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AGRICULTURAL SITUATION IN INDIA

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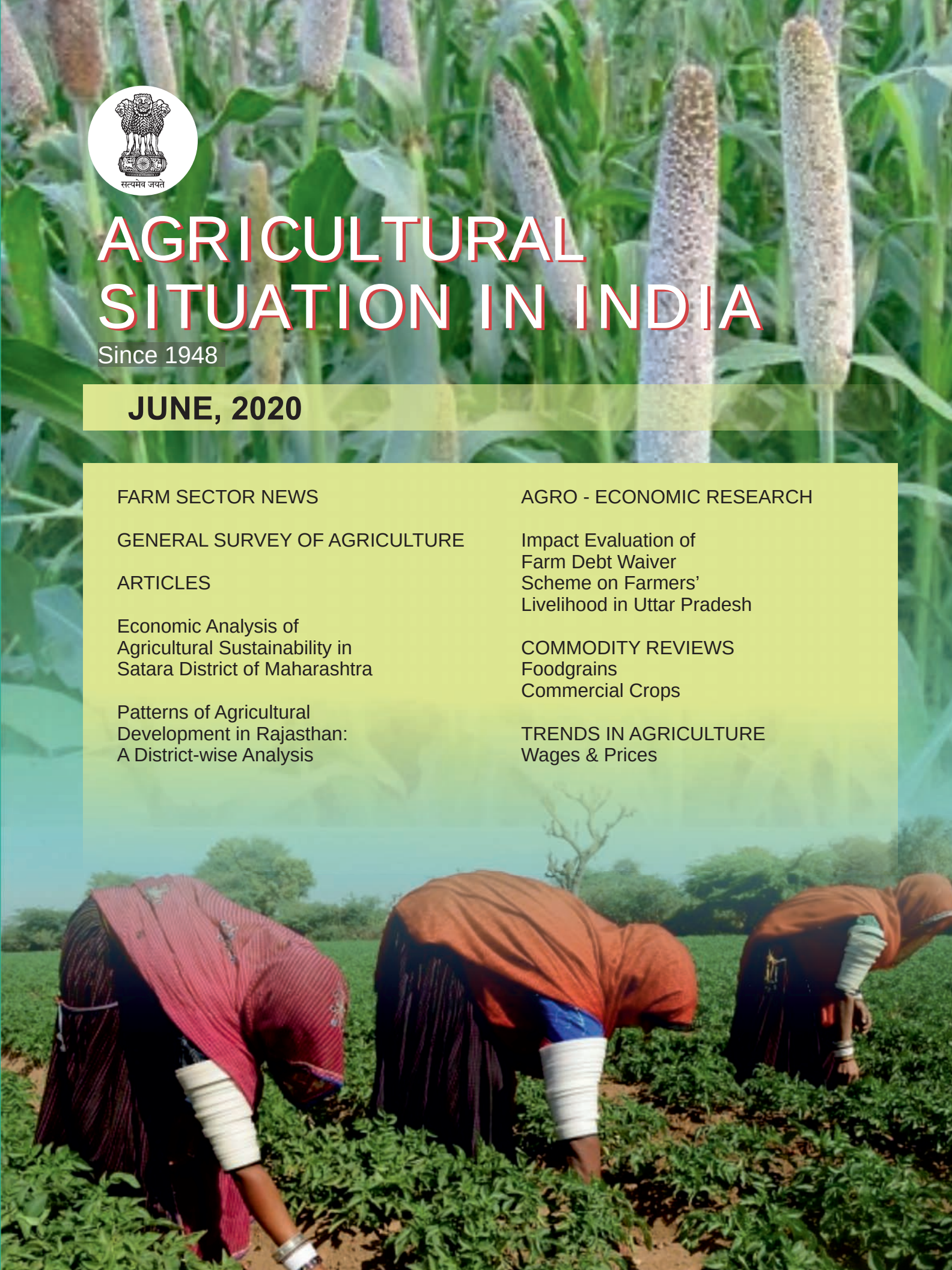

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From Editor's Desk

This issue of 'Agricultural Situation in India' gives an overview of current agricultural policy initiatives and schemes of the Government in the farm sector, recent agricultural scenario; two academic research articles, one on economic analysis of agricultural sustainability in Satara district of Maharashtra; and, second, district-wise analysis on patterns of agricultural development in Rajasthan and an agro-economic research study report on the impact evaluation of farm debt waiver scheme on farmers' livelihood in Uttar Pradesh.

Important farm sector news covered in this issue are: status of procurement of pulses, oilseeds and wheat during rabi season 2020-21; Union Agriculture Minister's call for farmers' movement on integrated soil nutrient management based on Soil Health Card; third advance estimates of production of foodgrains, oilseeds and other commercial crops for 2019-20; allocation of Rs. 500 crore towards beekeeping under Atma Nirbhar Abhiyan; increase in area under summer crops; and locust swarm control operations in the affected states, *i.e.,* Rajasthan, Punjab, Gujarat and Madhya Pradesh.

So far as the agricultural scenario is concerned, the Wholesale Price Index (WPI) of foodgrains, pulses, cereals, wheat, paddy and vegetables increased by 9.33 percent, 14.32 percent, 8.43 percent, 7.52 percent, 2.41 percent and 31.34 percent, respectively, in April, 2020 as compared to that in April, 2019. The cumulative pre-monsoon season, 2020 rainfall in the country has been 20 percent higher than the long period average during 1st March, 2020 to 27th May, 2020. Current live storage in 123 major water reservoirs in the country was 58.03 BCM as against 34.70 BCM of normal storage based on the average storage of last 10 years.

In academic column's first article, the author, Dr. M S Deshmukh and Digvijay R Patil analyse the economic aspects of agricultural sustainability in Satara district of Maharashtra by undertaking a comparative study between period I (2009) and period II (2018) in eleven blocks of the district. The study is based on secondary data collected from socio-economic review of Satara district, census reports of Government of India and other online available database. The author had adopted the UNDP methodology to construct the sustainable livelihood security index (SLSI) in Satara district which is a cross-sectional tool to assess the comparative sustainability standing and basic pre-requisite of sustainable development of agriculture in a region. Further, the author analysed three interacting component indices under SLSI, that is, ecological security index (considering ecological degradation, extent of pollution and ecological balance, etc.), economic efficiency index (considering agriculture output, cropping pattern, income of farmers, etc.) and social equity index (considering poverty, inequality, etc., in society). On the basis of research done, author concludes that there is decreasing trend in sustainable agricultural development in Satara district. The study found that maximum and minimum SLSI values varied between 0.635 to 0.355 during 2009 and 0.528 to 0.323 during 2018. It clearly indicates that there is wide regional inconsistency in various blocks of Satara district. So, the author suggested that Maharashtra state need to pay more attention on the principal tools of SLSI, *i.e.,* ecological, economic and social policies for the improvement of the agricultural sustainability. There is a need to grow the forest area by planting trees, controlling pollution, preventing excessive population, etc. Moreover, Government should take steps for modernization of agriculture by increasing irrigated area alongwith appropriate use of fertilizers, etc. To bridge the gap of social inequality, the district planning commission may adopt policies related to spreading of quality education, better health services and adequate rural infrastructure for socio-economic development of the region.

In the second article, the author, Dr. Manish Kant Ojha evaluates the district-wise as well as division-wise disparity in the development of agriculture in Rajasthan using various indicators, *i.e.,* value of products, cropping intensity, fertilizer consumption, gross area sown per tractor/ agricultural labour/ tubewell, etc. These indicators reflect important vision about regional agriculture development in Rajasthan after green revolution and economic reforms during 1991 in India. A robust composite agricultural development index (CADIX) has been constructed using secondary data from all 33 districts and 7 administrative divisions for different time periods beginning TE 1964-65 to TE 2012-13. The secondary data required for the study was collected from the state government offices, such as Directorate of Agriculture, Directorate of Economics & Statistics, various websites and other relevant publications. The study brought out that development of agriculture in Rajasthan over the year has shifted from eastern Rajasthan to western Rajasthan districts, especially to Ganganagar, Hanumangarh, Bikaner and Jaisalmer. The main reason behind this is the improvement of canal irrigation facility through Indira Gandhi Canal project and abundance of solar power irrigation system. In addition, adoption of micro irrigation system by most of the farmers helped them in having more production from the same land holding with cost effective measures. The author suggested that the region specific policies need to be developed in various districts. Government should promote alternative employment opportunities in rural areas, like MGNREGA. Emphasis on agriculture extension activities is also required to educate farmers to adopt cheap, suitable and effective technologies and crop varieties. Steps should be taken for development of warehousing facilities to enable agricultural sector to grow at a higher pace in Rajasthan.

Agro-economic research shared in this issue is a report on impact evaluation of farm debt waiver scheme on farmers' livelihood in Uttar Pradesh prepared by Agro-Economic Research Centre, University of Allahabad, Prayagraj. The major objectives of the study are: to examine socio-economic characteristics of beneficiaries; to analyse the nature and extent of indebtness among farmers; and to brought out the perception of beneficiaries on impact of the scheme. To realize these objectives, primary data from different climatic zones of western region of Uttar Pradesh was collected. Based on research done, study highlighted some resolution based suggestions to benefit all the marginal and small farmers with poor resources, like spread awareness on Governments' schemes, encourage and assist them to shift from primary agriculture to other allied and secondary occupations, increase subsidies on farm machinery, diversify farms to increase the crop intensity, encourage rearing of crossbred cattle, curtail production cost and other domestic expenditures, improve penetration of regional rural banks, and finally, implement farm debt waiver schemes in a transparent manner.

P. C. Bodh

Farm Sector News*

Pulses, Oilseeds and Wheat procurement during Rabi Season 2020-21 in full flow

A quantity of 2,61,565 MT of pulses and 3,17,473 MT of oilseeds has been procured under Rabi 2020-21 season till 02.05.2020 at MSP value of Rs. 2,682 crores benefitting 3,25,565 farmers. Of this, a quantity of 14,859 MT pulses and 6706 MT of oilseeds was procured on 1st and 2nd May, 2020 in six states namely, Madhya Pradesh, Maharashtra, Karnataka, Rajasthan, Uttar Pradesh and Haryana.

Besides, in Rabi Marketing Season 2020-21, a total of 1,87,97,767 MT wheat arrived in FCI, out of which 1,81,36,180 MT has been purchased.

Meanwhile, the Sowing Area Coverage of Summer Crops is as follows:

- **Rice**: About 34.80 lakh ha area coverage under summer rice as compared to 25.26 lakh ha during the corresponding period of last year.
- **Pulses**: About 8.77 lakh ha area coverage under pulses as compared to 5.44 lakh ha during the corresponding period of last year.
- **Course Cereals**: About 9.12 lakh ha area coverage under coarse cereals as compared to 5.49 lakh ha during the corresponding period of last year.
- **Oilseeds**: About 8.87 lakh ha area coverage under oilseeds as compared to 7.00 lakh ha during the corresponding period of last year.

Union Agriculture Minister calls for farmers' movement on integrated soil nutrient management based on Soil Health Card

The Union Minister for Agriculture & Farmers Welfare, Shri Narendra Singh Tomar has called for making integrated soil nutrient management a farmers' movement. Reviewing the progress of the Soil Health Programme on 6th May, 2020, he directed running mission mode awareness campaigns on increasing use of bio and organic fertilizers and reducing chemical fertilizers strictly based on recommendations of Soil Health Card.

During 2020-21, the major focus of the programme would be on mass awareness programme for farmers in over 1 lakh villages covering all districts of the country. Shri Tomar advocated the setting up of village level soil testing labs by youth, having education in agriculture, women self help groups, FPOs, etc. He said the SHC scheme would focus on enabling employment generation after appropriate skill development.

The Department of Agriculture, Cooperation and Farmers Welfare would launch a comprehensive campaign on soil test based rational application of fertilizers and promotion of organic farming including Bhartiya Prakritik Krishi Padhati (BPKP) for safe nutritious food in association with the Departments of Panchayati Raj, Rural Development and Drinking Water and Sanitation.

Under the SHC scheme Soil Health Cards are provided to all farmers at an interval of 2 years. Launched by the Prime Minister Shri Narendra Modi on 19th February, 2015 at Suratgarh, Rajasthan, these cards provide information to farmers on nutrient status of their soil along with recommendation on appropriate dosage of nutrients to be applied for improving soil health and its fertility.

Deterioration of soil chemical, physical and biological health is considered as one of the reasons for stagnation of agricultural productivity in India.

Soil Health Card provides two sets of fertilizer recommendations for six crops including recommendations of organic manures. Farmers can also get recommendations for additional crops on demand. They can also print the card as their own from SHC portal. SHC portal has farmers database of both the cycles and is available in 21 languages for the benefit of the farmers.

A 2017 study by the National Productivity Council (NPC) found that the SHC scheme has promoted sustainable farming and led to a decrease in use of chemical fertilizer application in the range of 8-10%. Besides, overall increase in the yield of crops to the tune of 5-6% was reported due to application of fertilizer and micro nutrients as per recommendations available in the Soil Health Cards.

*Source:www.pib.nic.in

505 new mandis from various States & UTs integrated with the e-NAM platform in different phases for marketing of Agricultural produce

The Union Minister of Agriculture and Farmers Welfare, Shri Narendra Singh Tomar on 11th May, 2020 launched integration of 177 new mandis with the National Agriculture Market (e-NAM) to strengthen agriculture marketing and facilitate farmers to sell their harvested produce through the online portal. The mandis integrated today are as follows: Gujarat (17), Haryana (26), J&K (1), Kerala (5), Maharashtra (54), Odisha (15), Punjab (17), Rajasthan (25), Tamil Nadu (13) and West Bengal (1). With the launch of 177 additional mandis, the total number of eNAM mandis across country is 962.

Launching the new mandis through video conferencing, Shri Tomar said efforts should be made to strengthen eNAM further to benefit the farmers. He said eNAM portal has been envisioned by the Prime Minister Shri Narendra Modi as an ambitious use of technology for the benefit of farmers.

Earlier, 785 mandis were integrated with eNAM across 17 States and 2 UTs, with a user base of 1.66 Cr Farmers, 1.30 lakh traders and 71,911 Commission Agents. As of 9th May, 2020, total volume of 3.43 Crore MT & 37.93 Lakh numbers (Bamboo & Coconut) collectively worth more than Rs. 1 lakh crore has been traded on eNAM platform. Digital payment worth Rs. 708 Crore have been done via eNAM platform, benefitting more than 1.25 lakh farmers. eNAM facilitates trade beyond mandi/ state borders. A total of 236 mandis participated in inter-mandi trade across 12 States whereas 13 States/UT have participated in the inter-state trade allowing farmers to interact directly with distantly located traders. At present, 150 commodities, including food grains, oilseeds, fibers, vegetables and fruits, are being traded on eNAM. More than 1,005 FPOs have been registered on eNAM platform and have traded 2900 MT of agri-produce worth Rs 7.92 Crores.

To de-congest mandis during COVID-19 lockdown situation, FPO trade module, Logistics module and eNWR based Warehouse module were launched by the Union Agriculture Minister on 2nd April, 2020. Since then, 82 FPOs from 15 States have traded on eNAM with total quantity of 12048 Quintals of commodities worth Rs 2.22 Cr. Nine (9) Logistics Service Aggregators have partnered with eNAM having 2,31,300 transporters providing availability of 11,37,700 trucks to service transportation need of eNAM stakeholders.

National Agriculture Market (e-NAM) is a highly ambitious and successful scheme of Government of India which networks the existing APMC mandis to create a unified national market for agricultural commodities with a vision to promote uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.

On 1st May, 2020, Shri Tomar had launched integration of 200 eNAM mandis from 7 States including 1 new state of Karnataka being added on eNAM to help Indian farmers. In addition, the Union Agriculture Minister had also launched inter-operability between ReMS (Unified Market Portal-UMP) of Karnataka & eNAM portal. It provides an opportunity to access more markets for trade to traders and farmers of both the platforms, using inter-operability feature between these two platforms and vice versa.

38 additional mandis were also integrated with the eNAM platform on 15th May, 2020, thus achieving milestone of integration of 415 mandis as per the planned target. 38 Mandis integrated are in Madhya Pradesh (19), Telangana (10), Maharashtra (4) and One (1) each from Gujarat, Haryana, Punjab, Kerala & J&K.

While looking at the achievements of eNAM in its Phase-I (integration of 585 mandis), it is heading on a path of expansion by spreading its wings with additional 415 mandis planned to be on-boarded before 15th of May, 2020, taking the total number of eNAM mandis to 1,000 across 18 States & 3 UTs to achieve "One Nation One Market" vision of the Prime Minister.

Third Advance Estimates of Production of Foodgrains, Oilseeds and other Commercial Crops for 2019-20

The 3rd Advance Estimates of production of major crops for 2019-20 have been released by the Department of Agriculture, Cooperation and Farmers Welfare on 15th May, 2020. The cumulative rainfall in the country during the monsoon season (June to September, 2019) has been 10% higher than Long

Period Average (LPA). Accordingly, the production of most of the crops for the agricultural year 2019-20 has been estimated higher than their normal production. These estimates are subject to revision on account of more precise information flowing over the time.

As per 3rd Advance Estimates, the estimated production of major crops during 2019-20 is as under:

Foodgrains – 295.67 million tonnes. (record)

Rice – 117.94 million tonnes. (record)

Wheat – 107.18 million tonnes. (record)

Nutri /Coarse Cereals – 47.54 million tonnes. (record)

Maize – 28.98 million tonnes. (record)

Pulses – 23.01 million tonnes.

Tur – 3.75 million tonnes.

Gram – 10.90 million tonnes.

Oilseeds – 33.50 million tonnes. (record)

Soyabean – 12.24 million tonnes

Rapeseed and Mustard – 8.70 million tonnes

Groundnut – 9.35 million tonnes

Cotton – 36.05 million bales (170 kg per bale) (record)

Jute & Mesta – 9.92 million bales (180 kg per bale)

Sugarcane – 358.14 million tonnes

As per Third Advance Estimates for 2019-20, total foodgrain production in the country is estimated at record 295.67 million tonnes which is higher by 10.46 million tonnes than the production of foodgrain of 285.21 million tonnes achieved during 2018-19. However, the production during 2019-20 is higher by 25.89 million tonnes than the previous five years' (2014-15 to 2018-19) average production of foodgrain.

Total production of rice during 2019-20 is estimated at record 117.94 million tonnes. It is higher by 8.17 million tonnes than the five years' average production of 109.77 million tonnes.

Production of wheat during 2019-20 is estimated at record 107.18 million tonnes. It is higher by 3.58 million tonnes as compared to wheat production during 2018-19 and is higher by 11.02 million tonnes than the average wheat production of 96.16 million tonnes.

Production of nutri / coarse cereals estimated at record 47.54 million tonnes, is higher by 4.48 million tonnes than the production of 43.06 million tonnes achieved during 2018-19. Further, it is also higher by 4.50 million tonnes than the average production.

Total pulses production during 2019-20 is estimated at 23.01 million tonnes which is higher by 2.19 million tonnes than the Five years' average production of 20.82 million tonnes.

Total oilseeds production in the country during 2019-20 is estimated at record 33.50 million tonnes which is higher by 1.98 million tonnes than the production of 31.52 million tonnes during 2018-19. Further, the production of oilseeds during 2019-20 is higher by 4.10 million tonnes than the average oilseeds production.

Total production of sugarcane in the country during 2019-20 is estimated at 358.14 million tonnes.

Production of cotton is estimated at record 36.05 million bales (of 170 kg each) is higher by 8.01 million bales than the production of 28.04 million bales during 2018-19. Production of jute & mesta is estimated at 9.92 million bales (of 180 kg each).

The pan-India electronic agri-produce trading portal reaches milestone of 1000 mandis across 18 States & 3 UTs

National Agriculture Market (eNAM), a pan-India electronic trading portal was launched on 14th April, 2016, by the Prime Minister Shri Narendra Modi, with the aim of networking the existing Mandis on a common online market platform as "One Nation One Market" for agricultural commodities in India.

The e-NAM is being implemented by the Small Farmers Agri-business Consortium (SFAC), being the lead agency for the project under the aegis of Ministry of Agriculture and Farmers Welfare,

Government of India, with the support of all the e-NAM States/UTs, state marketing boards, mandi secretaries, supervisors, quality assayers, weighment operators, service providers, farmers, FPOs, traders and eNAM team.

This digital initiative of Government of India provides a single window service for all APMC related information and services, including commodity arrivals, quality assaying, competitive bid offers and electronic payment settlement directly into farmers' accounts. This online digital market aims at reducing transaction costs, bridging information asymmetries, and helping expansion of market access for farmers and other stakeholders.

