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From Editor's Desk

This issue of 'Agricultural Situation in India' highlights the Government's new initiatives and current policy in the farm sector and also provides a consolidated survey of agriculture, two academic research articles, one on rural transformation and farmers' income in Punjab; and, second, on a farm level analysis on ecological, economic and social sustainability of sugarcane cultivation in Maharashtra and an agro-economic research study report on the assessment of livestock feed and fodder in Gujarat.

Important farm sector news discussed in this issue are: the Cabinet's approval on extension of repayment date for short term loans upto 3 lakhs for agriculture and allied activities; hike in the minimum support price of Kharif Crops for marketing season 2020-21; release of second advance estimates of 2019-20 for horticulture crops; boost to rural India through Cabinet's various historic decisions and ordinances; annual allotment under 'Per Drop More Crop' and creation of Micro Irrigation Fund Corpus under NABARD; launch of SahakarMitra, a scheme on internship programme (SIP); Union Minister of Agriculture's address to 24th management board and 19th annual general board meeting of Small Farmers' Agribusiness Consortium (SFAC); organization of webinarson connecting agroforestry farmers to industry, reforms in Indian agriculture, strategic policy shifts and investment opportunities; declaration of minimum support price for mature de-husked coconut; and the various initiatives of government to utilize and arrange resources to control locust along with trials of Make in India prototype vehicle mounted ULV sprayer and helicopter services for aerial spray.

So far as the agricultural scenario is concerned, the Wholesale Price Index (WPI) of foodgrains, pulses, cereals, wheat and paddy increased by 3.69 percent, 11.91 percent, 1.97 percent, 6.04 percent and 1.21 percent, respectively, in May, 2020 as compared to that in May, 2019. The cumulative monsoon season, 2020 rainfall in the country has been 19 percent higher than the long period average during 1st June, 2020 to 29th June, 2020. Current live storage in 123 major water reservoirs in the country was 56.73 BCM as against 33.21 BCM of normal storage based on the average storage of last 10 years.

On academic contemplation, in the first article, the author analyses the growth performance of agriculture in Punjab with special reference to food grains and other commercial crops by undertaking a comparative study of cost and returns of major crops grown in Punjab. Using secondary data collected from CACP reports, NSSO surveys (Situation Assessment of Farmers, 2003 and Situation Assessment of Agricultural Households, 2013), etc., the study highlights the relative importance of the agriculture sector in the economy in the wake of improvements in agricultural production. On the basis of research done, the author concludes that the relative share of farm sector has declined, whereas that of non–farm sector has increased. The income earned by farmers from agricultural activities after paying for input costs and the wages for hired labour, has been increasing and fluctuating during the last three decades. The analysis of different crops presented in the study shows that the farmers have either realized low profits or suffered losses in cultivating major investigated crops. High use of various yield increasing inputs leads to rise in cost of cultivation for most of the crops. The rise in cost of cultivation is found to be higher than that of the value of output in many crops, made a significant impact on the profit margins of the farmers. So, the author suggested that the policy makers must keep close vigilance on the movement of both cost and value of output so as to announce the MSP for major crops in consonance with the cost of cultivation.

In the second article, Dr. AbanveVikas, interestingly. makes an attempt to ascertain how adoption, knowledge level and attitude of sugarcane growers towards sustainable sugarcane cultivation practices in Maharashtra eventually benefit ecological, economic and social sustainability. The study is based on primary data collected from four districts, namely, Pune, Solapur, Osmanabad and Latur of Maharashtra during 2017-18 using stratified multi-stage sampling method.The study reveals that almost all sugarcane growers agreed that the sustainability issue is one of the key factors for the future success of sugarcane cultivation. About 84 percent of growers agreed that sugarcane cultivation helps in the emergence of sugarcane-based ancillary activities. Sugarcane growers are found to strongly agree (89 percent) over the need for social participation. Sugarcane growers suggested that timely availability of suitable inputs and its demonstration at the village level, training programmes, reasonable inputs prices, promotion of bio-fertilizers instead of chemical fertilizers and development of pest and diseases resistant sugarcane varieties will help them in adoption of sustainable practices. While, the author suggested thatin order to achieve or maintain sustainability, a positive attitude is required to be developed among sugarcane growers towards extensions. Moreover, the constraints faced by the respondents need to be taken into consideration by the Government on a priority basis to make a larger number of best adopters of sustainable practices among sugarcane growers.

