipur	Autumn Rice, Winter Rice, Tur (K) Groundnut, Castorseed, Sesamum, Cotton.	–
Orissa	Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Chillies (Dry), Tobacco, Groundnut, Castorseed, Cotton, Jute, Mesta.	Summer Rice, Chillies (Dry)
Punjab and Haryana	Autumn Rice, Summer Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies Dry, Groundnut, Castorseed, Cotton, Sweet Potato, Turmeric, Sunn Hemp.	Wheat, Potato (Hills), Summer Potato, Tobacco, Onion.
Rajsthan	Jowar (K), Bajra, Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Tobacco, Groundnut, Castorseed, Cotton Sannhemp.	Small Millets (R)
Tamil Nadu	Autumn Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Summer Potato (Hills), Sugarcane, Chillies (Dry), Castorseed, Seasamum, Cotton, Turmeric, Sunn hemp Onion, Tapioca.	Summer Rice, Jowar (R), Sugar Chillies (Dry), Cotton, Sunn Hemp, Onion.
Tripura	Winter Rice, Urad (K), Mung (K), Sesamum Mesta.	–
Uttar Pradesh	Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses (Moth), Ginger, Chillies (Dry), Groundnut, Castorseed, Cotton, Jute, Mesta, Sweet Potato, Sunn Hemp, Nigerseed.	Sugarcane, Onion.
West Bengal	Autumn Rice, Maize, Tur (K), Ginger, Chillies (Dry), Mesta.	Chillies (Dry), Sesamum.
Delhi	Jowar (K), Bajra, Cotton.	–
Andaman & Nicobar	Autumn Rice, Winter Rice.	–

(K) – Kharif (R) – Rabi

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N.R.—Not Reported.
Neg. — Negligible.
Kg. — Kilogram.
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