In last 4 years, the e-NAM has registered a user base of 1.66 Cr Farmers, 1.31 lakh Traders, 73,151 Commission Agents and 1012 FPOs. As on 14th May, 2020, total volume of 3.43 Crore MT & 38.16 Lakh numbers (Bamboo & Coconut) collectively crossed a remarkable business milestone worth Rs. 1 lakh crore on e-NAM platform. Presently, 150 commodities, including Foodgrains, Oilseeds, Fibers, Fruits & Vegetables, are traded on eNAM.

To address the difficulties faced by the farmers due to the COVID19 lockdown crisis, the Union Minister of Agriculture & Farmers Welfare, Shri Narendra Singh Tomar, on 2nd April, 2020 launched 3 new modules of eNAM.

1. **FPO Module on eNAM:** This enables FPOs to conduct trade of commodities from their collection centres declared as "Deemed Market" or "Sub-Market yards". As on 14th May, 2020, 1012 FPOs were registered on e-NAM platform, and have traded 3053 MT of agri-produce worth Rs 8.11 Crore. Among these, 42 FPOs traded from their own collection center through recently introduced FPO module.

2. **Warehouse based Electronic Negotiable Warehouse Receipts (eNWR) trading:** For eNWR based trading, WDRA accredited warehouses from Andhra Pradesh (23) and Telangana (14) have been declared as deemed market by respective State Governments. Rajasthan Government has recently declared 138 State Government & cooperative warehouses as sub-market yards. Madhya Pradesh, Uttar Pradesh, Gujarat and Punjab have initiated amendments in their respective acts to facilitate warehouse based trade.

3. **Logistics Module:** This facilitates transportation of the commodities from farm to Mandis and from Mandis to warehouse/consumption centres. Nine logistic service providers/ aggregators linked with 2.3 lakh transporters and 11.37 lakh vehicles have been on-boarded on eNAM platform.

On 1st May, 2020, inter-operability between ReMS (Unified Market Portal-UMP) and e-NAM portal was launched. In this new module, farmers and traders across ReMS (UMP) of Karnataka and e-NAM platform can conduct inter-platform trade to access more markets for trade using inter-operability features and vice-versa.

These revolutionary steps of eNAM further strengthen it towards One Nation One Market goal, facilitating farmers, traders and mandis to collectively work together as a cohesive unit to take nation towards online sale and purchase of agri-produce through eNAM portal.

Government has allocated Rs. 500 crore towards Beekeeping under Atma Nirbhar Abhiyan: Shri Narendra Singh Tomar

The Union Minister of Agriculture & Farmers Welfare, Shri Narendra Singh Tomar has said that the Government is promoting Beekeeping as part of its aim to double farmers' income. Addressing a webinar organised by the National Cooperative Development Corporation (NCDC), Shri Tomar said the Government has allocated Rs. 500 crore towards beekeeping under the Atma Nirbhar Abhiyan. He said that India is among the world's top five honey producers. Compared to 2005-06, honey production has risen by 242% and exports shot by 265%.

Shri Tomar said, as evident by the rising honey exports, beekeeping would be an important factor in achieving the goal of doubling farmers' income by 2024. He said that the National Bee Board has created four modules to impart training as part of the National Beekeeping and Honey Mission (NBHM) and 30 lakh farmers have been trained in beekeeping. They are also being financially supported by the Government.

The Minister said that the Government is implementing the recommendations of the

Committee to promote beekeeping. He said that under guidance of the Prime Minister Shri Narendra Modi, the Government has launched 'Honey Mission' as part of 'Sweet Revolution' which has four components. Even small and marginal farmers can adopt beekeeping since investment is low and returns high, he added.

Speaking in the webinar, Dr. Dhansingh Rawat, Cooperation Minister of Uttarakhand highlighted the resolve of the State Government to mainstream organic honey production. He mentioned the need to bring about modifications in the Honey Mission. Managing Director, NCDC, Shri Sundeep Kumar Nayak highlighted the role of NCDC over the years in promotion of women groups and development of apiculture cooperatives.

Prof. Nazeer Ahmad, Vice Chancellor, Sher-e-Kashmir University of Agriculture Science and Technology, Kashmir talked about the unique characteristics of Kashmir honey which is at par with the best in the world such as Manuka of New Zealand. Mr. Tomio Schichiri, Representative, UNFAO talked about the importance of quality assurance in exports of honey. Dr. M V Rao, Additional Chief Secretary, West Bengal talked about the massive steps of their Government to promote production, branding and marketing of organic honey and wild honey by women groups. Dr. BNS Murthy, Horticulture Commissioner of India highlighted the innovations in new mission.

Issues before beekeepers such as promotion of scientific beekeeping, quality assurance, minimum support price, transport of bee colonies, processing, packaging, branding, testing, organic certification of honey and different beehive products were discussed. Successful beekeepers and entrepreneurs from Kashmir, West Bengal, Uttarakhand, Bihar, Kerala, Tamil Nadu, Karnataka, Uttar Pradesh, Jharkhand and Madhya Pradesh shared their experiences and suggested ways forward to bring about the Sweet Revolution.

The webinar was conducted on 21st May, 2020, by the NCDC on the theme "Sweet Revolution and Atma Nirbhar Bharat" in partnership with the National Bee Board, the Government of West Bengal, the Government of Uttarakhand and the Sher-e-Kashmir University of Agriculture Sciences and Technology, Kashmir. The objective was to popularize scientific beekeeping as source of livelihood for landless rural poor, small and marginal famers to supplement agricultural income, as also as tool to enhance agriculture and horticulture production. It attracted participation of beekeepers, honey processors, marketing and branding professionals, research scholars, academicians, cooperators from major honey producing states, representatives of State and Union Governments, international organizations such as FAO and NEDAC, Bangkok.

More areas under Summer Crops over last year, procurement too rises despite lockdown

Sowing of Summer Crops

The Sowing Area Coverage of Summer Crops is as follows:

i. **Rice**: About 34.87 lakh hectares area coverage under summer rice as compared to 25.29 lakh ha during the corresponding period of last year.

ii. **Pulses**: About 12.82 lakh ha area coverage under pulses as compared to 9.67 lakh ha during the corresponding period of last year.

iii. **Coarse Cereals**: About 10.28 lakh ha area coverage under coarse cereals as compared to 7.30 lakh ha during the corresponding period of last year.

iv. **Oilseeds**: About 9.28 lakh ha area coverage under oilseeds as compared to 7.34 lakh ha during the corresponding period of last year.

Distribution of Pulses under PM-GKY Yojana

Under the Pradhan Mantri Garib Kalyan Yojana (PM-GKY) about 4.57 Lakh MT of pulses have been dispatched to the States/UTs. Out of this, 1.78 Lakh MT pulses have been distributed to 1340.61 Lakh beneficiaries in the States/UTs.

Status of procurement of pulses and oilseeds by NAFED during lockdown period

i. 7.33 Lakh MT Gram (Chana) has been procured from 9 States namely Andhra Pradesh, Telangana, Karnataka, Rajasthan, Maharashtra, Madhya Pradesh, Gujarat, Uttar Pradesh and Haryana.

ii. 5.91 Lakh MT Mustard has been procured from

5 States namely Rajasthan, Madhya Pradesh, Uttar Pradesh, Gujarat and Haryana.

iii. 2.41 Lakh MT Toor has been procured from 8 States namely Tamil Nadu, Telangana, Andhra Pradesh, Maharashtra, Karnataka, Madhya Pradesh, Gujarat and Odisha.

Wheat Procurement in Rabi Marketing Season

In Rabi Marketing Season (RMS) 2020-21, a total of 359.10 Lakh MT wheat is arrived in FCI out of which 347.54 Lakh MT is purchased.

Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Scheme

Under the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Scheme during the lockdown period from 24.3.2020 till date, 9.67 crore farmers have been benefitted and an amount of Rs. 19,350.84 crore has been released so far.

Amidst a wave of locust swarms sweeping across northern India, control operations stepped up in the affected States of Rajasthan, Punjab, Gujarat and Madhya Pradesh

Amidst a wave of locust swarms sweeping across western and northwestern India, the Department of Agriculture and Farmers Welfare (DAC&FW) has stepped up locust control operations in the affected states of Rajasthan, Punjab, Gujarat and Madhya Pradesh. As of 27th May, 2020, there are active swarms of immature locust in Barmer, Jodhpur, Nagaur, Bikaner, Ganganagar, Hanumangarh, Sikar, Jaipur Districts in Rajasthan and Satna, Gwalior, Seedhi, Rajgarh, Baitul, Devas, Agar Malwa district of Madhya Pradesh.

At present 200 Locust Circle Offices (LCO) are conducting survey & control operations in close coordination with district administration and agriculture field machinery of the affected States. Locust control operations are in full swing in coordination with state agriculture departments and local administration. In Rajasthan 21 districts, in Madhya Pradesh 18 districts, in Punjab one district and in Gujarat 2 districts have undertaken Locust control till now. For effective control of locusts beyond scheduled desert areas, temporary control camps have been established in Ajmer, Chittorgarh and Dausa in Rajasthan; Mandsaur, Ujjain and Shivpuri in Madhya Pradesh and Jhansi in Uttar Pradesh.

So far (till 26.05.2020), control operations against Locusts have been done in 47,308 hectare area in total 303 places in Rajasthan, Punjab, Gujarat and Madhya Pradesh by LCOs in coordination with District Administration and State Agriculture Department. 89 fire brigades for pesticide spray; 120 survey vehicles; 47 control vehicles with spray equipments and 810 tractor mounted sprayers have been deployed for effective locust control, as per requirement during different days.

Usually, the locust swarms enter the Scheduled Desert Area of India through Pakistan for summer breeding in the month of June/July with the advent of monsoon. This year, however, the incursions of locust hoppers and pink swarms have been reported much earlier because of presence of residual population of Locusts in Pakistan which they couldn't control last season. Since 11th April, 2020, locust hoppers and from 30th April, 2020, the incursion of pink immature adults has been reported in bordering districts of Rajasthan and Punjab, which are being controlled. Pink immature adults fly high and cover long distances during day hours from one place to another along with the westerly winds coming from the Pakistan side. Most of these pink immature adults settle on the trees during night and mostly fly during day.

Concerned over the early attack of locust swarms this year, the Union Minister for Agriculture & Farmers Welfare, Shri Narendra Singh Tomar chaired a meeting with the pesticide manufacturers and all related stakeholders on 6th May, 2020 to review the preparedness for locust control in the affected States. Following directions of the Agriculture Minister Shri Tomar, a video conference was conducted under the chairmanship of Shri Sanjay Agarwal, Secretary (DAC&FW), was conducted on 22nd May, 2020 with the district administration and district agriculture officers of locust threatened districts of Punjab, Rajasthan, Gujarat, Madhya Pradesh and Uttar Pradesh along with the representatives of NDMA. Locust awareness literature, SOPs, approved pesticides and awareness videos were shared with the States in the meeting. Earlier, a video Conference was held on 5th May, 2020 with the Principal Secretary (Agriculture) and DMs of the locust prone districts of Rajasthan, Gujarat and Punjab under the chairmanship of Secretary, DAC&FW to review

the preparedness and further coordination with the locust States for taking necessary action.

On 11th March, 2020 a high-level virtual meeting on desert locust in south-west asian countries was held at the office of the FAO representative in India. Representatives of four member countries (Afghanistan, India, Iran and Pakistan) and the Plant Protection Division of FAO, Rome also participated in the meeting. The MoS (Agriculture & FW) Shri Kailash Choudhury and Secretary DAC&FW attended the meeting. It was decided to hold the virtual meetings of technical officers of member countries every Monday via Skype and nine meetings have so far been held. Advisories have been issued to the States of Rajasthan, Gujarat, Haryana and Punjab regarding the locust attack and necessary measures to be taken for effective control and pesticides that are to be used for effective Locust control in the cropped area.

Currently, Locust Control Offices have 21 Micronair and 26 Ulvamast (47 spray equipments) which are being utilized for locust control. On approval of the Agriculture Minister Shri Tomar, supply order for additional 60 sprayers has been placed to M/s. Micron, United Kingdom. e-Tender has been invited for the empanelling agencies to provide services of drones for aerial spraying of insecticides for effective control over tall trees and inaccessible areas. Ministry of Civil Aviation has approved "Conditional exemption to Government entity (DPPQS) for use of Remotely Piloted Aircraft System for anti-locust operations" on 21st May, 2020 and in accordance with this order, two firms have been finalized through tender for use of the drones for spray of pesticides for Locust control.

Meanwhile, supply order for procurement of additional 55 vehicles has been placed to strengthen the control potential. Adequate stock of Pesticide is being maintained (53,000 litres Malathion) with locust control organizations. Under sub-mission on agriculture mechanization, assistance for 800 tractors mounted spray equipments has been sanctioned for Rajasthan costing Rs. 2.86 crores. Also, under RKVY sanction for hiring of vehicles, tractors and for purchase of pesticides has been issued for Rajasthan worth Rs. 14 crores. Under RKVY sanction for purchase of vehicles, spray equipments, safety uniform, android application and training has also been issued for Gujarat at a cost of Rs. 1.80 crores.

As per FAO's locust status update of 21st May, 2020, the current situation remains extremely alarming in East Africa where it is an unprecedented threat to food security and livelihoods. New swarms would migrate to the summer breeding areas along both sides of the Indo-Pakistan border as well as to Sudan and West Africa. As vegetation dries out, more groups and swarms would form and move from these areas to the summer breeding areas along both sides of the Indo-Pakistan border. Good rains are predicted during the first half of June along the Indo-Pakistan border that would allow egg-laying to occur.

During 2019-20, India witnessed a massive locust attack which was successfully controlled. Starting from 21st May, 2019 till 17th February 2020, a total of 4,03,488 ha area was treated and locust was controlled. Along with this, the State Agriculture Department of Rajasthan and Gujarat coordinated locust control in cropped areas of the State. During 2019-20, Control operations were done in 3,93,933 ha area of 11 districts of Rajasthan; 9,505 ha area in 2 districts of Gujarat and 50 ha area in 1 district of Punjab. Senior Locust Forecasting Officer of FAO who visited India on 16-17 January 2019 also appreciated the efforts of India in Locust control.

Every day, locust control organizations and district authorities and state agriculture department officials with control spray vehicles of LCOs, tractor mounted with sprayers and fire tenders, are undertaking Locust control operations in early morning hours. The immature locust is very active and their mobility makes it difficult to control the swarm at one location and it takes 4 to 5 days of control at different locations to control a particular locust swarm.

Locust is an omnivorous and migratory pest and has the ability to fly hundreds of kilometers collectively. It is a trans-border pest and attacks the crop in large swarm. Found in Africa, the Middle East and Asia, they inhabit some 60 countries and can cover one-fifth of Earth's land surface. Desert locust plagues may threaten the economic livelihood of one-tenth of the world's human population. Swarms of locusts in the desert come to India from Africa/ Gulf/ South West Asia during the summer monsoon season and go back towards Iran, Gulf & African countries for spring breeding.

In India more than 2 lakh square kilometers

area comes under Scheduled Desert Area. Locust Warning Organization and 10 Locust Circle Offices (LCO) of Government of India are situated in Rajasthan (Jaisalmer, Bikaner, Phalodi, Barmer, Jalore, Churu, Nagaur, Suratgarh) and Gujarat (Palanpur and Bhuj) are responsible for monitoring, survey and control of Desert Locust in Scheduled Desert Area in coordination with State Governments.

Locust control operations conducted at 15 locations in Rajasthan and Madhya Pradesh

Locust Control Offices (LCOs) on 29th May, 2020, conducted control operations at 10 locations in districts of Jaipur, Dausa, Bikaner, Jodhpur, Barmer, Chittorgarh, Sri Ganganagar (Rajasthan) and Niwari and Shivpuri (Madhya Pradesh). State Department of Agriculture, Madhya Pradesh has also undertaken control operations at 5 locations located one each in districts of Satna, Balaghat, Niwari, Raisen and Shivpuri. No crop loss is reported.

As on 28th May, 2020 a total of 377 spots covering 53,997 hectares has been covered since Locust control operations started from 11th April, 2020. Districts covered by locust control are – Rajasthan – 22, MP – 24, Gujarat – 2, Punjab – 1, UP – 2, Maharashtra – 3.

A Video Conference (VC) was organized under the chairmanship of Secretary (Agriculture, Cooperation and Farmers Welfare) Shri Sanjay Agarwal with Principal Secretary (Agriculture) of all the states and UTs. In this meeting, all the states and UTs were informed about the latest status and control of locust attack. After this VC, an advisory has been issued in respect of locust to all the states/ UTs and related SOPs has been shared.

On 27.05.2020 a letter was issued by the Union Home Secretary to the Chief Secretaries of all the states/UTs giving necessary instructions to streamline the inter-state movement facility for the personnel engaged in locust control works. Ministry of Home Affairs has included the following items and norms of assistance under SDRF and NDRF-

- **Item** - Hiring of vehicles, tractors with spray equipments for spraying of plant protection chemicals for pest control; hiring of water tankers; and purchase of plant protection chemicals for locust control.

- **Norm-** The quantum of assistance would be limited to the actual expenditure incurred on these items. However, expenditure should not exceed 25% of SDRF allocation for the year.

As per FAOs locust status Bulletin of 27th May, 2020, in Pakistan and Iran adults are forming groups and small swarms in spring breeding areas in Baluchistan, Indus Valley (Pak) and southern coast and parts of Sistan-Baluchistan. These infestations would move to the summer breeding areas along the Indo-Pakistan from Cholistan to Tharparkar. In India, Spring-bred immature adult groups and swarms continued to move east and to the central states of Madhya Pradesh and Maharashtra. Much of these movements were associated with strong westerly winds from Cyclone Amphan. Several successive waves of invasions can be expected until July in Rajasthan with eastward surges across northern India as far as Bihar and Orissa followed by westward movements and a return to Rajasthan on the changing winds associated with the monsoon. These movements would cease as swarms begin to breed and become less mobile. Swarms are less likely to reach south India, Nepal, and Bangladesh.

General Survey of Agriculture

Trends in Foodgrain Prices

Based on Wholesale Price Index (WPI) (2011-12=100), WPI in case of foodgrains increased by 9.33 percent in April, 2020 over April, 2019.

Among foodgrains, WPI of pulses, cereals and vegetables increased by 14.32 percent, 8.43 percent and 31.34 percent, respectively, in April, 2020 over April, 2019.

Among cereals, WPI for wheat and paddy increased by 7.52 percent and 2.41 percent, respectively, in April, 2020 over April, 2019.

Similarly, WPI in case of foodgrains increased by 4.30 percent in April, 2020 over March, 2020.

Among foodgrains, WPI of pulses, cereals and vegetables increased by 12.31 percent, 2.74 percent and 2.22 percent in April, 2020 over March, 2020.

Among cereals, WPI for wheat and paddy increased by 7.26 percent and 1.40 percent, respectively, in April, 2020 over March, 2020.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative pre-monsoon season, 2020 rainfall for the country as a whole during the period 1st March, 2020 to 27th May, 2020 has been 20% higher than the Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period has been higher than LPA by 109% in Central India, by 24 % in North-West India and by 9% in East & North East India but lower than LPA by 7% in South Peninsula.

Out of 36 met sub-divisions, 20 met sub-divisions received large excess/excess rainfall, 10 met sub-divisions received normal rainfall and 6 met sub-divisions received deficient/large deficient rainfall.

Current live storage in 123 reservoirs (as on 28th May, 2020) monitored by Central Water Commission having Total Live Capacity of 171.09 BCM was 58.03 BCM as against 34.11 BCM on 28.05.2019 (last year) and 34.70 BCM of normal storage (average storage of last 10 years). Current year's storage is 170% of last year's storage and 167% of the normal storage.

3rd Advance Estimates of Production of Major Crops for 2019-20

The third advance estimates of major agricultural crops for the year 2019-20 have been released by the directorate of economics & statistics on 15.05.2020. As per Third Advance Estimates for 2019-20, total foodgrain production in the country is estimated at record 295.67 million tonnes. Total production of rice during 2019-20 is estimated at record 117.94 million tonnes. Production of wheat during 2019-20 is estimated at record 107.18 million tonnes. Production of nutri / coarse cereals estimated at record 47.54 million tonnes. Total pulses production during 2019-20. Total oilseeds production in the country during 2019-20 is estimated at record 33.50 million tonnes. Total production of sugarcane in the country during 2019-20 is estimated at 358.14 million tonnes. Production of cotton is estimated at record 36.05 million bales (of 170 kg each). Production of jute & mesta is estimated at 9.92 million bales (of 180 kg each).