In agro-economic research column, we are sharing a report on assessment of livestock feed and fodder in Gujarat prepared by Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat. Primary objectives of the study are to examine demand, supply, and deficit of feed and fodder production in the Gujarat. To realize these objectives, primary data using sample survey method and secondary level data of livestock and fodder from published sources were collected. On the basis of findings, the study suggests to increase public investment in the livestock sector; to work out strategies for sufficient good quality feed and fodder for efficient utilization of genetic potential of various livestock and sustainable improvement in productivity; to involve local educated youth in the form of local resource persons (LRPs); to encourage cooperative farming of fodder on barren land; and to support the Milk Producer Companies in all the areas for balanced development of dairy sector.

P. C. Bodh

Farm Sector News*

Cabinet approves extension of repayment date for short term loans for agriculture and allied activities by banks which have become due or shall become due between 1st March, 2020 and 31st August, 2020

The Union Cabinet chaired by the Prime Minister, Shri Narendra Modi, has given its approval to extend repayment date up to 31st August, 2020 for Standard Short-Term loans upto Rs 3 lakh advanced for agriculture and allied activities by banks, which have become due or shall become due between 1st March, 2020 and 31st August, 2020 with continued benefit of 2% Interest Subvention (IS) to Banks and 3% Prompt Repayment Incentive (PRI) to farmers.

Benefit

Extension of repayment date upto 31st August, 2020 for Standard Short-Term loans upto Rs 3 lakh for agriculture and allied activities by banks falling due between 1st March, 2020 and 31st August, 2020 with continued benefit of 2% IS to Banks and 3% PRI to farmers, shall help the farmers to repay/renew such loans upto the extended repayment date of 31st August, 2020 at 4% p.a., interest without attracting any penalty and thus help them in avoiding travelling to banks for such renewal during this COVID pandemic period.

Minimum Support Prices (MSP) of Kharif Crops for marketing season 2020-21

The Cabinet Committee on Economic Affairs (CCEA) chaired by the Hon'ble Prime Minister Shri Narendra Modi has approved the increase in the Minimum Support Prices (MSPs) for all mandated Kharif crops for marketing season 2020-21.

Government has increased the MSP of Kharif crops for marketing season 2020-21, to ensure remunerative prices to the growers for their produce. The highest increase in MSP is proposed for nigerseed (Rs 755 per quintal) followed by sesamum (Rs 370 per quintal), urad (Rs 300 per quintal) and cotton (long staple) (Rs 275 per quintal). The differential remuneration is aimed at encouraging crop diversification.

The increase in MSP for Kharif crops for marketing season 2020-21 is in line with the Union Budget 2018-19 announcement of fixing the MSPs at a level of at least 1.5 times of the All India weighted average Cost of Production (CoP), aiming at reasonably fair remuneration for the farmers. The expected returns to farmers over their cost of production are estimated to be highest in case of bajra (83%) followed by urad (64%), tur (58%) and maize (53%). For rest of the crops, return to farmers over their cost of production is estimated to be at least 50%.

MSP for all Kharif crops for marketing season 2020-21

Sl. No.	Crops	Projected Cost KMS 2020-21	MSP for Kharif 2020-21	Increase in MSP (Absolute)	Return over Cost (in %)
1	Paddy (Common)	1,245	1,868	53	50
2	Paddy (Grade A)^	-	1,888	53	-
3	Jowar (Hybrid)	1,746	2,620	70	50
4	Jowar (Maldandi)^	-	2,640	70	-
5	Bajra	1,175	2,150	150	83
6	Ragi	2,194	3,295	145	50
7	Maize	1,213	1,850	90	53
8	Tur (Arhar)	3,796	6,000	200	58
9	Moong	4,797	7,196	146	50
10	Urad	3,660	6,000	300	64
11	Groundnut	3,515	5,275	185	50
12	Sunflower Seed	3,921	5,885	235	50
13	Soybean (yellow)	2,587	3,880	170	50
14	Sesamum	4,570	6,855	370	50
15	Nigerseed	4,462	6,695	755	50
16	Cotton (Medium Staple)	3,676	5,515	260	50
17	Cotton (Long Staple)^	-	5,825	275	-

^Cost data are not separately compiled for Paddy (Grade A), Jowar (Maldandi) and Cotton (Long staple)

*Source: www.pib.nic.in

Government's strategy is to promote sustainable agriculture with diversified cropping pattern matching with the country's agro-climatic conditions, towards higher productivity without jeopardizing nation's bio-diversity. Support is in the form of MSP as well as procurement with the intention of giving enough policy thrust to income security of the farmers. Government's production-centric approach has been replaced by income-centric approach.