As per 3rd Advance Estimates 2019-20, total area sown under Rabi crops in the country has been reported to be 621.15 lakh hectares as compared to 595.34 lakh hectares during the Final estimates of 2018-19.

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

TABLE 1: All India Rabi Crop Situations: 3rd Adv. Est. (2019-20) vis-à-vis Final Est. (2018-19)

(Area in lakh hectares)

Crop Name	Normal Area	Area sown				
		3rd Adv. Est. (2019-20)	% of Normal	Final Estimate (2018-19)	Absolute change (+/-)	% Change
Wheat	305.58	305.54	100.0	293.19	12.4	4.2
Rice	42.77	46.53	108.8	41.92	4.6	11.0
Jowar	35.75	29.78	83.3	23.39	6.4	27.3
Maize	17.49	17.46	99.9	16.97	0.5	2.9
Barley	6.57	6.18	94.1	5.76	0.4	7.4
Total Coarse Cereals	59.81	53.43	89.3	46.11	7.3	15.9
Total Cereals	408.17	405.50	99.3	381.22	24.3	6.4
Gram	93.53	96.77	103.5	95.47	1.3	1.4
Lentil	14.19	14.32	100.9	13.63	0.7	5.0
Urad	8.61	7.99	92.7	8.77	-0.8	CO %
Moong	10.10	9.04	89.5	9.23	-0.2	-2.0
Others	19.56	15.51	79.3	16.17	-0.7	-4.0
Total Pulses	146.00	143.63	98.4	143.27	0.4	0.3
Total Foodgrains	554.16	549.13	99.1	524.48	24.6	4.7
Rapeseed & Mustard	60.48	61.43	101.6	61.24	0.2	0.3
Groundnut	7.76	6.98	90.0	5.99	1.0	16.5
Safflower	1.41	0.44	31.1	0.46	0.0	-4.3
Sunflower	2.92	1.33	45.5	1.44	-0.1	-7.6
Linseed	2.99	1.84	61.8	1.73	0.1	6.9
Total Oilseeds (Nine)	78.82	72.02	91.4	70.85	1.2	1.6
All- Crops	632.98	621.15	98.1	595.34	25.8	4.3

Articles

Economic Analysis of Agricultural Sustainability in Satara District of Maharashtra

DR. M S DESHMUKH* AND DIGVIJAY R PATIL**

Abstract

The present research paper presents an economic analysis of agricultural sustainability in Satara district of Maharashtra. The growing inequality, improper management of resources, drought situations, low availability of fertile land and least irrigation facilities have created obstacles in the prosperous improvement of sustainable agriculture. Sustainable livelihood security index (SLSI) is a composite index which has three components, i.e., (i) ecological security index (ESI), (ii) economic efficiency index (EEI), and (iii) social equity index (SEI). These indicators are used to study the essential conditions for sustainable agricultural development in the study region. We have made an attempt to undertake comparative study of period I (2009) and period II (2018) to assess the progress of different components of sustainable agricultural development in eleven blocks of Satara district. The empirical analysis reveals that SLSI has declined from 0.495 in 2009 to 0.440 in 2018. It indicates that there is decreasing trend in sustainable agricultural development in Satara district. The study found that maximum and minimum SLSI values varied between 0.635 to 0.355 during 2009 and 0.528 to 0.323 during 2018, respectively. The study clearly reveals that there is wide regional inconsistency in various blocks of Satara district. In the year 2018, ESI of Karad (0.123) and Satara (0.071), EEI of Mahabaleshwar (0.007) and Wai (0.195) and SEI of Karad (0.134) and Phaltan (0.227) were lowest among all the blocks of Satara district and hence, need an immediate attention and efforts to improve it for the sustainable and socio-economic development of the various blocks of Satara district.

Keywords: *Agricultural sustainability, SLSI, ecological security, economic efficiency, social equity.*

1. Introduction

Agriculture plays a crucial role in human development. However, it faces various challenges in the way to achieve major goals such as adequate food production, better health, economic prosperity, environmental sustainability and livelihood sustainability. The major proportion of the population of our country lives in rural areas, hence, the strategy of sustainable agricultural development will help in upliftment of the rural livelihood, poverty eradication, employment and income generation for the farmers, rural poor's and will mitigate hunger too. The Brundtland commission defined sustainable development as the "ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Agriculture must be ecologically more sustainable and also need a revolution to meet growing demands to contribute efficiently for the poverty reduction and malnutrition.

Agriculture affects the environment and in turn, is squeezed by the environment. Therefore, sustainability of society in general and human beings in particular, depends much on the environment friendly agriculture (Sajjad, H. *et al.,* 2014). Agriculture is a core occupation in India, as far as income and employment is concerned, nearly 48 percent households are engaged in agriculture and allied activities (NABARD, All India Survey of Financial Inclusion, 2016-17). Agriculture is considered to be an engine of growth of developing countries in general and India in particular. After green revolution, the agricultural production was increased tremendously, but due to redundant application of high yielding variety (HYV) seeds, chemical fertilizers, pesticides and excessive use of water resulting in degradation of land, soil quality and environment. Therefore, agricultural sustainability is a big challenge before the country.

SLSI has the ability to check whether there exist certain necessary conditions for sustainable agricultural development or not in a given study

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area. (Singh & Hiremath, 2009). Safeguarding sustainable livelihood security will meet peoples need while also reducing pressure on ecology that means it will be possible for more people to meet their livelihood needs in near future (Chambers, 1986). Therefore, an attempt has been made to do an economic analysis of agricultural sustainability of different blocks of Satara district by using SLSI as a policy instrument.

1.1. Objectives of the study

i. The major objectives of the present research is to estimate and construct the SLSI and its trends in the study area of Satara district in Maharashtra.

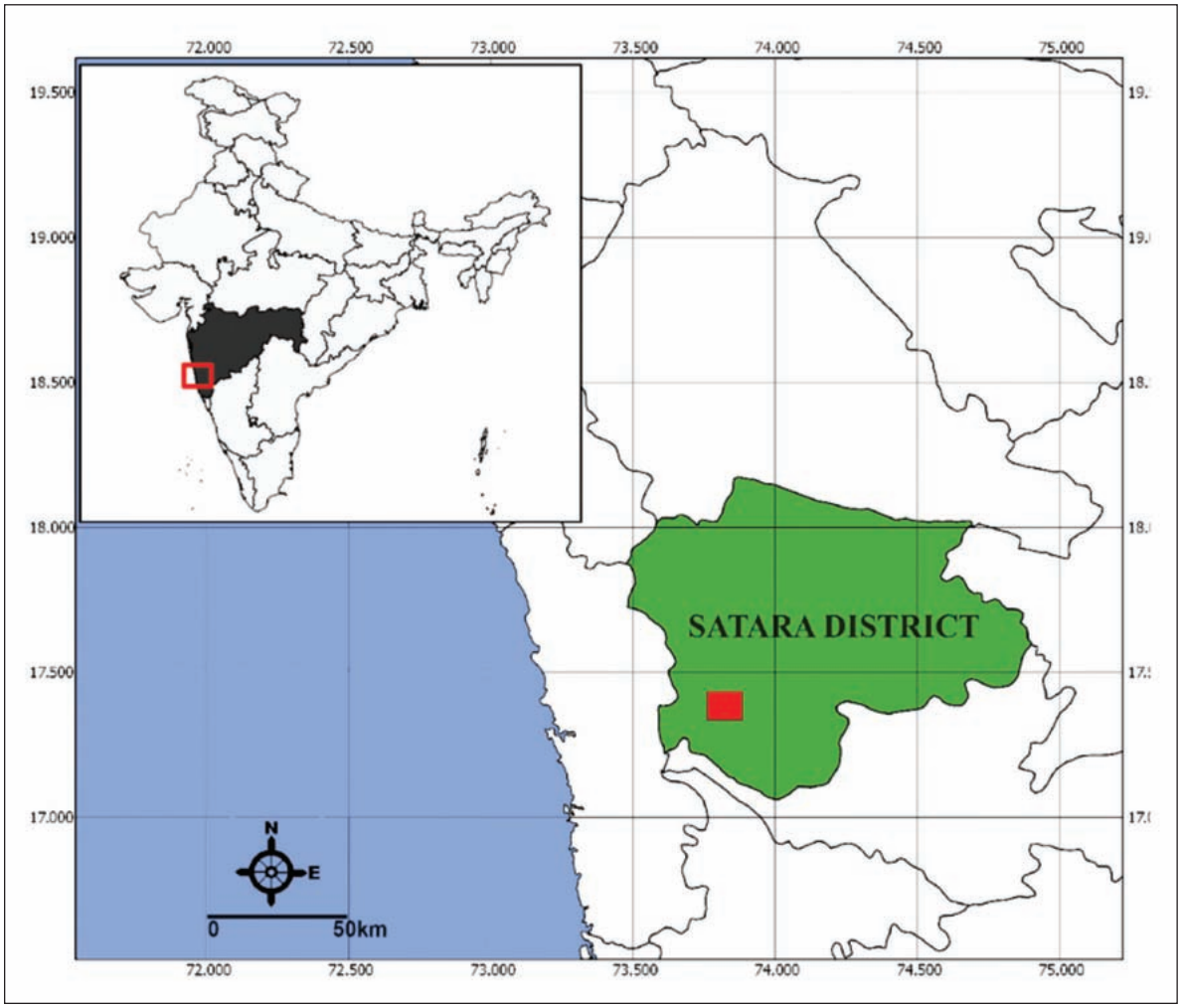
ii. Suggest policy measures for the improvement of various blocks in the Satara district.

2. Methodology

2.1. Selection of the study area

The geographical area of Satara district is 10,480 sq/km and total population is 30.03 lakh, of which 12.19 lakh is rural population. Satara district has 11 blocks that covers around 3.4 percent of the total area of Maharashtra. The density of population is 287 persons per sq/km. The percentage of scheduled caste (SC) and scheduled tribe (ST) to the overall population is 10.76 percent and 0.99 percent, respectively. The sex ratio of the district is 988 and literacy rate is 82.87 percent. The classification of population on the basis of economic status shows that 43.24 percent are cultivators, 21.94 percent are agricultural labourers, 2.94 percent are household industry workers, and 31.89 percent are other workers (Census of India, 2011).

Figure 1: The Study Region of Satara District in Maharashtra



2.2. Analytical framework

The present research paper is purely based on secondary data, which is collected from socio-economic review of Satara district, census reports of Government of India and online available database. The researchers had adopted the UNDP methodology to construct the SLSI in Satara district of Maharashtra. SLSI is a cross-sectional tool to assess the comparative sustainability standing and basic pre-requisite of sustainable development of agriculture in the given region. (Saleth & Swaminathan, 1993)

The systematic approach essential for operationalizing sustainable livelihood security in the form of SLSI is classified into three propositions of sustainable development of agriculture (SDA). First, three-dimensional conceptions of the SDA in terms of (i) ecological security (ii) economic efficiency, and (iii) social equity in both intra and inter-regional contexts. Second, for assessing the contextual as well as dynamic nature of SDA analysis, sustainability needs to be relative rather than absolute in both time and space. Third, in an operational approach, the multi-dimensional conceptions of SDA require the SLSI to be a composite of three interacting component indices, that is, ecological security index, economic efficiency index and social equity index (Hatai & Sen, 2008).

2.3. Construction of sustainable livelihood security index

Let X_{ijk} and $SLSI_{ijk}$ represent the value of i^{th} variable, j^{th} component and k^{th} block and index for i^{th} variable representing the j^{th} component of the SLSI of k^{th} block, respectively. Then, we have, for positive implication used equation (1) and for negative implication used equation (2)

$$SLSI_{ijk} = \frac{X_{ijk} - Min_{ijk}}{Max_{ijk} - Min_{ijk}} \quad \text{.....(1)}$$

$$SLSI_{ijk} = \frac{MaxX_{ijk} - X_{ijk}}{Max_{ijk} - Min_{ijk}} \quad \text{.....(2)}$$

$$SLSI_{ijk} = \frac{\sum SLSI_{ijk}}{I} \quad \text{.....(3)}$$

Where,

i = variables (1,2,3……. I)

j = components (1,2,3……. J)

k = blocks (1,2,3……. K)

The numerator in equation (1) and (2) shows that, it measures the extent by which the k^{th} block did better in the i^{th} variable representing the j^{th} components of SLSI as compared to the blocks showing the worst performance in that component, and the denominator indicates the range (i.e., the difference between the maximum and the minimum values of the variable representing a given component).

The equation (3) exhibits that three component indices of SLSI, *viz.*, ESI, EEI and SEI were calculated for all variables, taking simple mean by assigning equal weights to the indices of their respective variables. The SLSI has range of 0 to 1 in which a value closer to zero shows low level of sustainability and value near to 1 denotes high level of sustainability.

2.4. Selection of variables

The selection of variables for calculating SLSI is based on relative concepts and availability of block- wise data which is able to represent the comprehensive three indicators of sustainability, *viz.*, ecological security indicator, economic efficiency indicator and social equity status. We have used population density (+ve) variable as ecological indicator because it plays a crucial role for the ecological balance, higher the population density higher will be the pressure on natural resources and therefore, lower will be the ecological security. Also, higher population density causes higher extent of pollution which again responsible for degradation of the environment. The growing population density may become an obstacle for the sustainability of protected forest areas. Therefore, the variable density of population was selected in opinion of its capability to imitate the amount of human pressure on inclusive ecological safety (Harron *et al.*, 2014). Forest cover is an important variable for ecological balance, higher is the total forest area higher will be ecological security. It also provides a great source of income and livelihood for rural population near forest area. Moreover, it also helps in controlling pollution within atmosphere which results in ecological security.

TABLE 1: THE COMPONENTS, CRITERIA AND INDICATORS USED FOR ASSESSING AGRICULTURE SUSTAINABILITY IN SATARA DISTRICT, MAHARASHTRA

Component	Criteria	Indicators (+Ve/-Ve)
Ecological security	Ecological degradation Extent of pollution	Density of population (-Ve)
	Ecological balance Pollution reduction	Forest area (+Ve)
Economic efficiency	Agriculture output Cropping pattern	Irrigated area (+Ve)
	Agricultural efficiency Income of farmers.	Fertilizer consumption (+Ve)
Social equity	Poverty Inequality in the society	Household BPL (-Ve)
	Equity between male and female Balance in society.	Sex ratio (+Ve)

Source: Compiled by author.

For the economic efficiency as far as agriculture is concerned net irrigated area (+ve) plays a very important role for improving agricultural output and fertility of land. It leads to undertake different varieties of commercial crops like sugarcane, cotton, etc. which can boost the farmers' income and helps to improve rural livelihood. Another important variable is fertilizer consumption (+ve) which is now-a-days backbone of farming. It has two sides, as far as sustainability of agriculture is concerned, the positive and negative sides. The positive side is that it helps to improve nutritional requirements of crops resulting in higher productivity and higher output. In contrast, negative side dampens the health of the soil in the long-term causing soil salinity and alkalinity which is not a good sign for sustainability of agriculture. We have considered the positive side since it comes under economic efficiency.

Speaking about, the social equity indicator, we have used the variable households below poverty line (BPL). It is very important indicator which shows the extent of poverty in the society. Higher the households under BPL, higher will be the social and economic inequalities in the blocks. Hence, we have taken it as negative indicator of agricultural sustainability. The sex ratio is one of the variables of social equity. Most of the developing countries are facing the problem of gender inequality. Females must be recognized as working population and pulling them into the working force will help the development process of a nation.

2.5. Constructing sustainable livelihood security index

For estimating index values of ecological security indicator, economic efficiency indicator and social equity indicator, we have applied equation (1) and equation (2) by taking equal weights of the indices of the representative values, while, the value of SLSI for whole region is estimated by taking arithmetic mean of its component indices by using equation number (3), which gives composite index of the study area.

Table 2 shows the raw data used for estimating SLSI of different blocks of Satara district for period I (2009). To estimate ESI, we have used the indicators like, density of population and area under forest. Karad had highest density of population, while, Man had lowest. Also, Mahabaleshwar had highest area under forest, while, Khatav had lowest. Similarly, for estimating economic efficiency indicator we have used net irrigated area and fertilizer consumption. Karad had highest net irrigated area and highest fertilizer consumption, while, Mahabaleshwar had lowest. Speaking about the social equity indicator, Karad had highest rural households below poverty line, while, Mahabaleshwar had lowest. Besides, Khatav had highest sex ratio, while, Mahabaleshwar had lowest.

TABLE 2: RAW DATA USED FOR THE CALCULATION OF SLSI IN SATARA DISTRICT, MAHARASHTRA (2009)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator	
	Density of population *(p/sq.km)*	Area under forest *(%)*	Net irrigated area *(ha)*	Fertilizer consumption *(metric tonne)*	Households BPL *(number)*	Sex ratio *(per 1000 persons)*
Mahabaleshwar	245	59.65	4256	713	834	873
Wai	306	20.62	15065	9978	4954	1021
Khandala	229	12.12	9667	7127	4127	961
Phaltan	261	9.15	21511	26371	9299	953
Man	138	8.59	15522	7117	6144	994
Khatav	231	3.01	15662	14254	9041	1024
Koregaon	275	11.07	18325	11404	7900	1000
Satara	516	9.66	18454	14254	10788	973
Jaoli	144	22.76	15755	4276	4448	1101
Patan	226	19.74	21590	11404	10640	1089
Karad	561	10.17	22805	35637	15342	962
Satara (whole district)	**268**	**16.95**	**178612**	**142535**	**83517**	**995**

Source: Socio-economic review of Satara district 2009, Census Government of India, 2001.

Table 3 demonstrates that the raw data used for estimating SLSI of different blocks of Satara district for the period II (2018). To estimate ecological security index, we have used the indicators, like density of population and area under forest. Satara had highest density of population, while Man had lowest. Also, Mahabaleshwar had highest area under forest, while, Khatav had lowest. Likewise, for estimating economic efficiency indicator we have used net irrigated area and fertilizer consumption.

TABLE 3: RAW DATA USED FOR THE CALCULATION OF SLSI IN SATARA DISTRICT, MAHARASHTRA (2018)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator	
	Density of population *(p/sq.km)*	Area under forest *(%)*	Net irrigated area *(ha)*	Fertilizer consumption *(metric tonne)*	Households BPL *(number)*	Sex ratio *(per 1000 persons)*
Mahabaleshwar	111	42.57	3186	2418	1466	937
Wai	280	17.82	7899	13192	5107	1005
Khandala	264	10.79	9330	11132	4021	947
Phaltan	274	7.34	29309	36718	9323	944
Man	146	9.12	21866	15255	6247	976
Khatav	189	3.48	14502	21798	9008	1012
Koregaon	270	8.9	14881	19667	7897	999

TABLE 3: RAW DATA USED FOR THE CALCULATION OF SLSI IN SATARA DISTRICT, MAHARASHTRA (2018)-*CONTD.*

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator	
	Density of population *(p/sq.km)*	Area under forest *(%)*	Net irrigated area *(ha)*	Fertilizer consumption *(metric tonne)*	Households BPL *(number)*	Sex ratio *(per 1000 persons)*
Satara	548	9.05	26677	21980	10586	976
Jaoli	180	19.93	2759	6750	3851	1068
Patan	203	18.2	9322	17464	10942	1065
Karad	510	9.67	32725	51930	14568	972
Satara (whole district)	**287**	**14.26**	**172056**	**218304**	**83016**	**988**

Source: Socio-economic review of Satara district 2018, Census Government of India, 2011.

Karad had highest net irrigated area and highest fertilizer consumption, while, Mahabaleshwar had lowest. Speaking about the social equity indicator, Karad had highest rural households BPLwhile, Mahabaleshwar had lowest and Jaoli had highest sex ratio, while, Mahabaleshwar had lowest.

Table 4 and Table 5 shows the calculated indices values of ecological security (density of population index, area under forest index), economic efficiency (net irrigated area index, fertilizer consumption index) and social equity (households below poverty line index, sex ratio index) for period I (2009) and period II (2018), respectively. Maximum value of each index is 1 (one) and minimum value is 0 (zero).

TABLE 4: INDICES VALUES OF THE SUSTAINABILITY INDICATORS IN SATARA DISTRICT, MAHARASHTRA (2009)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator	
	Density of population index	Area under forest index	Net irrigated area index	Fertilizer consumption index	Households BPL index	Sex ratio index
Mahabaleshwar	0.747	1.000	0.000	0.000	1.000	0.000
Wai	0.603	0.311	0.583	0.265	0.716	0.649
Khandala	0.785	0.161	0.292	0.184	0.773	0.386
Phaltan	0.709	0.108	0.930	0.735	0.417	0.351
Man	1.000	0.099	0.607	0.183	0.634	0.531
Khatav	0.780	0.000	0.615	0.388	0.434	0.662
Koregaon	0.676	0.142	0.758	0.306	0.513	0.557
Satara	0.106	0.117	0.765	0.388	0.314	0.439
Jaoli	0.986	0.349	0.620	0.102	0.751	1.000
Patan	0.792	0.295	0.934	0.306	0.324	0.947
Karad	0.000	0.126	1.000	1.000	0.000	0.390

Source: Compiled by author.

TABLE 5: INDICES VALUES OF THE SUSTAINABILITY INDICATORS IN KOLHAPUR DISTRICT, MAHARASHTRA (2018)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator	
	Density of population index	Area under forest index	Net irrigated area index	Fertilizer consumption index	Households BPL index	Sex ratio index
Mahabaleshwar	1.000	1.000	0.014	0.000	1.000	0.000
Wai	0.613	0.367	0.172	0.218	0.722	0.519
Khandala	0.650	0.187	0.219	0.176	0.805	0.076
Phaltan	0.627	0.099	0.886	0.693	0.400	0.053
Man	0.920	0.144	0.638	0.259	0.635	0.298
Khatav	0.822	0.000	0.392	0.391	0.424	0.573
Koregaon	0.636	0.139	0.405	0.348	0.509	0.473
Satara	0.000	0.142	0.798	0.395	0.304	0.298
Jaoli	0.842	0.421	0.000	0.087	0.818	1.000
Patan	0.789	0.377	0.219	0.304	0.277	0.977
Karad	0.087	0.158	1.000	1.000	0.000	0.267

Source: Compiled by author.

3. Results and Discussion

Table 6 shows the categorization of SLSI value into five groups, *i.e.*, very high (0.81 above), high (0.61 to 0.80), medium (0.41 to 0.60), low (0.21 to 0.40) and very low (Below 0.20) during both period I and period II. No block in Satara district having very high SLSI value in both study periods.

In the period I (2009), we don't find even a single block in very high SLSI value category. Only Jaoli block comes in high SLSI category in period I. The blocks come under medium SLSI category was Mahabaleshwar, Wai, Khandala, Phaltan, Man, Khatav, Koregaon, Patan and Karad. The block Satara comes under low SLSI category. No single block was in very low SLSI category in period I (2009).

TABLE 6: THE SLSI VALUES AND CATEGORIZATION OF MAJOR BLOCKS OF SATARA DISTRICT DURING PERIOD I AND PERIOD II.

S.No.	Category of SLSI value	Blocks	
		Period I (2009)	Period II (2018)
1.	**Very High (0.81 Above)**	-	-
2.	**High (0.61 to 0.80)**	Jaoli	-
3.	**Medium (0.41 to 0.60)**	Mahabaleshwar, Wai, Khandala, Phaltan, Man Khatav, Koregaon, Patan, Karad	Jaoli, Mahabaleshwar, Wai, Khandala, Phaltan, Man, Khatav, Koregaon, Patan, Karad.
4.	**Low (0.21 to 0.40)**	Satara	Khandala, Satara
5.	**Very Low (Below 0.20)**	-	-

Source: Compiled by author.

Similarly, for period II (2018) we don't find even a single block either in very high SLSI value or in high SLSI value category. Jaoli has slipped from high category to medium category in period II (2018). The blocks come under medium SLSI category was Jaoli, Mahabaleshwar, Wai, Phaltan, Man, Khatav, Koregaon, Patan and Karad. The block Khandala has slipped from medium to low category. Satara and Khandala come under low SLSI category. No single block was in very low SLSI category in period II (2018).

Empirical illustration shows that composite index SLSI of Satara districts in the first phase of the study was 0.495 and after nine years in second phase of the study period it was 0.440, which showed declining trend of agricultural sustainability in the study region.

The performance of SLSI and its component indices (ESI, EEI and SEI) of the different blocks is shown in table 7 and table 8. The results show that SLSI has decreasing trend from period I (2009) to period II (2018), however, it has wide regional disparity in the sustainability of agriculture in the different blocks of Satara district of Maharashtra.

TABLE 7: THE SUSTAINABLE LIVELIHOOD SECURITY STATUS OF SATARA DISTRICT, MAHARASHTRA (2009)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator		Sustainable livelihood security index	
	ESI Value	ESI Rank	EEI Value	EEI Rank	SEI Value	SEI Rank	SLSI Value	SLSI Rank
Mahabaleshwar	**0.874**	1	**0.001**	11	0.500	8	**0.458**	8
Wai	0.457	6	0.424	7	0.683	2	**0.521**	4
Khandala	0.473	5	0.238	10	0.579	5	**0.430**	9
Phaltan	0.409	8	0.832	2	0.384	9	**0.542**	3
Man	0.549	3	0.395	8	0.582	4	**0.509**	5
Khatav	0.390	9	0.501	6	0.548	6	**0.480**	7
Koregaon	0.409	7	0.532	5	0.535	7	**0.492**	6
Satara	0.112	10	0.577	4	0.376	10	**0.355**	11
Jaoli	0.667	2	0.361	9	**0.875**	1	**0.635**	1
Patan	0.544	4	0.620	3	0.636	3	**0.600**	2
Karad	**0.063**	11	**1.000**	1	**0.195**	11	**0.419**	10
Satara (whole district)	**0.450**	-	**0.498**	-	**0.536**	-	**0.495**	-

Source: Compiled by author.

Specifically talking about indicators such as ESI, EEI and SEI in both the study periods reveals that highest ecological security in the first phase of the study found in Mahabaleshwar (0.874), Jaoli (0.667) and Man (0.549), while Karad (0.063) and Satara (0.112) has lowest ecological security. Similarly, in the second phase, Mahabaleshwar (1.00) and Jaoli (0.631) had highest ESI value, while, in second phase also Karad (0.123) and Satara (0.071) continues their worst performance in ecological security index. They must improve ESI value by adopting environment friendly policies in the region.

Taking into consideration the economic efficiency for the study of agriculture sustainability, it is found that in both the phases of the study period,

Karad rank highest with the EEI value 1. Though, Karad has EEI value 1 which does not mean that there is no scope of economic improvement, there is still a lot of scope for economic improvements. However, other blocks must follow Karad as an ideal block in the economic development. In the first phase followed by Karad, Phaltan (0.832), Patan (0.620) and Satara (0.577) did well in EEI but blocks like, Mahabaleshwar (0.01), Khandala (0.238), Jaoli (0.361) and Man (0.395) must adopt better economic policies to improve their economic efficiency. In the second phase of the study, Phaltan's EEI value decreased from 0.832 to 0.789, Satara's EEI value improved from 0.577 to 0.597and that of Man from 0.395 to 0.448 but Jaoli's EEI value decreased from 0.361 to 0.044 and Mahabaleshwar (0.007) continues his worst performance in EEI during period II (2018).

TABLE 8: THE SUSTAINABLE LIVELIHOOD SECURITY STATUS OF SATARA DISTRICT, MAHARASHTRA (2018)

Block	Ecological security indicator		Economic efficiency indicator		Social equity indicator		Sustainable livelihood security index	
	ESI Value	ESI Rank	EEI Value	EEI Rank	SEI Value	SEI Rank	SLSI Value	SLSI Rank
Mahabaleshwar	**1.000**	1	**0.007**	11	0.500	4	**0.502**	2
Wai	0.490	5	0.195	9	0.621	3	**0.435**	6
Khandala	0.418	6	0.198	8	0.441	8	**0.352**	10
Phaltan	0.363	9	0.789	2	0.227	10	**0.460**	5
Man	0.532	4	0.448	4	0.466	7	**0.482**	4
Khatav	0.411	7	0.392	5	0.498	5	**0.434**	7
Koregaon	0.387	8	0.376	6	0.491	6	**0.418**	9
Satara	**0.071**	11	0.597	3	0.301	9	**0.323**	11
Jaoli	0.631	2	0.044	10	**0.909**	1	**0.528**	1
Patan	0.583	3	0.261	7	0.627	2	**0.490**	3
Karad	0.123	10	1.000	1	**0.134**	11	**0.419**	8
Satara (whole district)	**0.455**	**-**	**0.392**		**0.474**	**-**	**0.440**	

Source: Compiled by author.

Third important indicator of agricultural sustainability is social equity indicator. Jaoli block was the best performer in both study periods with highest SEI value of 0.875 and 0.909 during 2009 and 2018, respectively. In the first phase of the study period followed by Jaoli, Wai (0.683), Patan (0.636) and Man (0.582) did better in terms of SEI value but Karad (0.195), Satara (0.376), Phaltan (0.384) had least social security. In the second phase of the study period, SEI value of Jaoli increased from 0.875 to 0.909, while that of Wai decreased from 0.683 to 0.621. Karad (0.134), Satara (0.301), Phaltan (0.227) continued with their worst performance.

Table 9 reveals that the comparative analysis of SLSI and net change in SLSI value during the period I (2009) to period II (2018). Only one block has shown the positive change in SLSI value and remaining ten blocks have shown negative change in the values of SLSI. As far as positive increment is concerned Mahabaleshwar (+0.044) has shown increase in SLSI, while, Patan (-0.110) and Jaoli (-0.107) shown highest decrease in SLSI from the period I (2009) to period II (2018). The SLSI has shown decreasing trend from 0.495 to 0.440, *i.e.,* net negative change of (-0.055) during the study period.

TABLE 9: COMPARATIVE ANALYSIS OF SLSI AND NET CHANGE IN SLSI VALUE OF SATARA DISTRICT, MAHARASHTRA DURING PERIOD I (2009) AND PERIOD II (2018)

Block	Comapritive analysis of SLSI			
	SLSI Period I(2007-11)	SLSI Period II(2013-18)	Net change in SLSI value	Trend
Mahabaleshwar	0.458	0.502	+0.044	⇧
Wai	0.521	0.435	-0.086	⇩
Khandala	0.430	0.352	-0.078	⇩
Phaltan	0.542	0.460	-0.082	⇩
Man	0.509	0.482	-0.027	⇩
Khatav	0.480	0.434	-0.046	⇩
Koregaon	0.492	0.418	-0.074	⇩
Satara	0.355	0.323	-0.032	⇩
Jaoli	0.635	0.528	-0.107	⇩
Patan	0.600	0.490	-0.110	⇩
Karad	0.419	0.419	0.000	-
Satara (whole district)	**0.495**	**0.440**	**-0.055**	⇩

Source: Compiled by author.

TABLE 10: THE BLOCKS WHICH NEEDS IMPROVEMENT IN DIFFERENT COMPONENTS OF SUSTAINABLE AGRICULTURAL DEVELOPMENT IN SATARA DISTRICT, MAHARASHTRA

Block	Priority in the components of SLSI			
	ESI	EEI	SEI	SLSI
Mahabaleshwar		@		
Wai		@		
Khandala				@
Phaltan	@		@	
Man				
Khatav				
Koregaon				@
Satara	@		@	@
Jaoli		@		
Patan				
Karad	@		@	

Source: Compiled by author.
NOTE: @ indicates that the improvement required for ESI, EEI, SEI and SLSI values in different blocks of Satara district.

Table 10 illustrates the blocks which must improve on the different components of SLSI, i.e., ESI, EEI and SEI. Except Mahabaleshwar and Karad, rest all blocks in Satara district has shown a reduction in SLSI. Satara , Phaltan and Karad blocks required focus on more than two indicators of SLSI. However, out of eleven blocks of Satara district, Jaoli block was at the top of list whereas, Satara block is at the bottom of SLSI.

4. Conclusion and Policy Implications

The policy makers must work upon different areas of sustainable agricultural development in Satara district of Maharashtra. The empirical analysis reveals that the sustainability status of Satara district of Maharashtra comes under medium development category. However, during the study period its index has shown slight reduction. SLSI being a policy tool detects not only the regions requiring instantaneous responsiveness but also the explicit thematic areas in which the efforts can be focused to achieve security of the livelihoods. This, in turn, helps in launching inter-regional urgencies for the allocation of agricultural resources and highlights the activities and programs pertinent to each region for sustainable agricultural development.

Following measures need immediate attention to improve the ranking of various blocks in study area.

i. Satara district of Maharashtra state need to pay more attention on the principal tools of SLSI, i.e., ecological, economic and social policies for the improvement of the agricultural sustainability.

ii. Talking about the ecological security, Karad, Satara and Phaltan blocks need immediate attention towards ecological aspect. There is a need to grow the forest area by planting trees, controlling pollution, preventing excessive population etc.

iii. About economic efficiency indicator, Mahabaleshwar, Wai and Jaoli blocks need to develop programmes to improve economic efficiency. It may include modernization of agriculture by increasing irrigated area and resulting increase in agricultural output with appropriate use of fertilizers, etc.

iv. Speaking about social equity indicator, Karad, Satara and Phaltan blocks have more social inequality. To bridge the gap of social inequality, the district planning commission may adopt policies related to spreading of quality education, better health services and adequate rural infrastructure for socio-economic development of the region.

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Patterns of Agricultural Development in Rajasthan: A District-wise Analysis

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Abstract

The growth of agriculture is desirable for the overall development of the Indian economy because without agricultural development, all other sector of economy wouldn't accelerate at proper pace. All districts of a state together contribute for agricultural development of a state. Each district of a state possesses some unique characteristics which have significant bearing on agricultural development of a district. Therefore, it is very important to examine various characteristics of districts. It contributes significantly to the export earnings and also affects the performance of other sectors of the economy. The present paper analyses district-wise as well as division-wise disparity in the development of agriculture in Rajasthan using various indicators. A robust composite index has been constructed at the district level and also at division level for different time periods. Evidence shows existence of high and persistent inter-state disparity in agriculture in the state over the periods. The transformation of some districts from the level of relatively under performer to high performer districts and vice-versa in the state is significantly appearing. It is suggested that region specific policies need to be developed in various districts. Government should create alternative employment opportunities in rural areas. In addition, agriculture extension activities are required to educate farmers to adopt cheap, suitable and effective technology and crop varieties. Steps should be taken for development of micro irrigation system and warehousing facilities to enable agricultural sector to grow at a higher pace.

Keywords: *Rajasthan, agricultural development, composite agriculture development index, value of products, cropping intensity.*

1. Introduction

Rajasthan is the largest state of India, constituting 10.4 percent of total geographical area and 5.67 percent of total population of India (Government of India, 2011). The state is divided into 7 divisions, 33 districts, which are further sub-divided into 244 tehsils, 249 panchayat sammitee and 9,168 gram panchayats. Physio-graphically, the state can be divided into 4 major regions, namely (i) the western desert with barren hills, rocky plains and sandy plains, (ii) the Aravalli hills running south-west to north-east starting from Gujarat to Delhi, (iii) the eastern plains with rich alluvial soils, and (iv) the south-eastern plateau. Mahi, Chambal and Banas are the three major rivers of the state. The state has well identified 10 agro-climatic zones. The state is endowed with diverse soil and weather conditions comprising of several agro-climatic situations, warm humid in south-eastern parts to dry cool in western parts of the state. About 65 percent population (i.e., about 56.5 million) of the state is dependent on agriculture and allied activities for their livelihood. The three major canal irrigations, other than the vast area under arid and dry lands offer great help for agricultural development of the state. Agriculture in Rajasthan is primarily rainfed, covering country's 13.27 percent of available land. The diversity in climatic conditions of the state creates potentiality to develop certain belts of horticultural crops. The arid part of the state which receives not more than annual rainfall of 25 cm thrives on agriculture that is done with irrigation systems and painstaking efforts of the poor farmers of Rajasthan. As a major portion of the state is arid, the risk and instability in agricultural production and productivity is quite high (AERC report 145). All districts of a state together contribute for agricultural development of a state. Each district of a state possesses some unique characteristics which have significant bearing on agricultural development of a district.

1.1. Objectives of the study

The main objective of the study is to construct a composite index for agriculture development in Rajasthan at district level for different time periods by using different indicators. These indicators reflect important vision about regional agriculture development in Rajasthan after green revolution

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and economic reforms in 1991 in India. This study also reveals that which district perform better than others and which district was not up to the mark so that policy makers can adopt priority based policies important for under developed districts.

2.1. Methodology

This paper is based on secondary data. The necessary secondary data on gross sown area, net sown area, production and yield of various crops and area under irrigation, fertilizer, farm inputs, etc., have been collected from different government publications. The secondary data required for the study was collected from the state government offices, such as Directorate of Agriculture, Directorate of Economics & Statistics, various websites and other relevant publications.

The present paper is based on the analysis of district-wise secondary data from all 33 districts and 7 administrative divisions. The present study has covered all crops which was grown in the state and only crops left out are fruits and vegetables because statistical reliability of area and output estimates at the district level was uncertain for different sources. The time series information on area, production and yield of all crops at the district level is available from published sources of Directorate of Agriculture, Government of Rajasthan, and Directorate of Economics and Statistics, Government of Rajasthan and their respective websites, such as www.krishi.rajasthan.gov.in and www.des.rajasthan.gov.in. Total 26 districts covered for time estimates (TE) 1964-65, TE 1972-73 and TE 1982-83, and 30 districts covered for TE 1992-93, 32 districts covered for TE 2002-03, while, all 33 districts covered for TE 2012-13 period.

The study is confined to the period 1962-63 to 2012-13 which is divided into five parts given below:

(1) TE 1964-65 pre-Green Revolution period in Indian agrarian economy.

(2) TE 1972-73 post-Green Revolution period in Indian agrarian economy.

(3) TE 1982-83 expansion of HYVY seeds and irrigation facility period in Indian agrarian economy.

(4) TE 1992-93 pre-liberalisation period in Indian agrarian economy.

(5) TE 2002-03 and TE 2012-13 post-liberalisation period in Indian agriculture.

In order to attain the objectives of the study, various statistical techniques are used for the analysis of the secondary data.

2.2. Measuring Composite Agricultural Development Index (CADIX) in Rajasthan

In this paper, an attempt has been made to develop suitable indices involving appropriate indicators to measure the extent of disparity in agricultural development in the Rajasthan. The indicators are different and heterogeneous across the various districts of the state. District level data on the variables have been chosen keeping in the view the availability of information. We have constructed a CADIX for different districts of Rajasthan during TE 1964-65 to TE 2012-13. The study computes composite index for agricultural development which shows the pattern of development and rank of various districts in agricultural attainment. The major limitation of this analysis was non-availability of district-wise various indicators in Rajasthan for different time periods, that's why we included a few but very important indicators for constructing an index which shows unbiased agriculture development in different districts across various time periods in the state.

First of all the values of the selected indicators for all the 33 districts of the state were collected and tabulated. Then, the tabulated data was transformed into standardised Xid's, where Xidr stands for actual value of i^{th} variable for district d^{th} number of district and Min Xidr stands for minimum value of i^{th} variable of all districts, Max Xidr stands for the maximum value of i^{th} variable within all districts and Xid stands for the standard value of the i^{th} variable in the d^{th} district and d^{th} runs from 1 to 33, representing all the 33 districts of the state of Rajasthan.

$$Xid = \frac{Xidr - MinXidr}{MaxXidr - MinXidr}$$

By giving the equal weight on the basis of Human Development Index (HDI) method we have averaged the value of all variables according to the weight and find the composite index of agricultural sector. The following indicators were used for analysis:

(i) Value of products (VOP) in Rs./ha.: The district-

wise value of production has been estimated for each crop at constant average price 2010-2012 which was published by Commissionerate of Agriculture, Jaipur, Rajasthan, in the various issues of Agricultural Statistics. This average price was estimated through model prices of each district for each crop and average of model prices of each crop was used for state average crop for computation of value of products. The average prices for sugarcane, tobacco and potato crops were taken from average price at all India level for estimation of value of production because Rajasthan state has not published this crops' average price.

(ii) Cropping intensity: Cropping intensity was estimated through gross cropped area divided by net sown area in different districts of Rajasthan for different time periods.

(iii) Gross irrigated area as percentage of gross cropped area: This indicator was estimated through gross irrigated area divided by gross cropped area in different districts of Rajasthan for different time periods.

(iv) Fertilizer consumption per hectare from GCA: Fertilizer consumption (N, P, K) per hectare was estimated through total fertilizer consumption of different districts divided by GCA in different districts of Rajasthan for different time periods.

(v) Availability of gross area sown per tractor: This indicator was estimated through the total number of tractors in different districts and time periods divided by GCA in different districts of Rajasthan for different time periods.

(vi) Availability of gross area sown per tubewell: This indicator was estimated through the total number of tubewells in different districts and time periods divided by GCA in different districts of Rajasthan for different time periods.

(vii) Availability of gross area sown per agricultural labour: This indicator was estimated through the total number of agricultural labour of different districts and time periods divided by GCA in different districts of Rajasthan for different time periods.