Concerted efforts were made over the last few years to realign the MSPs in favour of oilseeds, pulses and coarse cereals to encourage farmers shift to larger area under these crops and adopt best technologies and farm practices, to correct demand - supply imbalance. The added focus on nutri-rich nutri-cereals is to incentivize its production in the areas where rice-wheat cannot be grown without long term adverse implications for groundwater table.

In continuation with the above-mentioned measures, Government is taking holistic approach towards supporting the farmers and facilitate farming related activities in the lockdown situation due to Covid-19. Efforts are being made to facilitate marketing of agricultural produce by the farmers. Advisories have been issued by the union government to state governments/UT to facilitate direct marketing, enabling direct purchase from the farmers/FPOs/cooperatives, etc., by bulk buyers/ big retailers / processors by limiting regulation under state APMC Act.

Besides, the umbrella scheme "Pradhan Mantri Annadata Aay SanraksHan Abhiyan" (PM-AASHA) announced by the government in 2018 would aid in providing remunerative return to farmers for their produce. The umbrella scheme consists of three sub-schemes, i.e., Price Support Scheme (PSS), Price Deficiency Payment Scheme (PDPS) and Private Procurement & Stockist Scheme (PPSS) on a pilot basis.

In order to provide food security during the prevailing situation due to COVID-19 pandemic, the Government has decided to distribute pulses to the eligible households under Pradhan Mantri Garib Kalyan Yojana (PM-GKY). About 1,07,077.85 MT pulses have so far been issued to the States/ UTs.

2nd Advance Estimates of 2019-20 of Horticulture Crops

Department of Agriculture, Cooperation and Farmers Welfare has released the 2nd advance estimates of 2019-20 for area and production of various horticulture crops. These are based on the information received from states and other source agencies.

Total Horticulture	2018-19 (Final)	2019-20 (2nd Advance Estimate)
Area (Million Hectare)	25.43	25.66
Production (Million Tonne)	310.74	320.48

Highlights of 2019-20 (2nd Advance Estimates)

- Total horticulture production in 2019-20 (2nd advance estimates) is estimated to be 3.13% higher than 2018-19.
- Increase in vegetables, fruits, aromatics and medicinal plants and flowers, while decrease in plantation crops and spices, over previous year, is observed.
- The fruits production is estimated to be 99.07 million tonne compared to 97.97 million tonne production in 2018-19. It is mainly due to increase in production of banana, apple, citrus fruits and watermelon.
- The production of vegetables in 2019-20 is estimated to be 191.77 million tonne, compared to 183.17 million tonne in 2018-19. Increase is mainly due to increased production of onion, tomato, okra, peas, potato, etc.
- Onion production is estimated to be 26.74 million tonne, as compared to 22.82 million tonne in 2018-19.
- Tomato production is estimated to be 20.57 million tonne (increase of 8.2%) as compared to 19.01 million tonnes in 2018-19.

PM chairs Cabinet Meeting to give historic boost to Rural India

The Union Cabinet chaired by Prime Minister Shri Narendra Modi met on 3rd June, 2020. Several landmark and historic decisions were taken in the meeting, which would go a long way in helping India's farmers while also transforming the agriculture sector.

i. Historic Amendment to Essential Commodities Act

The Cabinet today approved historic amendment to the Essential Commodities Act. This is a visionary step towards transformation of agriculture and raising farmers' income.

Background

While India has become surplus in most agri-commodities, farmers have been unable to get better prices due to lack of investment in cold storage, warehouses, processing and export as the entrepreneurial spirit gets dampened due to hanging sword of Essential Commodities Act. Farmers suffer huge losses when there are bumper harvests, especially of perishable commodities. With adequate processing facilities, much of this wastage can be reduced.

Benefits

With the amendment to Essential Commodities Act, commodities like cereals, pulses, oilseeds, edible oils, onion and potatoes would be removed from list of essential commodities. This would remove fears of private investors of excessive regulatory interference in their business operations.

The freedom to produce, hold, move, distribute and supply would lead to harnessing of economies of scale and attract private sector/foreign direct investment into agriculture sector. It would help drive up investment in cold storages and modernization of food supply chain.

Safeguarding interest of consumers

The Government, while liberalizing the regulatory environment, has also ensured that interests of consumers are safeguarded. It has been provided in the amendment, that in situations such as war, famine, extraordinary price rise and natural calamity, such agricultural foodstuffs can be regulated. However, the installed capacity of a value chain participant and the export demand of an exporter would remain exempted from such stock limit imposition so as to ensure that investments in agriculture are not discouraged.

The amendment announced would help both farmers and consumers while bringing in price stability. It would create competitive market environment and also prevent wastage of agri-produce that happens due to lack of storage facilities.

ii. Barrier-free trade in agriculture produce

Cabinet approved 'The Farming Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020'.