All above said indicators were used to construct a CADIX for different districts of Rajasthan during different time periods and presented in table I and II.

3. Results and Discussion

3.1. District-wise CADIX and ranking

Table I and II present district-wise CADIX ranking and score during TE 1964-65 to TE 2012-13 in Rajasthan. Table I shows Churu, Bhilwara and Bikaner districts have occupied 1st, 2nd and 3rd position in state during TE 1964-65 and later on, Bhilwara district have occupied 1st rank during TE 1972-73 but thereafter this district's rank declined very sharply and occupied 25th rank during TE 2012-13 in the state. Churu and Bikaner district's rank was declined during TE 1972-73 and TE 1982-83 but after that both districts shown improvement in CADIX ranking and reached upto 4th and 5th position during TE 2012-13 in the state. The table I shows a very interesting picture about Udaipur district which stood 4th during TE 1964-65, but improved its position slightly during TE 1972-73 and TE 1982-83 upto 3rd rank but after that its rank declined very significantly during TE 1992-93 to TE 2012-13 period and fallen down to 18th rank in overall period.

TABLE I: DISTRICT-WISE RANKING BASED ON CADIX IN RAJASTHAN DURING DIFFERENT TIME PERIODS

District	TE 1964-65	TE 1972-73	TE 1982-83	TE 1992-93	TE 2002-03	TE 2012-13	TE 1964-65 to TE 2012-13 (Overall Ranking)
Hanumangarh	-	-	-	-	4	3	**1**
Ganganagar	5	2	1	1	1	2	**2**
Churu	1	11	10	7	9	4	**3**
Bikaner	3	9	16	3	6	5	**4**
Dausa	-	-	-	4	8	17	**5**
Baran	-	-	-	15	7	6	**6**

TABLE I: DISTRICT-WISE RANKING BASED ON CADIX IN RAJASTHAN DURING DIFFERENT TIME PERIODS-*CONTD.*

District	TE 1964-65	TE 1972-73	TE 1982-83	TE 1992-93	TE 2002-03	TE 2012-13	TE 1964-65 to TE 2012-13 (Overall Ranking)
Alwar	10	5	7	8	5	12	**7**
Bundi	11	6	9	6	14	8	**8**
Jaisalmer	18	20	19	2	3	1	**9**
Karuli	-	-	-	-	13	16	**10**
Chittorgarh	6	7	4	5	20	15	**11**
Bharatpur	8	8	11	17	11	13	**12**
Bhilwara	2	1	5	14	24	25	**13**
Dholpur	-	-	-	21	12	14	**14**
Jhalawar	14	4	13	11	18	10	**15**
Kota	19	15	12	9	10	9	**16**
Pratapgarh	-	-	-	-	-	20	**17**
Udaipur	4	3	3	18	28	31	**18**
Banswara	9	12	6	16	21	27	**19**
Jaipur	20	13	8	20	17	21	**20**
Barmer	17	24	23	12	2	7	**21**
S.Madhopur	15	14	14	19	19	23	**22**
Sirohi	13	16	15	13	23	24	**23**
Dungarpur	7	10	2	27	31	32	**24**
Tonk	16	18	20	25	25	18	**25**
Rajsamand	-	-	-	10	32	26	**26**
Jhunjhunu	26	22	24	24	15	11	**27**
Jalore	22	21	18	22	22	22	**28**
Sikar	23	23	21	26	16	19	**29**
Ajmer	12	17	17	28	30	28	**30**
Pali	21	19	22	23	29	33	**31**
Nagaur	24	25	25	29	26	30	**32**
Jodhpur	25	26	26	30	27	29	**33**

Source: Based on calculation.

Ganganagar district CADIX rank was very high for all time periods as standing between 1st -5th ranks in state, and same is true in case of Hanumangarh district. Ajmer district's rank based on CADIX varies between 12th -17th during TE 1964-65 to TE 1982-83 but after that its rank was declined very sharply and stood at 30th rank in overall period in the state. The table I shows very interesting picture that only Jodhpur district ranked in lower growth group over the period and its rank varies between 25th -30th and it occupied bottom of table in overall time periods in the state. Jaisalmer district's CADIX rank started with 18th during TE 1964-65 but over the period its ranking was improved year-on-year and 1st position was occupied during TE 2012-13 and it reached in high growth group districts after TE 1992-93.

Only 13 districts have stood always in middle growth groupduring all time periods and other 20 districts have been changing its position over the periods. Table II shows that only Hanumangarh and Ganganagar districts have achieved 0.433 and 0.427 score and occupied their seats in high growth districts' group in overall ranking. However

TABLE II: DISTRICT-WISE SCORE BASED ON CADIX IN RAJASTHAN DURING DIFFERENT TIME PERIODS

District	TE 1964-65	TE 1972-73	TE 1982-83	TE 1992-93	TE 2002-03	TE 2012-13	TE 1964-65 to TE 2012-13 (Overall Index score)
Hanumangarh	-	-	-	-	0.406	0.460	**0.433**
Ganganagar	0.363	0.384	0.374	0.463	0.487	0.491	**0.427**
Churu	0.425	0.286	0.297	0.349	0.369	0.460	**0.364**
Bikaner	0.397	0.325	0.240	0.403	0.394	0.375	**0.356**
Dausa	-	-	-	0.391	0.376	0.292	**0.353**
Baran	-	-	-	0.284	0.379	0.366	**0.343**
Alwar	0.285	0.362	0.304	0.343	0.394	0.327	**0.336**
Bundi	0.278	0.355	0.297	0.360	0.335	0.354	**0.330**
Jaisalmer	0.216	0.147	0.213	0.412	0.441	0.546	**0.329**
Karuli	-	-	-	-	0.344	0.295	**0.319**
Chittorgarh	0.321	0.353	0.338	0.369	0.230	0.298	**0.318**
Bharatpur	0.304	0.343	0.291	0.268	0.363	0.304	**0.312**
Bhilwara	0.420	0.394	0.334	0.285	0.182	0.247	**0.310**
Dholpur	-	-	-	0.260	0.350	0.299	**0.303**
Jhalawar	0.242	0.368	0.268	0.308	0.252	0.342	**0.297**
Kota	0.211	0.227	0.288	0.329	0.367	0.351	**0.296**
Pratapgarh	-	-	-	-	-	0.284	**0.284**
Udaipur	0.378	0.370	0.338	0.268	0.124	0.153	**0.272**
Banswara	0.296	0.259	0.328	0.280	0.223	0.225	**0.268**
Jaipur	0.209	0.255	0.303	0.263	0.297	0.278	**0.268**
Barmer	0.221	0.066	0.187	0.305	0.460	0.362	**0.267**
S.Madhopur	0.241	0.251	0.252	0.267	0.250	0.258	**0.253**
Sirohi	0.243	0.224	0.246	0.304	0.200	0.254	**0.245**
Dungarpur	0.318	0.320	0.366	0.192	0.109	0.153	**0.243**
Tonk	0.234	0.175	0.213	0.219	0.179	0.291	**0.218**
Rajsamand	-	-	-	0.322	0.098	0.226	**0.215**
Jhunjhunu	0.107	0.103	0.182	0.219	0.335	0.332	**0.213**
Jalore	0.177	0.132	0.228	0.259	0.209	0.263	**0.211**
Sikar	0.156	0.096	0.200	0.202	0.302	0.287	**0.207**
Ajmer	0.244	0.216	0.234	0.177	0.117	0.221	**0.201**
Pali	0.180	0.151	0.196	0.220	0.117	0.148	**0.169**
Nagaur	0.131	0.049	0.149	0.153	0.153	0.166	**0.133**
Jodhpur	0.131	0.031	0.138	0.140	0.124	0.173	**0.123**

Source: Based on calculation.

Jodhpur, Nagaur and Pali districts stand in lower growth group districts and remaining 28 districts have occupied middle growth group in state. Table I depicts very important picture that top 4 districts Hanumangarh, Ganganagar, Churu and Bikaner districts have occupied first four position

and Jaisalmer district occupied 9th position during overall period which belongs to arid western part of Rajasthan and this part received hardly 200 mm rainfall in rainy season which was possible due to extension of cannel and micro irrigation facilities. The table II shows that only three districts' (Pali, Nagaur and Jodhpur) CADIX score was below state average and remaining 30 districts' score was higher than state average.

Table III presents correlation matrix between indicators of CADIX in Rajasthan during TE 2012-13. This table shows that cropping intensity and gross irrigated area indicator were positively correlated with VOP indicator. It means that if gross irrigated area in state increased then VOP would increase, while, other remaining indicators are negatively correlated with VOP indicator.

TABLE III : CORRELATION MATRIX BETWEEN INDICATORS OF COMPOSITE AGRICULTURAL DEVELOPMENT SCORE IN RAJASTHAN

TE 2012-13	VOP (Rs./Ha.)	Cropping intensity	Irrigated area in percentage	Fertilizer consumption per NSA (net sown area)	Number of tractors per NSA	Number of Tube well of GCA	Number of Agriculture worker per GCA
VOP (Rs./Ha.)	1.00						
Cropping intensity	0.56*	1.00					
Irrigated area (in percentage)	0.90*	0.51*	1.00				
Fertilizer consumption per NSA	-0.56*	-0.56*	-0.59*	1.00			
Number of tractors per NSA	-0.46*	-0.48*	-0.43**	0.62*	1.00		
Number of Tube well of GCA	-0.07	-0.50*	0.01	0.45*	0.62*	1.00	
Number of Agriculture worker per GCA	-0.37**	-0.53*	-0.36**	0.73*	0.76*	0.63*	1.00

NOTE: * and ** indicate coefficient significant at 1% and 5% level of significance, respectively, for two tailed t- test.
Source: Based on calculation.

Cropping intensity indicator is highly correlated with fertilizer consumption per hectare from GCA. Gross irrigated area as percentage of GCA has positive but low correlation with gross area sown per Tube well and this figure was significant at only 10% significance t-test level. Fertilizer consumption per hectare from GCA is highly correlated with availability of gross area sown per agricultural labour, it means that if fertilizer consumption was increased than gross area sown per agriculture was also increased. Availability of gross area sown per tractor is highly correlated with availability of gross area sown per agricultural labour it means that when gross area sown per tractor was increased then gross area sown per agriculture labour was also increased.

3.2. Division-wise CADIX and Ranking

Table V presents division wise CADIX. This table shows that Bikaner division, situated in western part of state, occupied 1st position, . This division received hardly less then 200mm annual rains in rainy season, but it was highly irrigated with cannel irrigation and used micro irrigation system, like drip and sprinkler irrigation, solar irrigation and farm pond structure for efficient use of water for cultivation.

Kota division achieved 2nd position and this division did not rank below 3rd position across all time periods and this division is also irrigated with command area. Udaipur division's ranking declined

TABLE IV : DISTRICT-WISE CLASSIFICATION BASED ON CADIX SCORE DURING DIFFERENT TIME PERIODS

Time period	CADIX score 0 - 0.200 (Lower Growth Group)	CADIX score 0.200 to 0.400 (Middle Growth Group)	CADIX score >0.400 (Higher Growth Group)
TE 1964-65	Sikar, Nagaur, Jhunjhunu, Jodhpur, Jalore, Pali (06 Districts)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bikaner, Bundi, Chittorgarh, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jhalawar, Kota, S. Madhopur, Sirohi, Tonk, Udaipur (18 Districts)	Bhilwara and Churu (2 Districts)
TE 1972-73	Barmer, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Tonk (09 Districts)	Jaipur, Bharatpur, Kota, S. Madhopur, Udaipur, Alwar, Chittorgarh, Bundi, Banswara, Bikaner, Churu, Ajmer, Dungarpur, Sirohi, Jhalawar, Bhilwara, Ganganagar (17 Districts)	Nil
TE 1982-83	Barmer, Nagaur, Jhunjhunu, Jodhpur, Pali (05 Districts)	Jaisalmer, Sikar, Jalore, Tonk, Jaipur, Bharatpur, Kota, S. Madhopur, Udaipur, Alwar, Chittorgarh, Bundi, Banswara, Bikaner, Churu, Ajmer, Dungarpur, Sirohi, Jhalawar, Bhilwara, Ganganagar (21 Districts)	Nil
TE 1992-93	Nagaur, Jodhpur, Ajmer, Dungarpur (04 Districts)	Baran, Dausa, Dholpur, Rajsamand, Sikar, Jalore, Tonk, Jaipur, Bharatpur, Kota, S. Madhopur, Udaipur, Alwar, Chittorgarh, Bundi, Banswara, Churu, Sirohi, Jhalawar, Bhilwara, Barmer, Jhunjhunu, Pali (23 Districts)	Jaisalmer, Bikaner and Ganganagar (3 Districts)
TE 2002-03	Bhilwara, Nagaur, Jodhpur, Ajmer, Dungarpur, Pali, Tonk, Rajsamand, Udaipur (09 Districts)	Bikaner, Baran, Dausa, Dholpur, Sikar, Jalore, Jaipur, Bharatpur, Kota, S. Madhopur, Alwar, Chittorgarh, Bundi, Banswara, Churu, Sirohi, Jhalawar, Jhunjhunu, Karuli (19 Districts)	Barmer, Jaisalmer, Hanumangarh, Ganganagar (4 Districts)
TE 2012-13	Nagaur, Jodhpur, Dungarpur, Pali, Udaipur (05 Districts)	Bhilwara, Tonk, Ajmer, Pratapgarh, Bikaner, Baran, Dausa, Dholpur, Rajsamand, Sikar, Jalore, Jaipur, Bharatpur, Kota, S. Madhopur, Alwar, Chittorgarh, Bundi, Banswara, Barmer, Sirohi, Jhalawar, Jhunjhunu, Karuli (24 Districts)	Churu, Jaisalmer, Hanumangarh , Ganganagar (4 Districts)

Source: Based on calculation.

sharply from top to bottom after TE 1982-83 because this division was highly populated with tribal peoples who cultivated crops with traditional methods and still rely on those methods which are important only for survival and not for development. Jaipur division shown remarkable agriculture development over the period, while, Bharatpur division's ranking was unstable over the period. Jodhpur division presents very fruitful picture in recent decades but Ajmer division's agricultural development shows same picture during overall period.

TABLE V: DIVISION-WISE COMPOSITE AGRICULTURAL DEVELOPMENT SCORE AND RANKING IN RAJASTHAN DURING DIFFERENT TIME PERIODS.

Divisions of Rajasthan	TE 1964-65	TE 1972-73	TE 1982-83	TE 1992-93	TE 2002-03	TE 2012-13	Overall TE1964-65 to TE 2012-13
Bikaner division	0.444	0.402	0.411	0.558	0.612	0.669	**0.516**
Kota division	0.426	0.402	0.392	0.486	0.497	0.518	**0.454**
Udaipur division	0.587	0.618	0.489	0.481	0.251	0.254	**0.447**
Bharatpur division	0.415	0.434	0.372	0.348	0.461	0.383	**0.402**
Jaipur division	0.276	0.300	0.333	0.399	0.591	0.425	**0.387**
Jodhpur division	0.370	0.199	0.320	0.365	0.422	0.415	**0.349**
Ajmer division	0.396	0.242	0.312	0.272	0.245	0.264	**0.289**
Rajasthan (overall)	0.302	0.243	0.263	0.325	0.373	0.348	**0.309**
Ranking							
Bikaner division	2	4	2	1	1	1	**1**
Kota division	3	3	3	2	3	2	**2**
Udaipur division	1	1	1	3	6	7	**3**
Bharatpur division	4	2	4	6	4	5	**4**
Jaipur division	7	5	5	4	2	3	**5**
Jodhpur division	6	7	6	5	5	4	**6**
Ajmer division	5	6	7	7	7	6	**7**

Source: Based on calculation.

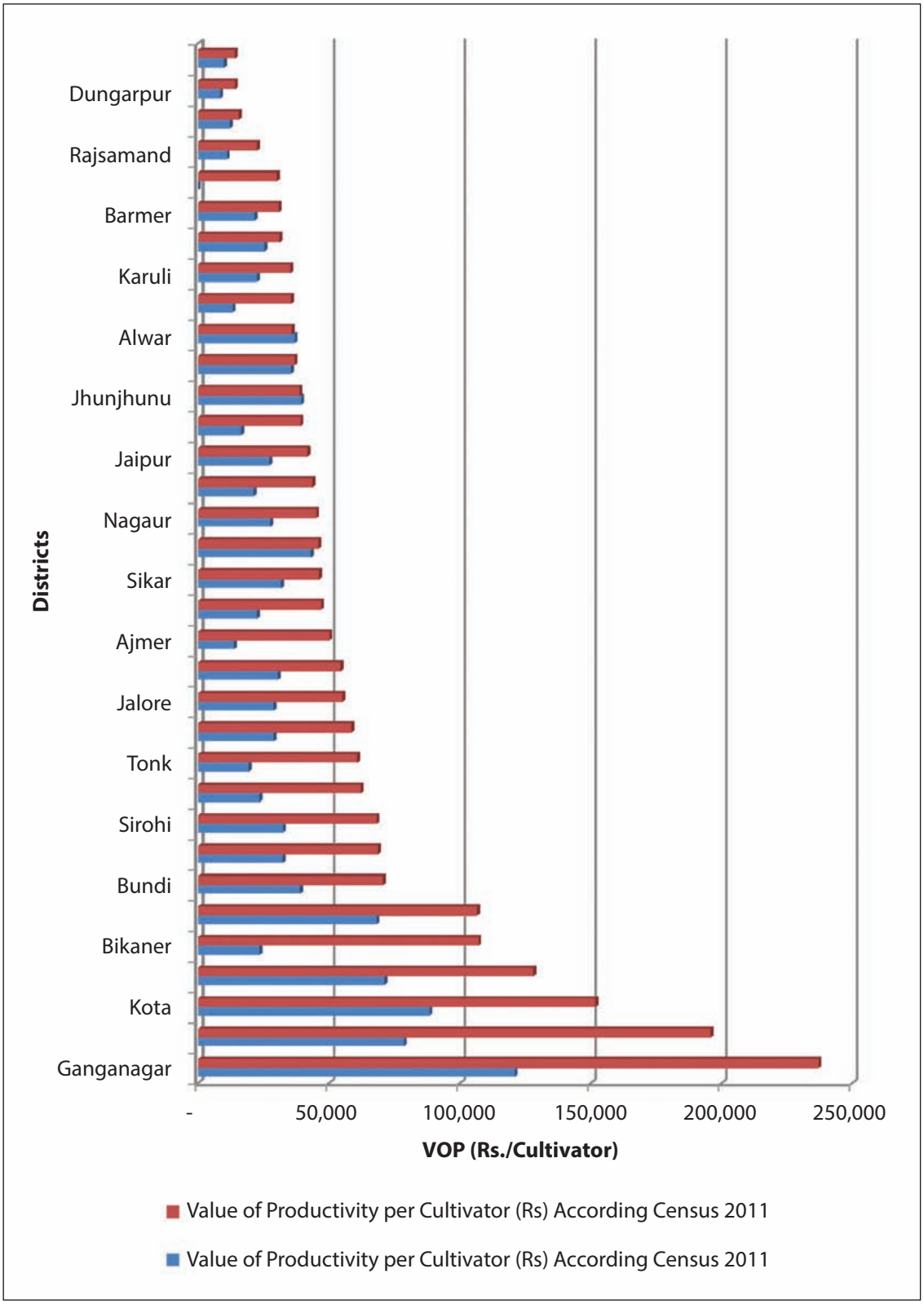
3.3. District-wise VOP per cultivator

Table VI and VII present district-wise VOP per cultivator and changes in VOP according to census 2001 and 2011 in Rajasthan, respectively. Table VI presents that Ganganagr, Hanumangarh and Kota district have achieved 1st, 2nd and 3rd rank under VOP per cultivator according to census 2011 with Rs. 237069, Rs. 195867 and Rs. 151878 per cultivator received from all crops, respectively, whereas, all these three districts' cultivator have received Rs. 120935, Rs. 78597 and Rs. 88397 according to census 2001 in Rajasthan, respectively. Total 13 districts out of 33 districts have received more VOP per cultivator than state average due high growth in VOP than cultivator in 2011 census. According to census 2011 data and VOP for all crops for TE 2012-13 data, Rajasthan state per cultivator received Rs. 54534 VOP for all crops, whereas, he received only Rs. 30502 according to census 2001. As per table VII, State VOP for all crops increased with 9.77 percent growth rate every year and number of cultivator increased with 3.58 percent growth rate per year so, overall VOP per cultivator increased by 5.98 percent.

The VOP for all crops was increased in the state in last decade due to better agricultural development, expansion of irrigated area through cannel irrigations, extensive use of modern agriculture inputs, like fertilizers, HYV seeds, mechanization in agriculture, micro irrigation system, (drip and sprinkler system) etc. Total 20 districts out of 33 districts have received less VOP than state average and most important feature of table VI is that total 13 districts received VOP less than Rs. 40000 per cultivator in state. Three districts Udaipur, Dungarpur and Banswara received VOP only Rs. 15537, Rs. 14148 and Rs. 14131 per cultivator according census 2011 data, respectively, and so all three districts stands at bottom in the table VI. The main reason behind this situation was that all three districts were tribal belt and cultivators doing farming with traditional methods so VOP did not increase much over the period.

Table VI shows that Alwar and Jhunjhunu districts have received VOP per cultivator less than what received in earlier period. Jhunjhunu and Alwar districts have received VOP (according to census 2011 data) of Rs.38788 and Rs.35878, while, earlier

Figure 1: Value of Productivity of all Crops (Rs./Cultivator)



Source: Based on table VI.

TABLE VI : DISTRICT-WISE VOP PER CULTIVATOR AND PER HECTARE IN RAJASTHAN.

S. No.	District	Value of products (all crops) TE 2002-03 (Rs. in lakh)	GCA for all crops (Lakh ha.)	Total cultivators (2001 Census) (in Lakh)	Productivity (Rs./ha.)	Productivity per cultivator (Rs.)	GCA per cultivator (ha.)	Value of Products (All Crops) TE 2012-13 (Lakh Rs.)	GCA for all crops (Lakh ha.)	Total cultivators (2011 Census)(in Lakhs.)	Productivity (Rs./Ha.)	Productivity per cultivator (Rs.)	GCA per cultivator (ha.)
		Period I (TE 2002-03)								Period II (TE 2012-13)			
1	Ganganagar	263362	9.23	2.18	28523	120935	4.24	636049	11.24	2.68	56610	237069	4.19
2	Hanumangarh	232633	10.23	2.96	22732	78597	3.46	725591	12.48	3.70	58137	195867	3.37
3	Kota	100261	3.51	1.13	28588	88397	3.09	213027	4.81	1.40	44316	151878	3.43
4	Baran	126167	3.81	1.77	33147	71117	2.15	277284	6.32	2.17	43902	128053	2.92
5	Bikaner	66872	7.34	2.84	9112	23576	2.59	534491	18.69	4.99	28600	107065	3.74
6	Jaisalmer	44632	3.66	0.65	12206	68188	5.59	141082	8.60	1.32	16399	106504	6.49
7	Bundi	70922	3.34	1.82	21265	39039	1.84	177005	4.58	2.50	38662	70674	1.83
8	Jhalawar	83369	3.96	2.58	21041	32309	1.54	225761	5.99	3.29	37682	68680	1.82
9	Sirohi	28631	1.51	0.88	19008	32499	1.71	84603	2.28	1.24	37045	68185	1.84
10	Pali	51246	4.96	2.18	10324	23475	2.27	151383	7.99	2.43	18940	62172	3.28
11	Tonk	50822	4.31	2.63	11785	19340	1.64	198299	6.90	3.26	28749	60812	2.12
12	Jodhpur	108481	9.82	3.75	11050	28903	2.62	346867	14.98	5.92	23158	58556	2.53
13	Jalore	97768	7.40	3.38	13204	28896	2.19	272299	9.73	4.93	27985	55193	1.97
	Rajasthan (Total)	**2922732**	**177.14**	**95.82**	**16500**	**30502**	**1.85**	**7426358**	**249.60**	**136.19**	**29755**	**54534**	**1.83**
14	Ajmer	35692	4.16	2.61	8582	13696	1.60	149992	6.94	2.99	21614	50189	2.32
15	Chittorgarh	116636	4.78	5.19	24406	22459	0.92	213168	5.15	4.53	41410	47036	1.14
16	Sikar	111709	6.57	3.52	16992	31768	1.87	232212	8.06	5.01	28795	46321	1.61
17	Bharatpur	150414	5.19	3.49	28971	43138	1.49	230715	5.82	5.01	39635	46051	1.16
18	Nagaur	142449	12.91	5.16	11034	27624	2.50	331845	16.17	7.35	20518	45173	2.20
19	S.Madhopur	52013	2.76	2.44	18818	21330	1.13	136799	4.13	3.13	33161	43656	1.32
20	Jaipur	152539	8.04	5.59	18983	27294	1.44	310684	11.06	7.44	28085	41738	1.49
21	Churu	66277	11.27	4.00	5880	16555	2.82	224376	14.93	5.73	15031	39183	2.61
22	Jhunjhunu	105565	5.70	2.67	18514	39485	2.13	202352	6.85	5.22	29558	38788	1.31
23	Dholpur	53742	1.76	1.51	30551	35478	1.16	84880	2.33	2.30	36493	36914	1.01
24	Alwar	209854	7.25	5.68	28953	36962	1.28	322502	8.46	8.99	38139	35878	0.94
25	Bhilwara	58813	4.09	4.44	14378	13234	0.92	197572	6.50	5.55	30401	35588	1.17
26	Karuli	50734	2.47	2.26	20536	22483	1.09	118386	3.44	3.35	34454	35307	1.02
27	Dausa	71678	2.88	2.82	24848	25412	1.02	121879	3.95	3.91	30874	31174	1.01
28	Barmer	106005	15.86	4.92	6684	21532	3.22	233079	18.31	7.54	12733	30902	2.43
29	Pratapgarh	0	0.00	-	-	-		92145	2.85	3.06	32354	30072	0.93
30	Rajsamand	12198	0.95	1.10	12896	11060	0.86	46798	1.38	2.08	33835	22544	0.67
31	Udaipur	44377	2.68	3.69	16550	12026	0.73	83761	3.37	5.39	24892	15537	0.62
32	Dungarpur	14533	1.51	1.72	9626	8459	0.88	32236	1.97	2.28	16389	14148	0.86
33	Banswara	42339	3.32	4.25	12748	9971	0.78	77235	3.38	5.47	22857	14131	0.62

NOTE : District arranged in descending order on the basis of productivity per cultivator (2011 Census).

Source: Based on calculation.

TABLE VII : CHANGES IN DISTRICT-WISE VOP BETWEEN PERIOD I AND PERIOD II IN RAJASTHAN

S. No.	District	Difference in VOP per cultivator (Rs.)	Growth rate of productivity per cultivator	Difference in VOP of all crops (lakh Rs.)	Growth rate of VOP for all crops	Difference in number of cultivator (census 2011- census 2001) (in lakh)	Growth rate of no. of cultivators from census 2001 to 2011	Diff. in GCA (in Lakh ha.)	Growth rate of GCA for all crops
1	Ganganagar	116134	6.96	372686	9.22	0.51	2.11	2.00	1.98
2	Hanumangarh	117270	9.56	492958	12.05	0.74	2.27	2.25	2.00
3	Kota	63481	5.56	112767	7.83	0.27	2.15	1.30	3.20
4	Baran	56936	6.06	151117	8.19	0.39	2.01	2.51	5.19
5	Bikaner	83489	16.34	467619	23.10	2.16	5.82	11.35	9.80
6	Jaisalmer	38316	4.56	96450	12.20	0.67	7.30	4.95	8.93
7	Bundi	31635	6.11	106083	9.58	0.69	3.26	1.24	3.22
8	Jhalawar	36371	7.83	142393	10.48	0.71	2.45	2.03	4.22
9	Sirohi	35686	7.69	55972	11.44	0.36	3.48	0.78	4.25
10	Pali	38696	10.23	100137	11.44	0.25	1.10	3.03	4.88
11	Tonk	41473	12.14	147477	14.58	0.63	2.18	2.59	4.81
12	Jodhpur	29653	7.32	238386	12.33	2.17	4.67	5.16	4.32
13	Jalore	26298	6.69	174532	10.79	1.55	3.84	2.33	2.77
	Rajasthan (Total)	**24032**	**5.98**	**4503626**	**9.77**	**40.37**	**3.58**	**72.47**	**3.49**
14	Ajmer	36493	13.87	114299	15.44	0.38	1.38	2.78	5.25
15	Chittorgarh	24577	7.67	96533	6.22	-0.66	-1.35	0.37	0.75
16	Sikar	14553	3.84	120503	7.59	1.50	3.61	1.49	2.06
17	Bharatpur	2914	0.66	80302	4.37	1.52	3.69	0.63	1.15
18	Nagaur	17549	5.04	189396	8.82	2.19	3.60	3.26	2.28
19	S.Madhopur	22326	7.42	84786	10.15	0.70	2.54	1.36	4.09
20	Jaipur	14444	4.34	158145	7.37	1.86	2.91	3.03	3.25
21	Churu	22628	9.00	158099	12.97	1.72	3.64	3.66	2.85
22	Jhunjhunu	-697	-0.18	96786	6.72	2.54	6.91	1.14	1.85
23	Dholpur	1436	0.40	31138	4.68	0.78	4.26	0.57	2.83
24	Alwar	-1084	-0.30	112648	4.39	3.31	4.70	1.21	1.55
25	Bhilwara	22354	10.40	138759	12.88	1.11	2.25	2.41	4.74
26	Karuli	12824	4.62	67652	8.84	1.10	4.04	0.97	3.35
27	Dausa	5762	2.06	50201	5.45	1.09	3.32	1.06	3.19
28	Barmer	9370	3.68	127074	8.20	2.62	4.36	2.45	1.45
29	Pratapgarh	-	-	-	-	-	-	-	-
30	Rajsamand	11485	7.38	34600	14.39	0.97	6.53	0.44	3.87
31	Udaipur	3511	2.59	39385	6.56	1.70	3.86	0.68	2.30
32	Dungarpur	5689	5.28	17703	8.29	0.56	2.86	0.46	2.68
33	Banswara	4160	3.55	34896	6.20	1.22	2.56	0.06	0.17

NOTE : District arranged in descending order on the basis of productivity per cultivator (2011 Census).
Source: Based on calculation.

they received Rs.39485 and Rs.36962 per cultivator, respectively. The main reason behind this situation(as shown in table VII) was that both districts' VOP has increased by 6.72 percent and 4.39 percent and number of cultivators increased by 6.91 percent and 4.70 percent, while, gross cropped area increased by 1.85 percent and 1.55 percent, respectively, for both the districts. Figure 1 presents district-wise VOP per cultivator (in Rs.) in Rajasthan according to Census 2001 and 2011 data.

4. Conclusion and Suggestions

The study has shown that development of agriculture in Rajasthan over the year has shifted from eastern Rajasthan to western Rajasthan districts, especially to Ganganagar, Hanumangarh, Bikaner and Jaisalmer. The main reason behind this is canal irrigation facility improved through Indira Gandhi Canal project and abundance of solar power irrigation system. In addition, most of the farmers had adopted micro irrigation system in their fields so that they can produce more production in same land holding with cost effective measures.

The empirical evidence suggested that maximum number of district that scored and ranked well are located in western and eastern region of the state like Kota, Bundi and Jhalawar districts, where agriculture is commercialized and technology is also advanced. This was the region that was much influenced by green and technical revolution, resulted in higher contribution in export and food production of the state. The disparity existing in agricultural development is high and alarming in some tribal belt districts, like Udaipur, Dungarpur and Banswara. A series of measures are needed on the part of the government to bridge the wide gap. Given below are some suggestions that can be helpful to alleviate the problems faced by farmers in the various districts.

i. There is a need for region specific policies in this state because it is huge in size. For the high density eastern regions, where excessive dependence of population is causing adoption of backward technology and small size of holding, we need to create alternative employment opportunities in rural areas like MGNREGA.

ii. Agriculture extension activities are required to educate farmers to adopt cheap, suitable and effective technology and crop varieties. They should compulsorily adopt micro irrigation system because Rajasthan receives just 50cm annual average rainfall and facing alarming situation of ground water level.

iii. The warehousing facility in Rajasthan state was (as per latest available estimateas on 31.12.2015) 1085.69 thousand tonnes, which is very less in respect of production capacity of the state. These warehouses provided not only storage facilities but also serve as an important tool of price stabilization during higher production in the state, so that farmers can easily manage his huge production through these warehouses and can save himself from distress sell.

The above discussion shows much scope for development of agriculture in India as well as in state. Also, this detailed district-wise analysis is useful in identifying poorer districts as well as strong potential districts, so that government can make district specific policies.

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Agro-Economic Research

Impact Evaluation of Farm Debt Waiver Scheme on Farmers' Livelihood in Uttar Pradesh*

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1. Introduction

In terms of farmer's income, the state of Uttar Pradesh ranks 13th among the states of India. The average income of a farmer in Uttar Pradesh is Rs. 4,923 per month, which is lower than the national average income of Rs. 6,426 per month, and is also less than one third of the average monthly income (Rs.18,059) of a farmer of Punjab. Also, average monthly consumption expenditure of Rs. 6,230 pushes an average farmer of Uttar Pradesh into a deficit of Rs. 1,307 each month. Keeping this hardship in view, the Government of Uttar Pradesh chalked out a plan to provide timely relief to the distressed farmers. Thus formulated a crop loan redemption scheme for marginal and small farmers and named it as Farm Debt Waiver Scheme. This scheme is an investment for empowering the marginal and small farmers to alleviate their hardship and rejuvenate their agriculture. Also, the increased dependence of farmers on credit to meet out the rising cost of cultivation and decreased returns due to additional costs have been identified as the main reasons for the indebtedness of farmers in the State of Uttar Pradesh. Considering the options carefully, the Government of Uttar Pradesh under the "Farm Debt Waiver Scheme" is committed to redeem crop loans, up to Rs one lakh, of individual marginal and small farmers whose crop loans were disbursed by lending institutions in line with the RBI norms.

1.1. Objectives

This study was undertaken with the following specific objectives:

(i) To examine socio-economic characteristics of the beneficiaries under the Farm Debt Waiver Scheme.

(ii) To study the nature and extent of indebtedness of the beneficiaries.

(iii) To put forth the perceptions of beneficiaries about the likely impact of scheme on their livelihood.

2. Research Methodology

2.1. Coverage of the study

The present study is confined to the Western Region of Uttar Pradesh where from the three distinct agro-climatic zones areas were selected randomly to cover and represent the whole Western Region of Uttar Pradesh. Such agro-climatic zones thus undertaken were namely,

(1) Western Plain Zone which is located between the Ganga and Yamuna in the west and includes Saharanpur, Muzaffarnagar, Meerut, Ghaziabad and Bulandshahar districts.

(2) Mid-Western Plain Zone represents mainly Rohilkhand division which embraces Bijnor, Moradabad, Rampur, Bareilly, Pilibhit and Badaun districts.

(3) South-Western Semi-Arid Zone comprises Aligarh, Etah, Mainpuri, Mathura and Agra.

2.2. Sampling design

Three representative districts were selected randomly from each of the three distinct agro-climatic zones selected from the western region of Uttar Pradesh. These districts were namely (1) Bulandshahar from western plain zone, (2) Moradabad from mid-western plain zone and (3) Agra from south western semi-arid zone. From these three selected districts, two blocks were selected randomly from each selected district. Thereafter, two clusters of villages from each block were undertaken randomly for the field survey. Thereafter, 15 beneficiaries of farm debt waiver scheme were randomly chosen from each of the clusters of village/villages. Thus, the total samples comprised 180 beneficiary farmers.

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3. Major Findings

i. On 01.04.2019, total 44,54,064 farmers in Uttar Pradesh were reported as beneficiaries under the farm debt waiver scheme and the total amount paid was estimated as Rs. 24,821.23 crore as a whole.

ii. The maximum debts were waived off among marginal and small farmers, only one fourth of the same was waived off.

iii. The maximum, *i.e.*, more than 26 percent of the sample farmers were illiterate and among literates the maximum, *i.e.*, 24 percent were matriculates only. The farmers having graduates and post graduates degrees were only about 6 percent.

iv. The status of education among both marginal as well as small farmers in the area under the study was much lower than the national average.

v. The entire land, both owned and leased-in land, on all the sample farms was irrigated. No leasing-out land was practiced by sample farmers in the area under study.

vi. There was not any change in dairying as primary occupation after the redemption of debt. Non-agricultural labourers were not reported among small farmers.

vii. The annual household income had increased after redemption of debt on all farms. The small farmers were benefited significantly in the area under study.

viii. There was not any change in operational land on marginal farms. On small farms there were only nominal changes after the redemption of debt.

ix. The capital investments on machine, implements, irrigation structures and cattle sheds had increased after redemption of debt due to the effect of farm debt waiver scheme in the area under study. This confirms the significant impact of scheme on capital investments on marginal farms.

x. The capital investments on tractors, trolleys, cultivators and electric motors had decreased after redemption of debts on all farms showing adverse effect of the scheme.

xi. Among the buffaloes reared by marginal farmers, there was tremendous change in the value of adult female buffaloes after redemption of debt which confirms the impact of scheme.

xii. On an overall basis, on the crossbred cattle and buffaloes reared by all the sample farmers, there was clear impact of farm debt waiver scheme in the area under study affecting the total livestock inventory.

xiii. On the cropping pattern of the sample small farms, there was minor change in the crop coverage which confirms the impact of scheme in the area under study.

xiv. The operational cost of cultivation on marginal farms during Kharif season had increased considerably after redemption of debt showing clear impact of the scheme.

xv. In Rabi season too, the operational cost of cultivation on marginal farms had increased by 31 percent after the redemption of debt, which confirms the impact of debt waiver scheme on marginal farms.

xvi. On small farms too, there were considerable changes in the operational cost of cultivation during Kharif and Rabi seasons due to the implementation of farm debt waiver scheme.

xvii. On all sample farms, there was 13 percent increase in the cost of cultivation, which shows a clear impact of farm debt waiver scheme in the area under study.

xviii. On all sample farms too, there was considerable impact of farm debt waiver scheme on production in the area under study.

xix. The domestic expenditure of marginal farmers changed by 13.43 percent after redemption of debt confirms the clear impact of debt waiver scheme in the area under study.

xx. The domestic expenditure on small farms had changed by 6.85 percent after redemption of debt, which confirms the impact of scheme on small farmers too.

xxi. There had been a change of 11.65 percent in the domestic expenditure of all the sample farmers after the redemption of debt on an overall basis in the area under study.

xxii. There was clear impact of the scheme on credit structure of the marginal farmers as the change in amount borrowed was by 13.21 percent and in outstanding loan amount by 9.20 percent in case of loans from cooperative banks.

xxiii. Regarding annual change in saving pattern on marginal farms, one farmer was reported to have taken LIC policy before redemption of debt and which he continued after redemption too, but the details were not given by the farmer. Hence, the change was zero percent. No any other means of saving was reported on any of the marginal farms.

xxiv. On the sample small farms too, only one farmer was reported to have taken LIC policy without giving details of it and which he continued after redemption. No other means of saving was reported on small farms too. Hence, change was nil.

xxv. No any means of saving was reported by any of the sample farmers in the area during the survey of the study.

xxvi. The total amount borrowed per farm in case of marginal farmers was Rs. 1,00,000 and the outstanding loan amount was Rs. 1,07,000 per farm before the redemption of debt.

xxvii. While after redemption of debt, the amount borrowed from banking institutions was Rs. 71,054.45 and outstanding loan amount was Rs. 76,028 per farm.

xxviii. The percentage change in the amount borrowed was (-) 28.95 percent and in outstanding loan amount was by (-) 28.95 percent after the redemption of debt showing the decrease in debt on marginal farms.

xxix. As regards, the extent of debt waived on small farms, the amount borrowed per farm was Rs. 74,558 and the outstanding loan amount was Rs. 79,777 after redemption of debt on all farms.

xxx. Therefore, the percentage change in amount borrowed as well as in the amount outstanding was (-) 25.28 percent, which confirms the impact of debt waiver scheme implemented in Uttar Pradesh.

xxxi. Also 12.77 percent of all sample farmers had faced humiliation and 32.77 percent had viewed to face other constraints such as bribe, etc., in the area under study.

xxxii. About perceptions on farm debt waiver scheme in Uttar Pradesh, out of 141 sample marginal farmers, the maximum, i.e., 37.59 percent had responded that there was no reduction in agrarian stress, 14.18 percent told it less, 21.99 percent told it moderate, 26.24 percent told it low and no one told it huge.

xxxiii. On the 39 sample small farms, the change in amount borrowed was (-) 11.87 percent and in outstanding loan amount also it was (-) 11.87 percent after redemption of debt. This confirms the impact of debt waiver scheme in the state of Uttar Pradesh.

xxxiv. On all the sample farms, the change in amount borrowed as well as in the amount outstanding was (-) 25.28 percent. This confirms the impact of debt waiver scheme in Uttar Pradesh.

xxxv. About constraints/difficulties confronted in getting the benefits of scheme, 21.98 percent of marginal farmers had told that many man-days were lost, 26.24 percent told it cost incurring, 14.18 percent responded lot of humiliation and 37.58 percent had viewed to confront bribing, etc.

xxxvi. Among small farmers, 5.12 percent had told it time consuming, 38.46 percent told it cost incurring, 33.33 percent had told that many man-days were lost, 7.69 percent told to confront humiliation and 15.38 percent had faced bribing, etc.

xxxvii. On all sample farms, 100 percent had responded it time consuming, 8.88 percent cost incurring, 24.44 percent had told that many man-days were lost, 12.77 percent had faced humiliation and 32.77 percent viewed to face bribe, etc.

xxxviii. As regards suggestions, 37.59 percent of the marginal farmers responded that there was not any reduction in agrarian distress, 14.18 percent told it less, 21.99 percent told it moderate, 26.24 percent told it low and no one told it huge.

xxxix. About increased farm profitability 12.05 percent of marginal farmers responded that there was not any increase, 9.22 percent told it less, 39.72 percent told it moderate, 34.75 percent told it low and only 4.76 percent had told it huge.

xl. As regards the decreased indebtedness, 4.96 percent of marginal farmers had told it no, 21.28 percent told it less, 48.94 percent told it moderate, 17.02 percent told it low and only 7.80 percent had told it huge.

xli. On small farms, 33.33 percent had told that there was not any reduction in agrarian distress, 5.13 percent told it less, 30.77 percent told it moderate, 30.77 percent told it low and no one told it huge.

xlii. 33.33 percent of small farmers had also expressed their views that loans taken from money lenders should also be waived-off.

xliii. On all farms, 36.67 percent had said no about the reduction in agrarian distress, 12.22 percent had told it less, 23.89 percent told it moderate, 27.22 percent told it low and no farmer had told it huge.

xliv. About increased farm profitability, 12.78 percent had said no, 8.89 percent told it less, 38.33 percent told it moderate, 35.56 percent had told it low and 4.44 percent told it huge.

xlv. About decreased indebtedness, 5.56 percent had said no, 18.33 percent told it less, 52.22 percent had told it moderate, 17.78 percent told it low and only 6.11 percent had told it huge in the area under study.