Background

Farmers in India today suffer from various restrictions in marketing their produce. There are restrictions for farmers in selling agri-produce outside the notified APMC market yards. The farmers are also restricted to sell the produce only to registered licensees of the state governments. Further, barriers exist in free flow of agriculture produce between various States owing to the prevalence of various APMC legislations enacted by the state governments.

Benefits

The Ordinance would create an ecosystem where the farmers and traders would enjoy freedom of choice of sale and purchase of agri-produce. It would also promote barrier-free inter-state and intra-state trade and commerce outside the physical premises of markets notified under state agricultural produce marketing legislations. This is a historic-step in unlocking the vastly regulated agriculture markets in the country.

It would open more choices for the farmer, reduce marketing costs for the farmers and help them in getting better prices. It would also help farmers of regions with surplus produce to get better prices and consumers of regions with shortages, lower prices. The ordinance also proposes an electronic trading in transaction platform for ensuring a seamless trade electronically.

The farmers would not be charged any cess or levy for sale of their produce under this Act. Further, there would be a separate dispute resolution mechanism for the farmers.

One India, One Agriculture Market

The ordinance basically aims at creating additional trading opportunities outside the APMC market yards to help farmers get remunerative prices due to additional competition. This would supplement the existing MSP procurement system which is providing stable income to farmers.

It would certainly pave the way for creating One India, One Agriculture Market and would lay the foundation for ensuring golden harvests for our hard working farmers.

iii. Farmers empowered to engage with processors, aggregators, wholesalers, large retailers, exporters

Cabinet approved 'The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020'.

Background

Indian Agriculture is characterized by fragmentation due to small holding sizes and has certain weaknesses such as weather dependence, production uncertainties and market unpredictability. This makes agriculture risky and inefficient in respect of both input & output management.

Benefits

The ordinance would empower farmers for engaging with processors, wholesalers, aggregators, wholesalers, large retailers, exporters, etc., on a level-playing-field without any fear of exploitation. It would transfer the risk of market unpredictability from the farmer to the sponsor and also enable the farmer to access modern technology and better inputs. It would reduce cost of marketing and improve income of farmers.

This Ordinance would act as a catalyst to attract private sector investment for building supply chains for supply of Indian farm produce to global markets. Farmers would get access to technology and advice for high value agriculture and get ready market for such produce.

Farmers would engage in direct marketing thereby eliminating intermediaries resulting in full realization of price. Farmers have been provided adequate protection. Sale, lease or mortgage of farmers' land is totally prohibited and farmers' land is also protected against any recovery. Effective dispute resolution mechanism has been provided with clear timelines for redressal.

Government committed to the cause of farmer welfare

A series of steps were announced as part of the Atmanirbhar Bharat Abhiyaan to provide a boost to those engaged in agriculture and allied activities. These include provision of concessional credit through Kisan Credit Cards, financing facility for agri-infra projects, Pradhan Mantri Matsya Sampada Yojana and other measures to strengthen fisheries, vaccination against foot & mouth disease and brucellosis, herbal cultivation promotion, boost to beekeeping, operation green, etc.

Through PM-KISAN, over 9.54 crore farmer families (as on first June, 2020) have been benefited and an amount of Rs. 19,515 crore has been disbursed so far during the lockdown period. An amount of Rs. 8090 crore has been paid during lockdown period under PMFBY.

These are the latest steps in a series of measures taken by the government, which shows continuous commitment of government to championing the cause of welfare of the hardworking farmers of India.

Annual allotment of Rs. 4000 crore under 'Per Drop More Crop' and Micro Irrigation Fund corpus of Rs. 5000 crore also created with NABARD

Department of Agriculture Cooperation & Farmers Welfare is implementing 'Per Drop More Crop' component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY- PDMC). The PMKSY-PDMC focuses on enhancing water use efficiency at farm level through micro irrigation technologies viz., Drip and Sprinkler irrigation systems. Drip micro irrigation technique not only helps in water saving but also in reducing fertilizer usage, labour expenses and other input costs.

For the current year, annual allotment of Rs

4000 crore has already been allocated and conveyed to the state governments. The state governments have identified the beneficiaries to be covered under the programme. Fund release to some of the states is already under process for the year 2020-21.

Further, Micro Irrigation Fund corpus of Rs 5000 crore has been created with NABARD. The objective of the fund is to facilitate the states in mobilizing the resources for expanding coverage of micro irrigation by taking up special and innovative projects and also for incentivizing micro irrigation beyond the provisions available under PMKSY-PDMC to encourage farmers to install micro irrigation systems. So far, Micro Irrigation Funds have been released to the states of Andhra Pradesh and Tamil Nadu for Rs. 616.14 crore and for Rs.478.79 crore, respectively, through NABARD. The area covered under these projects is 1.021 lakh hectare in Andhra Pradesh and 1.76 lakh hectare in Tamil Nadu.

Union Minister for Agriculture & Farmers Welfare Shri Narendra Singh Tomar launches Sahakar Mitra Scheme on Internship Programme, an initiative by National Cooperative Development Corporation

In keeping with Prime Minister Shri Narendra Modi's clarion call for Atma Nirbhar Bharat (Self Reliant India) emphasizing the importance of vocal for local, Sahakar Mitra: Scheme on Internship Programme (SIP) was launched on 11th June, 2020 by Union Minister for Agriculture & Farmers Welfare Shri Narendra Singh Tomar. While launching the scheme, Shri Tomar said that the unique cooperative sector development finance organization, National Cooperative Development Corporation, NCDC has embarked upon a series of initiatives in the cooperative sector entrepreneurship development ecosystem through capacity development, paid internship to youth and assured project loans on liberalized terms to young cooperators on start-up mode.

The Minister said that NCDC has been proactive in delivering innovative solutions for the cooperative sector. In the series of initiatives by NCDC, the new scheme called Sahakar Mitra: Scheme on Internship Programme (SIP) would provide the young professionals an opportunity of practical exposure and learning from the working of NCDC and cooperatives as a paid intern. NCDC has also introduced a complementary scheme to promote start-up cooperative ventures. Sahakar Mitra would also provide an opportunity to professionals from academic institutions to develop leadership and entrepreneurial roles through cooperatives as Farmers Producers Organizations (FPO).

Sahakar Mitra scheme is expected to assist cooperative institutions access new and innovative ideas of young professionals while the interns gain experience of working in the field giving confidence to be self-reliant. It is expected to be a win-win situation both for cooperatives as well as for the young professionals.

Under the scheme, professional graduates in disciplines such as Agriculture and allied areas, IT, etc., would be eligible for internship. Professionals who are pursuing or have completed their MBA degrees in agri-business, cooperation, finance, international trade, forestry, rural development, project management, etc., would also be eligible.

NCDC has earmarked funds for Sahakar Mitra paid internship program under which each intern would get financial support over a four months internship period. Online application portal for internship application available on NCDC website, was also launched by the Union Agriculture & Farmers Welfare Minister.

Union Minister of Agriculture & Farmers Welfare, Shri Narendra Singh Tomar asserts that Small Farmers' Agribusiness Consortium (SFAC) has the important responsibility of formation of 10000 FPOs and strengthening of the e-NAM platform

Union Minister of Agriculture & Farmers Welfare, Rural Development & Panchayati Raj, Shri Narendra Singh Tomar, has said that Prime Minister Shri Narendra Modi has made revolutionary reforms in the field of agriculture, including the important step of announcing the formation of 10 thousand Farmer Producer Organizations (FPOs). The responsibility of completing this task lies with the Small Farmers' Agri-business Consortium (SFAC), which is also responsible for strengthening the e-NAM platform in the present circumstances. There has been considerable progress in institutional and private investments after the establishment of SFAC.

Addressing the 24th Management Board and 19th Annual General Board meetings of the SFAC, Shri Tomar congratulated SFAC team for linking

1000 markets to e-NAM in two phases. He further said that the purpose of creating the platform should be accomplished. Business of more than Rs. one lakh crore has been transacted over the e-NAM platform till now. More than 1.66 crore farmers and more than 1.30 lakh businesses have been registered with e-NAM since its inception. Shri Tomar said that it is a challenge for us to ensure that as a result of reforms, there is ease in selling of produce, along with transparency, farmers get remunerative prices for their produce and they have direct access to this platform. Farmers have completed the harvesting work with great dedication even during the period of lockdown and earning is also now being completed successfully. SFAC must be congratulated for helping the farmers in this.

Shri Tomar said that previously SFAC used to form FPOs on the basis of existing schemes, but it is a matter of happiness that Hon'ble Prime Minister has announced the formation of 10 thousand FPOs across the country which would give a boost to this task. FPOs must not only be formed but they must also achieve their objectives. Their responsibilities increase in ensuring that farmers gather in groups, hold discussions and get trained, increase their production, diversify their crops, and discuss ways of decreasing use of pesticides, etc. Hon'ble Prime Minister has set the target of doubling farmers' incomes. In between the problem of COVID-19 appeared, yet the pace of Ministry of Agriculture and farmers has not slackened. Shri Narendra Singh Tomar appreciated that SFAC launched the Kisan Rath app with the help of officials of the Ministry of Agriculture which lessened the problem of transport of farm produce during lockdown.