4. Policy Implications

Based on the findings the following policy implications are given:

i. 100 percent marginal farmers must be benefited under farm debt waiver scheme and among small farmers, only the farmers having poor resources or not having adequate resources may be benefited.

ii. Status of education among both marginal and small farmers must be elevated for proper awareness about the Government schemes for their benefits.

iii. Marginal and small both types of farmers must be encouraged and assisted to shift from their primary occupation of agriculture to other allied and secondary occupations for doubling their incomes.

iv. The subsidies on farm machines, particularly tractors, electric motors, rotavators, diesel engines and power threshers must be increased to benefit more genuine farmers.

v. Both marginal and small farmers must be facilitated and encouraged for rearing crossbred cattles, buffaloes and improved breeds of goats on their farms.

vi. Both marginal and small farmers must be provided incentives to diversify their farms for increasing the cropping intensity from 200 percent to atleast 300 percent.

vii. Both types of farmers must minimize their operational cost of cultivation by opting for the modern techniques of farming as per their available resources.

viii. For profitable disposal of their produce, marginal and small farmers must be adequately sensitized to take safeguards against mal-practices or illegal demands from any quarter.

ix. Both marginal and small farmers must minimize their domestic expenditures on litigations and other consumptions.

x. For better credit facilities, RRBs must be strengthened in the far-off and remote villages

to benefit poor farmers.

xi. Farm Debt Waiver Scheme must be implemented transparently avoiding discriminations with the farmers who repay installments of loan regularly.

xii. Loans taken from money lenders must also be waived off by the Government.

xiii. To alleviate indebtedness, farm profitability of marginal and small farmers must be increased through modern and improved techniques of farming.

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Commodity Reviews

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2019-20 up to 30.04.2020 is 42.64 million tonnes as against 39.13 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 2019-20 (up to 30.04.2020) and the corresponding period of last year is given in figure 1. The percentage share of different states in procurement of rice has been given in figure 2.

TABLE 1: PROCUREMENT OF RICE

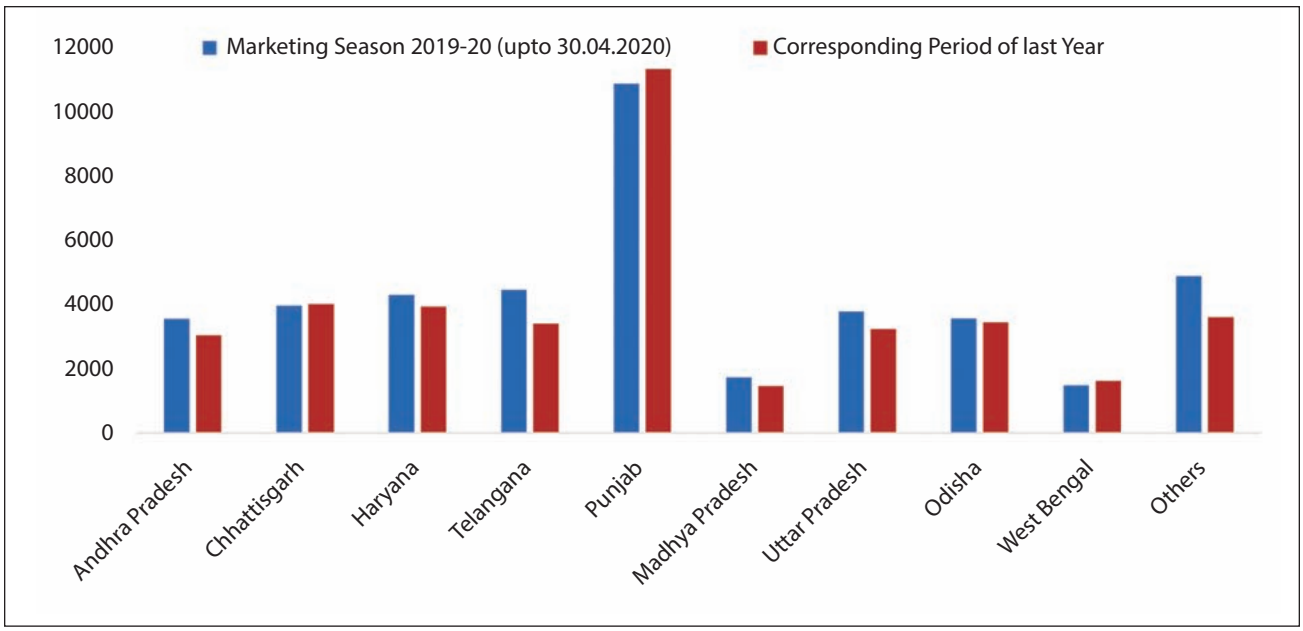
(In thousand tonnes)

State	Marketing Season 2019-20 (upto 30.04.2020)		Corresponding Period of last Year 2018-19	
	Procurement	% to Total	Procurement	% to Total
1	**2**	**3**	**4**	**5**
Andhra Pradesh	3557	8.3	3049	7.8
Chhattisgarh	3971	9.3	4020	10.3
Haryana	4303	10.1	3942	10.1
Telangana	4457	10.5	3403	8.7
Punjab	10876	25.5	11334	29.0
Madhya Pradesh	1740	4.1	1462	3.7
Uttar Pradesh	3790	8.9	3233	8.3
Odisha	3572	8.4	3449	8.8
West Bengal	1490	3.5	1629	4.2
Others	4887	11.5	3607	9.2
Total	42643	100.0	39128	100.0

Source: Department of Food & Public Distribution.

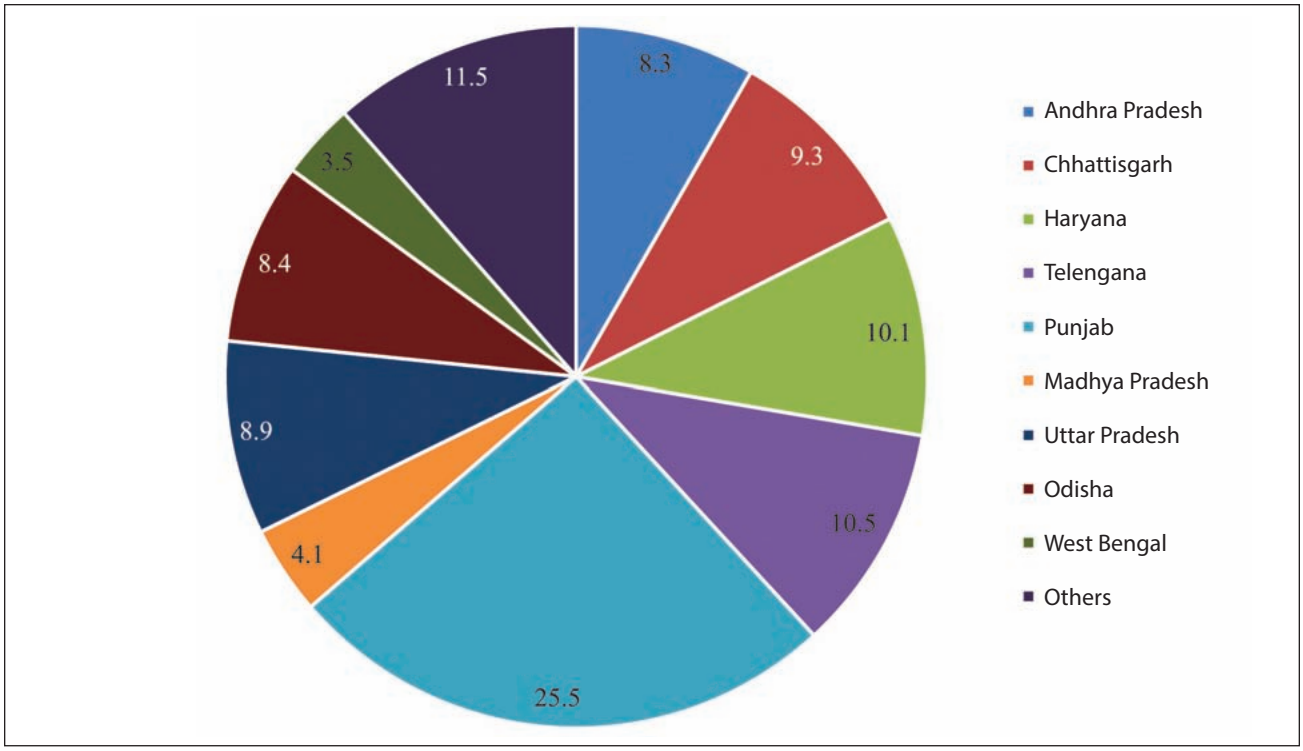
Figure 1: State-wise Procurement of Rice

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 2: Percentage Share of Different States in Procurement of Rice during Marketing Season 2019-20 (up to 30.04.2020).



Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat during rabi marketing season 2020-21 up to 30.04.2020 is 12.95 million tonnes as against 19.61 million tonnes during the corresponding period of last year. The details are given in Table 2. The figure 3 depicts the comparison of procurement of wheat during the marketing season 2020-21 (up to 30.04.2020) with the corresponding period of last year. The percentage share of different states in procurement of wheat has been given in figure 4.

TABLE 2: PROCUREMENT OF WHEAT

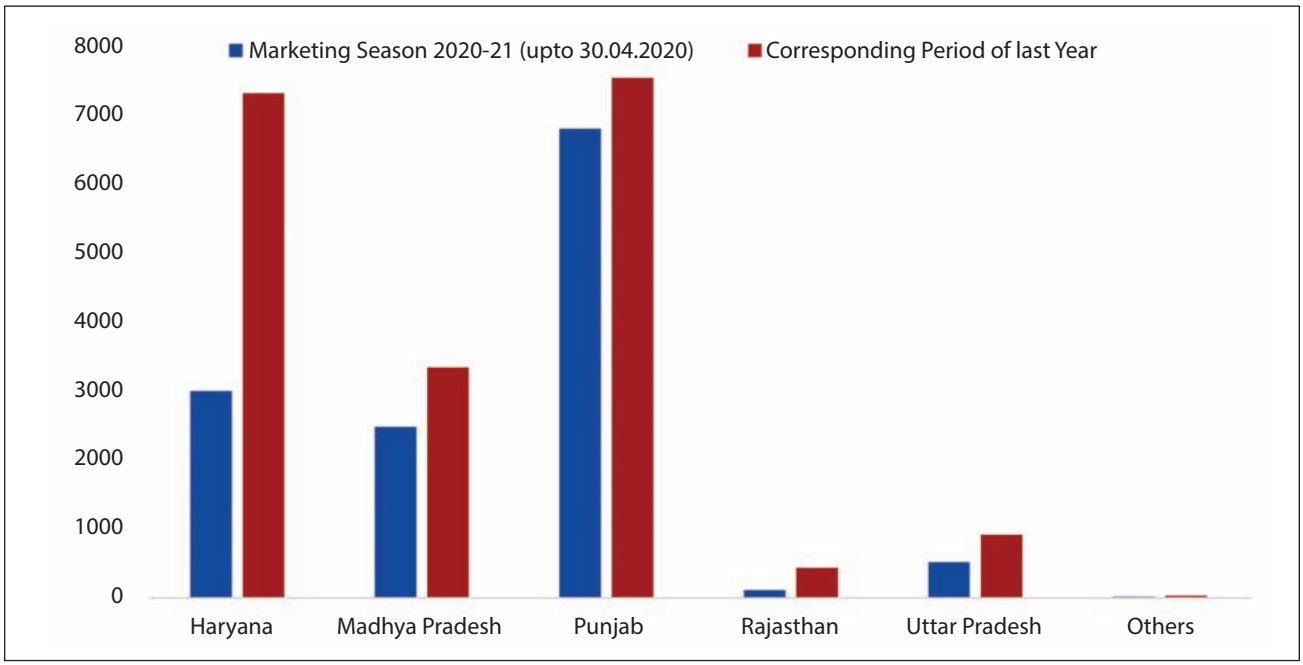
(In thousand tonnes)

State	Marketing Season 2020-21 (upto 30.04.2020)		Corresponding Period of last Year 2019-20	
	Procurement	% to Total	Procurement	% to Total
1	**2**	**3**	**4**	**5**
Haryana	3002	23.2	7331	37.4
Madhya Pradesh	2485	19.2	3346	17.1
Punjab	6816	52.6	7555	38.5
Rajasthan	114	0.9	434	2.2
Uttar Pradesh	519	4.0	914	4.7
Others	17	0.1	29	0.1
Total	12953	100.0	19609	100.0

Source: Department of Food & Public Distribution.

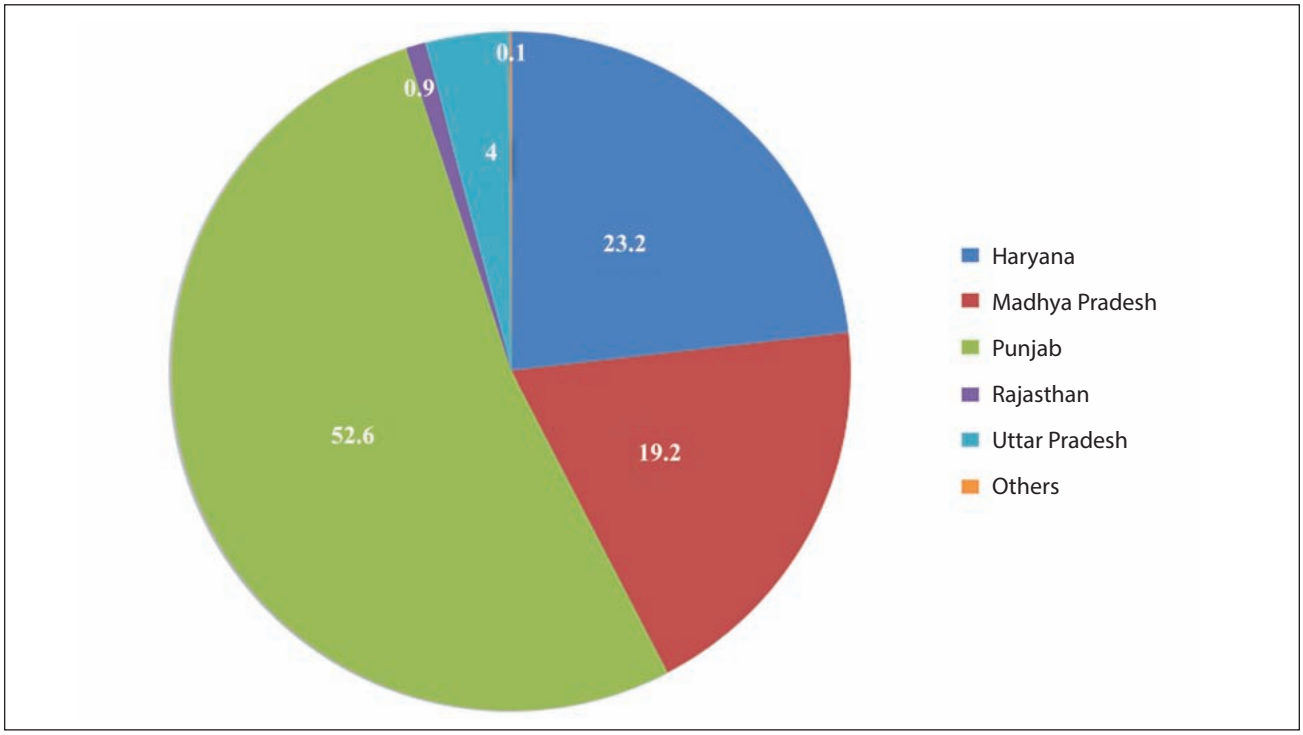
Figure 3: State-wise Procurement of Wheat

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 4: Percentage Share of Different States in Procurement of Wheat during Marketing Season 2020-21 (up to 30.04.2020).



Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 150 in April, 2020 showing an increase of 0.07% and increase of 1.49% over the previous month and year, respectively. WPI of groundnut seed increased by 1.73%, copra (coconut) by 0.05%, cotton seed by 0.20% while gingelly seed showed no improvement over the previous month. The WPI of safflower (kardi seed) decreased by 5.41%, soyabean by 0.45%, sunflower by 4.36%, rape & mustard seed by 0.34%, niger seed by 0.55% over the previous month.

Manufacture of Vegetable and Animal Oils and Fats

The WPI of manufacture of vegetable and animal oils and fats as a group stood at 127.6 in April, 2020.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 159.3 in April, 2020 showing an increase of 5.71% and increase of 0.50% over the previous month and year, respectively.

Potato

The WPI of potato stood at 228.1 in April, 2020 showing an increase of 5.36% and 59.40% over the previous month and year, respectively.

Onion

The WPI of onion stood at 205.8 in April, 2020 showing a decrease of 10.25% and increase of 73.52% over the previous month and year, respectively.

Condiments & Spices

The WPI of condiments & spices (group) stood at 146.8 showing a decrease of 1.74% and increase of 15.23% over the previous month and year, respectively. The WPI of turmeric decreased by 0.51% whereas that of black pepper and chillies increased by 0.16 and 0.12 percent, respectively.

Raw Cotton

The WPI of raw cotton stood at 106.8 in April, 2020 showing a decrease of 0.19% and a decrease of 14.56% over the previous month and year, respectively.

Raw Jute

The WPI of raw jute stood at 208.9 in April, 2020 showing a decrease of 0.62% and increase of 5.88% over the previous month and year, respectively.