Webinar on Connecting Agroforestry Farmers to Industry Held

A webinar was organized on 13th June, 2020 to discuss the ways and means to connect agroforestry farmers to industry and sensitize implementing states to assist farmers in making the correct choice of species. Shri Sanjay Agarwal, Secretary Department of Agriculture Cooperation and Farmers Welfare while inaugurating the webinar dwelt on the various reforms brought in the agriculture sector to ensure optimum remuneration to farmers to ensure their welfare, including Rs 1.63 lakh crore outlay and the Farming Produce Trade and Commerce (Promotion and Facilitation) Ordinance 2020 to establish a truly national market and give farmers the option to choose the market where they want to sell their produce by removing inter-state trade barriers and providing e-trading of agriculture produce. He highlighted the multiple uses of agroforestry ranging from additional income to farmers, nurseries as a means of livelihoods especially for women SHGs, green fodder, reduction in requirement of fertilizers by planting leguminous species, carbon sequestration for combating climate change, etc.

Prime Minister's call for Vocal for our Local is of great relevance to agroforestry too. Agroforestry could contribute to stepping up supply of raw material to industry to reduce import dependency in some crucial commodities. The earlier notion of agroforestry meaning only timber species, needs to have a relook from farmers and industry point of view. Timber trees have long maturity period and hence delays returns to the farmers. Whereas there are number of rising sectors which would ensure quick returns to farmers as well as fulfill industry requirements, including medicinal and aromatic plants, silk, lac, paper and pulp, tree borne oil seeds for production of bio-fuels, etc.

In the first of a series planned, this webinar had four prominent speakers, namely, Dr J. L. N. Sastry, Chief Executive Officer, National Medicinal Plant Board, Shri Rohit Pandit, Secretary General, Indian Papers Manufacturers Association, Dr H.K. Kulkarni, Former Vice President, ITC Limited and Shri Rajit Ranjan Okhandiar, Chief Executive Officer and Member Secretary Central Silk Board. Promotion of medicinal plants is a major component of Atma Nirbhar Bharat and there is tremendous scope for convergence for tree based and organic medicinal produce. Issues relating to constraints in supply of raw material to paper industry, which is being made up by imports, were discussed. Quality planting material is the basis for improving productivity and hence returns to farmers. The presentation flagged the importance of clonal planting material of the correct varieties which would also comply with industry requirement. Central Silk Board assured to assist farmers who plant the range of silk host species, which on an average would start giving returns in 3-4 years and hence were ideal for agroforestry systems.

In conclusion, states were advised to encourage contract farming on similar lines as crops right from pre planting, planting and harvest. Industry, both existing and potential, should be taken as the hub

and activities planned around that. Multipurpose species should be encouraged so that returns start flowing at the earliest. This would enable fulfillment of the vision of an 'Aatma Nirbhar Bharat'.

India became the first country in the world to formulate a National Agroforestry Policy in 2014. As a follow up, the Sub Mission for Agroforestry was launched in 2015 to assist the states in encouraging farmers to adopt tree planting along with crops. Agro climatic zone wise agroforestry models have been developed by research institutions, including ICAR and ICFRE. The scheme is currently being implemented in 21 States of the country.

Government declares Minimum Support Price for Mature Dehusked Coconut

Government of India has declared Minimum Support Price for mature dehusked coconut for the season 2020 at Rs. 2700/- per quintal, thus hiking the MSP by 5.02% from Rs. 2571/- per quintal during season 2019.

Giving this information, Union Minister of Agriculture & Farmers Welfare, Rural Development and Panchayati Raj, Shri Narendra Singh Tomar said that the Government of India under Prime Minister Shri Narendra Modi has given utmost importance to the interests of farmers growing all kinds of crops throughout the country. The hike in the MSP for mature dehusked coconut facilitates procurement of fresh coconut thereby ensuring that the benefit of MSP reaches the millions of small holder coconut farmers.

Shri Tomar said that coconut being a small holder's crop, aggregation and arranging copra making facility at farmer's level is not common. Even though MSP for milling copra is Rs. 9960/- per quintal for 2020 crop season, declaration of higher MSP for dehusked coconut ensures immediate cash to the small farmers, who are unable to hold the product and who are having insufficient facility for copra making. This would be a relief to the coconut farmers who are already affected by the pandemic and the consequent disruption in the supply chain.

Under Make in India initiative in locust control, trials of prototype vehicle mounted ULV sprayer have been successfully conducted in Ajmer and Bikaner; approvals required for commercial launch are underway

To overcome the limitation of importing equipment, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW), under Make in India initiative, has taken up the challenge to indigenously develop a vehicle mounted ULV sprayer for locust control. Leading the initiative, the mechanization and technology division of DAC&FW got a prototype of the sprayer developed through an Indian manufacturer. The trials of the sprayer have been successfully conducted in Ajmer and Bikaner district of Rajasthan. The other approvals required for commercial launch are underway. This is a major breakthrough as this would end the dependence of importing a very important equipment of locust control.

At present, the sole supplier of vehicle mounted sprayers is M/s Micron Sprayers, UK. Supply order for 60 sprayers was placed on the firm in February, 2020. Ministry for External Affairs and Ministry for Commerce and Industry were involved in expediting the supply of these equipments. High Commission of India, UK is also regularly following up with the firm and monitoring the early supply of the sprayers. Till date only 15 sprayers have been received. The supply of rest of 45 units would be completed within a month's time.

However, the ground control vehicles with sprayers used for locust control can spray up to a height of 25-30 ft only. The tractor mounted sprayers also has a limitation in reaching inaccessible areas and tall trees. Therefore, the necessity of exploring aerial spray option was explored.

During a review, Union Minister of Agriculture and Farmers Welfare, Shri Narendra Singh Tomar, directed that deployment of drones should be explored for locust control. As the existing policy guidelines issued by Ministry of Civil Aviation (MoCA) did not permit use of drones with payload of pesticides, so DAC&FW requested MoCA for permitting the same and Ministry of Civil Aviation approved conditional exemption to Government entity, i.e., Directorate of Plant Protection, Quarantine & Storage, Faridabad (DPPQ&S) for drone operations for locust control on 21.05.2020. Also, on 22.05.2020, the standard operating procedure of aerial spraying of insecticides by drones, airplanes and helicopters was approved by the Central Insecticides Board for locust control.

Subsequent to the conditional exemption given

by MoCA, two firms were empanelled for providing services of drones for spray of pesticides for locust control. These firms conducted some trials in Jaipur (Rajasthan) and Shivpuri (Madhya Pradesh). As a follow up of review meeting held at the level of cabinet secretary on 27.05.2020, a meeting was held by Secretary of Agriculture, Cooperation and Farmers Welfare with Secretary of Ministry of Civil Aviation, representatives of NDMA and Pawan Hans on the same day. The issue of availability of helicopter/aircraft with air-spray equipment and the strategy for maximizing the deployment of drones for locust control was discussed. An Empowered committee under the Chairmanship of the Additional Secretary, DAC&FW comprising of officers of the MoCA, Pawan Hans, DGCA, Air India and DAC&FW as members was constituted for facilitating the procurement of goods and services for aerial spray of pesticides through drones, aircraft and helicopter.

Thereafter, on the recommendation of the empowered committee work order for engagement of drones to five companies (@5 drones each) has been issued. All five drone service providers have started work at Barmer, Jaisalmer, Bikaner, Nagore and Phalodi (Jodhpur) district of Rajasthan with deployment of 12 drones till date in phased manner. The experience of use of drones has been more than satisfactory in inaccessible areas and for effective control over tall trees. The deployment of drones has added another dimension in the capabilities of locust circle offices to ensure effective control over desert locust. Food and Agriculture Organization (FAO) of the United Nations has appreciated that India is the first country in the world which is controlling desert locust through drones.

Department of Agriculture, Cooperation & Farmers Welfare, Government of India, hosts two webinars on Reforms in Indian Agriculture, Strategic Policy Shifts and Investment Opportunities

Department of Agriculture, Cooperation & Farmers Welfare, Government of India hosted two webinars on 25th & 26th June, 2020 – the first webinar was on the topic "Landmark Reforms in Indian Agriculture – Investment Opportunities Arising in Agri Enterprises", while the second webinar dealt with "Ushering a new dawn in Agri Reforms – Strategic Policy Shifts: The Policy Makers' View". The webinars were addressed by Shri Sanjay Agarwal, Secretary, Agriculture & Farmers Welfare, Shri Atul Chaturvedi, Secretary, Animal Husbandry & Dairying, Dr. Rajeev Ranjan, Secretary, Fisheries and Smt. Pushpa Subrahmanyam, Secretary, Food Processing, Government of India.