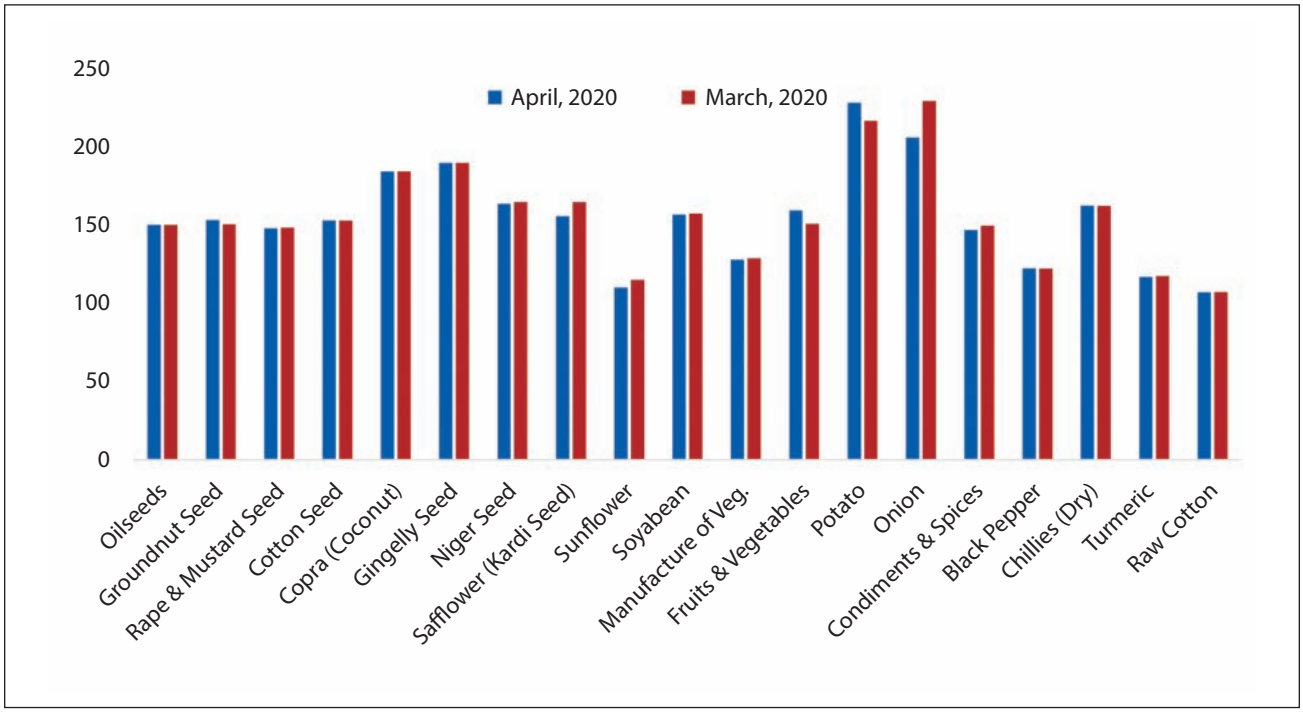
Wholesale Price Index of Commercial Crops is given in Table 3. A graphical comparison of WPI for the period of April, 2020 and March, 2020 is given in figure 5 and the comparison of WPI during the April, 2020 with the corresponding month of last year has been given in figure 6.

TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12=100)

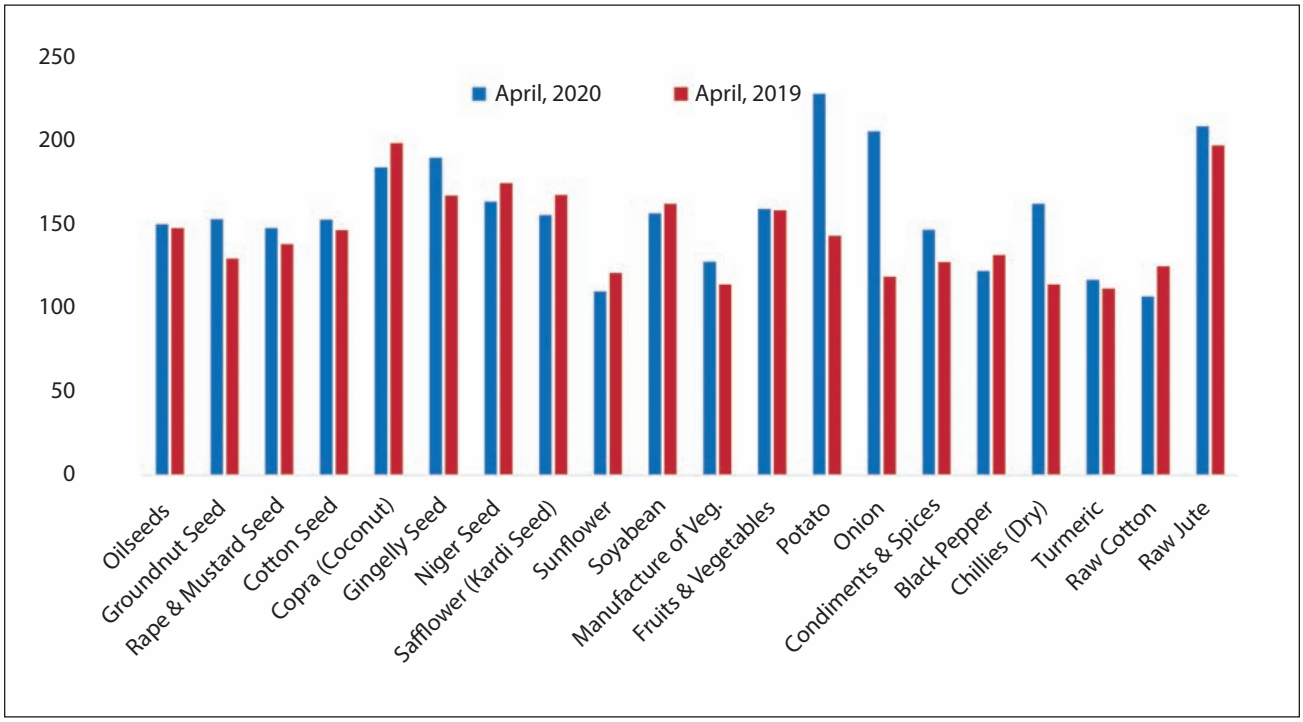
Commodity	Latest Apr-20	Month Mar-20	Year Apr-19	% Variation over the	
				Month	Year
Oilseeds	150	149.9	147.8	0.07	1.49
Groundnut Seed	153.1	150.5	129.5	1.73	18.22
Rape & Mustard Seed	147.7	148.2	138.2	-0.34	6.87
Cotton Seed	152.9	152.6	146.5	0.20	4.37
Copra (Coconut)	184.2	184.1	198.6	0.05	-7.25
Gingelly Seed (Sesamum)	189.8	189.8	167.3	0.00	13.45
Niger Seed	163.6	164.5	174.7	-0.55	-6.35
Safflower (Kardi Seed)	155.6	164.5	167.6	-5.41	-7.16
Sunflower	109.8	114.8	120.8	-4.36	-9.11
Soyabean	156.5	157.2	162.3	-0.45	-3.57
Manufacture of Vegetable Oils, Animals and Fats	127.6	128.4	113.9	-0.62	12.03
Mustard Oil	NA	131.6	120.2		
Soyabean Oil	NA	121.1	111.6		
Sunflower Oil	NA	112.8	108.7		
Groundnut Oil	NA	130.7	114.8		
Rapeseed Oil	NA	119.7	111.7		
Copra oil	NA	166.6	172.1		
Cotton Seed Oil	NA	117.7	108.6		
Fruits & Vegetables	159.3	150.7	158.5	5.71	0.50
Potato	228.1	216.5	143.1	5.36	59.40
Onion	205.8	229.3	118.6	-10.25	73.52
Condiments & Spices	146.8	149.4	127.4	-1.74	15.23
Black Pepper	122.1	121.9	131.7	0.16	-7.29
Chillies (Dry)	162.2	162	113.9	0.12	42.41
Turmeric	116.6	117.2	111.5	-0.51	4.57
Raw Cotton	106.8	107	125	-0.19	-14.56
Raw Jute	208.9	210.2	197.3	-0.62	5.88

Figure 5: WPI of commercial crops during April, 2020 and March, 2020



* Manufacture of Vegetable, Animal Oils and Fats

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



* Manufacture of Vegetable, Animal Oils and Fats

Statistical Tables

Wages

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

(In Rs.)

State	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	Nov, 2019	8	425	283	NA	NA	300	NA	NA	NA	NA
	Guntur	Tadikonda	Nov, 2019	8	381	350	400	NA	325	NA	NA	500	NA
Telangana	Ranga Reddy	Arutala	Jan, 20	8	396	396	500	NA	NA	NA	400	400	NA
Karnataka	Bangalore	Harisandra	Dec, 19	8	360	340	300	300	340	330	500	400	NA
	Tumkur	Gidlahali	Nov, 19	8	350	320	350	350	350	320	400	360	NA
Maharashtra	Bhandara	Adyal	Dec, 19	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chandrapur	Ballarpur	Dec, 19	8	300	200	300	200	300	NA	500	400	250
Jharkhand	Ranchi	Gaitalsood	June, 19	8	239	239	239	239	239	239	330	330	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Assam	Barpeta	Howly	May,19	M	8	300	NA	250	250	200	NA	275	280	NA
				W	8	NA	NA	170	170	150	NA	NA	NA	NA
Bihar	Muzaffarpur	Bhalui Rasul	June, 19	M	8	300	300	300	300	300	300	450	450	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Shekhpura	Kutaut	June, 19	M	8	NA	NA	NA	NA	NA	NA	500	500	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihava	Nov,19	M	8	250	200	NA	180	180	200	300	200	200
				W	8	NA	175	NA	150	150	170	NA	150	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Gujarat*	Rajkot	Rajkot	Jan,20	M	8	263	263	266	260	238	200	481	481	469
				W	8	350	325	263	253	238	196	NA	NA	NA
	Dahod	Dahod	Jan,20	M	8	294	294	163	163	163	NA	400	350	300
				W	8	NA	250	163	163	163	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	May, 19	M	8	400	400	400	400	400	NA	550	400	NA
				W	8	NA	300	300	350	300	NA	NA	NA	NA
Himachal Pradesh	Mandi	Mandi	Feb, 20	M	8	450	330	330	330	330	330	430	430	300
				W	8	NA	330	330	330	330	330	NA	NA	NA
Kerala	Kozhikode	Koduvally	Aug, 19	M	4-8	960	850	NA	800	980	NA	900	NA	NA
				W	4-8	NA	NA	650	650	700	NA	NA	NA	NA
	Palakkad	Elappally	Aug, 19	M	4-8	NA	600	NA	600	700	NA	750	NA	NA
				W	4-8	NA	NA	300	300	300	NA	NA	NA	NA
Madhya Pradesh	Hoshangabad	Sangarkhera	Dec, 19	M	8	250	NA	200	200	250	150	400	400	NA
				W	8	NA	NA	200	200	200	NA	NA	NA	NA
	Satna	Kotar	Dec, 19	M	8	300	300	300	300	300	300	500	500	500
				W	8	NA	300	300	300	300	300	NA	NA	NA
	Shyopurkala	Vijaypur	Dec, 19	M	8	NA	300	NA	NA	NA	300	400	400	NA
				W	8	NA	300	NA	NA	NA	300	NA	NA	NA
Odisha	Bhadrak	Chandbali	June, 19	M	8	350	350	350	350	383	300	500	400	400
				W	8	NA	300	300	300	308	250	NA	NA	NA
	Ganjam	Aska	June, 19	M	8	300	250	250	300	325	250	500	500	500
				W	8	NA	220	220	250	267	220	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	Jan,20	M	8	450	500	NA	NA	400	NA	480	480	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	Dec, 19	M	8	500	500	400	NA	NA	500	700	500	NA
				W	8	NA	NA	NA	NA	NA	300	NA	300	NA
	Jalore	Sarnau	Dec, 19	M	8	400	NA	300	300	NA	NA	600	400	NA
				W	8	NA	NA	250	300	NA	NA	NA	350	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Tamil Nadu*	Thanjavur	Pulvarnatham	Oct, 19	M	8	NA	346	NA	350	397	NA	540	450	NA
				W	8	NA	NA	158	150	126	NA	NA	NA	NA
	Tirunelveli	Malayakulam	Oct, 19	M	8	NA	NA	NA	500	610	NA	400	400	NA
				W	8	NA	200	200	187	NA	NA	NA	NA	NA
Tripura	State Average		Aug, 19	M	8	331	331	297	276	275	275	350	319	NA
				W	8	NA	331	250	229	225	241	NA	NA	NA
Uttar Pradesh*	Meerut	Ganeshpur	Jan, 20	M	8	300	300	300	300	300	NA	500	NA	NA
				W	8	NA	250	250	250	250	NA	NA	NA	NA
	Aurraiya	Aurraiya	Jan, 20	M	8	NA	300	NA	NA	300	NA	500	NA	.NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chandauli	Chandauli	Jan, 20	M	8	300	NA	NA	NA	300	NA	500	NA	NA
				W	8	NA	250	250	250	250	NA	NA	NA	NA

M - Man
W - Woman
NA - Not Available
NR – Not Reported
* The State reported district average daily wage

Prices

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

Commodity	Variety	Unit	State	Centre	Apr-20	Mar-20	Apr-19
Wheat	PBW 343	Quintal	Punjab	Amritsar			1840
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi		2050	1840
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	NT	1825	1860
Jowar	-	Quintal	Maharashtra	Mumbai	3300	3500	3000
Gram	No III	Quintal	Madhya Pradesh	Sehore	3850	NT	3980
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1900	1875	1900
Gram Split	-	Quintal	Bihar	Patna	6200	6250	5800
Gram Split	-	Quintal	Maharashtra	Mumbai	6250	5900	5700
Arhar Split	-	Quintal	Bihar	Patna	8500	8450	7080
Arhar Split	-	Quintal	Maharashtra	Mumbai	9400	8600	6500
Arhar Split	-	Quintal	NCT of Delhi	Delhi		7800	6600
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai		7000	7400
Gur	-	Quintal	Maharashtra	Mumbai	4700	4700	4300
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4500	4500	4200
Gur	Balti	Quintal	Uttar Pradesh	Hapur		2400	2360
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3900	4200	3400
Mustard Seed	Black	Quintal	West Bengal	Raniganj		4200	4200
Mustard Seed	-	Quintal	West Bengal	Kolkata	4600	4275	4100
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	5150	5400	4250
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	4600	4850	4300
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar		1800	1850
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3000	3000	2700
Castor Seed	-	Quintal	Telangana	Hyderabad		3900	5100
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	9500	9950	10400
Copra	FAQ	Quintal	Kerala	Alleppey	11250	NT	9950
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	5000	6000	5200
Groundnut	-	Quintal	Maharashtra	Mumbai	9100	8500	7300
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1385	1390	1345
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata		1380	1275

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

Commodity	Variety	Unit	State	Centre	Apr-20	Mar-20	Apr-19
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2000	1900	1480
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai		1900	1910
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1445	1460	1448
Castor Oil	-	15 Kg.	Telangana	Hyderabad		1260	1830
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi		1830	1760
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai		2900	3200
Coconut Oil	-	15 Kg.	Kerala	Cochin	2355	2325	2175
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2100	2150	1800
Groundnut Cake	-	Quintal	Telangana	Hyderabad		3642	3286
Cotton/Kapas	NH 44	Quintal	Andhra pradesh	Nandyal		5000	6050
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar		4600	5200
Jute Raw	TD 5	Quintal	West Bengal	Kolkata		4850	4375
Jute Raw	W 5	Quintal	West Bengal	Kolkata		4900	4425
Oranges	-	100 No	NCT of Delhi	Delhi		667	667
Oranges	Big	100 No	Tamil Nadu	Chennai		400	500
Banana	-	100 No.	NCT of Delhi	Delhi		458	417
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	300	300	630
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	80000	70000	74000
Almonds	-	Quintal	Maharashtra	Mumbai	61000	58000	60000
Walnuts	-	Quintal	Maharashtra	Mumbai	65000	60000	64000
Kishmish	-	Quintal	Maharashtra	Mumbai	20000	17000	20000
Peas Green	-	Quintal	Maharashtra	Mumbai	7000	6000	5400
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	1500	1500	1700
Ladyfinger	-	Quintal	Tamil Nadu	Chennai		2000	2100
Cauliflower	-	100 No.	Tamil Nadu	Chennai		2000	2550
Potato	Red	Quintal	Bihar	Patna	1900	1720	950
Potato	Desi	Quintal	West Bengal	Kolkata	1900	1300	800
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam		2230	2173
Onion	Pole	Quintal	Maharashtra	Nashik	700	1400	700
Turmeric	Nadan	Quintal	Kerala	Cochin	11000	11000	11000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai		10200	11000

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

Commodity	Variety	Unit	State	Centre	Apr-20	Mar-20	Apr-19
Chillies	-	Quintal	Bihar	Patna	13050	12650	9980
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	NT	NT	31000
Ginger	Dry	Quintal	Kerala	Cochin	27000	27000	24000
Cardamom	Major	Quintal	NCT of Delhi	Delhi		144000	120000
Cardamom	Small	Quintal	West Bengal	Kolkata		305000	195000
Milk	Buffalo	100 Liters	West Bengal	Kolkata		5200	5200
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi		70000	73333
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	42000	44000	42000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	40250	41000	38500
Fish	Rohu	Quintal	NCT of Delhi	Delhi		15000	16000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai		30000	43000
Eggs	Madras	1000 No.	West Bengal	Kolkata		3690	3735
Tea	-	Quintal	Bihar	Patna	21950	21950	21350
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	NT	NT	39000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	40000	40000	31450
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	29500	29500	24000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad		7800	7400
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad		4800	4100
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata		13200	12800
Rubber	-	Quintal	Kerala	Kottayam	NT	NT	11500
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai		63000	60500

Crop Production

Sowing and Harvesting Operations Normally in Progress during the Month of July, 2020

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, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca.	Autumn rice.
Assam	Winter Rice, Castorseed.	Autumn Rice, Jute.
Bihar	Autumn Rice, Winter Rice, Jowar (K) Bajra, Maize,Ragi, Small Millets (K) Tur (K), Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta.	Jute.
Gujarat	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Sannhemp.	–
Himachal Pradesh	Summer Rice, Jowar (K), Bajra, Ragi, Small Millets (K) Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Sesamum, Sennhemp, Sumer Potato (Plains).	Winter Potato (Hills).
Jammu & Kashmir	Autumn Rice, Jowar (K) Bajra, Small Millets (K), Urad (K), Mung (K), Winter Potato, Ginger, Tobacco, sesamum, Jute, Onion.	Tobacco, Sesamum, Onion.
Karnataka	Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Winter Potato (Plains), Summer Potato (Plains) Black Pepper, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca.	–
Kerala	Ragi, Sweet Potato, Tapicoa.	Sesamum, Tapioca.
Madhya Pradesh	Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Mung (K), Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed.	–
Maharashtra	Winter Rice, Jowar (K), Bajra, Maize, Ragi Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato (Plains), Chillies (Dry) Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sannhemp, Nigerseed.	–
Manipur	Winter Rice, Tur (K), Sesamum (K), Sweet Potato, Maize.	–
Orissa	Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Summer Potato (Plains), Chillies (Dry), Groundnut, Castorseed, Cotton, Mesta	Chillies (Dry.)

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF JULY, 2020-*Contd.*

State	Sowing	Harvesting
(1)	(2)	(3)
Punjab and Haryana	Autumn Rice, Summer Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Groundnut, Castorseed, Sweet Potato, Turmeric, Sannhemp.	Small Millets, (K), Potato.
Rajsthan	Autumn Rice, Jowar (K), Bajra, Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Groundnut, Castorseed, Cotton Sannhemp.	–
Tamil Nadu	Autumn Rice, Jowar (K), Bajra, Ragi, Small Millets (K), Tur (K), Urad (K), Summer Potato (Hills), Chillies (Dry), Groundnut, Castorseed, Seasamum, Cotton, Sannhemp, Onion, Tapioca.	Jowar (R), Summer Potato (Hills), Chillies (Dry), Sesamum, Cotton, Sannhemp.
Tripura	Winter Rice, Urad (K), Mung (K), Sesamum.	Onion, Autumn Rice.
Uttar Pradesh	Autumn Rice, Winter Rice, Jowar (K), Bajra Maize, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses Ginger, Groundnut, Castorseed, Sannhemp, Nigerseed, Tapicoca.	Small Millets (R), Chillies(Dry).
West Bengal	Autumn Rice, Winter (Rice), Tur (K), Ginger, Chillies (Dry).	Chillies (Dry), Sesamum.
Delhi	Summer Rice, Jowar (K), Bajra, Maize, Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato (Plains), Chillies (Dry), Cotton, Sweet Potato.	Winter Potato (Plains), Onion.
Andaman & Nicobar	Autumn Rice, Winter Rice.	–

(K) – Kharif (R) – - Rabi

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Note to Contributors

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c) Abstract (with keywords) is required and should not exceed 300 words in length.

d) The title page should contain the title, author name(s) andinstitutional affiliation (s).

e) The text should follow UK English and Number bullets should be used wherever required.

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Abbreviations used

N.A. — Not Available.
N.Q. — Not Quoted.
N.T. — No Transactions.
N.S.—No Supply/No Stock.
R. — Revised.
M.C. — Market Closed.
N.R.—Not Reported.
Neg. — Negligible.
Kg. — Kilogram.
Q. — Quintal.
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