While addressing the webinars, Shri Sanjay Agarwal, Secretary, Agriculture & Farmers Welfare, appreciated the path-breaking futuristic steps taken by the Government of India under the leadership of Prime Minister Shri Narendra Modi for the agriculture sector and welfare of farmers, during the crisis created by the Covid-19 pandemic. The competence of Indian farmers and efforts of the industry in this crisis situation is evident by the fact that the area covered by Kharif sowing this year is 316 lakh hectare as compared to 154 lakh hectare last year and an average of 187 lakh hectare during the last five years.

He emphasized that India has a strong advantage in the agriculture sector which contributes to about 15% of the GDP and livelihood for more than 50% of the population. The country is the fourth largest producer of agrochemicals, has the largest livestock population of around 31% of world's livestock and largest land area under irrigation. However, food processing in India is less than 10% and the target is to increase it to 25%. There is increasing demand for value-added health-fortified and processed food. The global organic market is growing at 12% per annum. He reiterated that developing a strong Agri ecosystem by providing access to better marketing avenues for farmers' produce and freeing up the sector from restrictive laws is a key focus area for the government, for which three new ordinances have been announced recently. The agri ecosystem is also being strengthened by several enabling schemes like the Agri Infra Fund of Rs. 1 lakh crore for post-harvest infrastructure, scheme for 10000 FPOs, special drive to include 25 million farmers who still do not have the KCC, and developing a digital agri-stack which would be a key enabler for online market places and smart agriculture. The Secretary, Agriculture & Farmers Welfare, projected an aspirational vision for 'Atmanirbhar Agriculture' by transforming farmers into entrepreneurs with higher incomes and better quality of life, making agriculture the "go to" investment opportunity, and making India the "Food Basket" for the world.

Comparing livestock rearing to an ATM machine for farmers, Shri Atul Chaturvedi, Secretary, Animal Husbandry & Dairying, said that no product

is as fast moving as milk for a retailer. However, the per capita consumption of milk in India is still only 394 gms per day as compared to 500-700 gms per day in US & Europe. The aim is to raise market demand in dairy sector from 158 million mttonne presently to 290 million mttonnes over next five years. The share of the organized sector in milk processing is targeted to be raised to 50% from present 30-35%.

Shri Chaturvedi said that Government of India has taken several measures to boost the animal husbandry sector. This includes giving one billion doses of vaccine in a year for FMD which is a bigger drive than in any other country to ensure that cattle are disease-free; animal tagging of five species through Pashu-Aadhar – about 57 crore animals would have unique ID over next 1.5 years on digital platform for mapping their parentage, breed and productivity; improving cattle breeds through artificial insemination, IVF and surrogacy; and aiming to unleash rural entrepreneurs by growing better feed and fodder for animals. Several incentives have been announced like Dairy Infra Development Fund in 2018 and Animal Husbandry Infra Development Fund this month.

Describing fisheries as a sunrise sector, Dr. Rajeev Ranjan, Secretary, Fisheries, said that from 2014-15 to 2018-19, fisheries sector has grown by 10.87%, fish production by 7.53%, fisheries exports have grown by 9.71% and India's global share of fish production has grown to 7.73%. India is now the 2nd largest aquaculture producer in the world and 4th largest sea food exporter. The USPs of the fisheries sector are its high growth rate, vast and diverse resources, low investment with high returns, low gestation period, strong technical backup, huge consumer base and export opportunities.

Dr. Rajeev Ranjan projected the key targets of Government of India in this sector in next five years – fish production targeted to be raised from 137.58 lakh tonnes in 2018-19 to 220 lakh tonnes in 2024-25, average aquaculture productivity to be raised from 3.3 tonnes/hectare to 5.0 tonnes/hectare in 2024-25, fisheries exports to Rs 1 lakh crore by 2024-25 and Rs 2 lakh crore by 2028, and employment generation from about 15 lakhs in 2018-19 to about 55 lakhs in 2024-25. He also elaborated on the recent policy reforms and government initiatives in fisheries sector like Fisheries Infrastructure Development Fund and KCC facility to fishermen. The Secretary outlined the investment opportunities in fish farming like brackish water aquaculture, cage farming, seaweed farming, and ornamental fisheries; and in support services like brood banks, hatcheries, feed manufacturing, value chain and processing, etc.

Union Agriculture & Farmers Welfare Minister, Shri Narendra Singh Tomar, flags off helicopter services for locust control through aerial spray

Union Agriculture & Farmers Welfare Minister, Shri Narendra Singh Tomar, on 30th June, 2020, flagged off a Bell Helicopter with spray equipment from a helipad facility at Gautam Buddh Nagar, Greater Noida, Uttar Pradesh. The helicopter would fly from Air Force Station at Uttarlai, Barmer where it would be stationed initially and from there deployed for locust control in desert areas of Barmer, Jaisalmer, Bikaner, Jodhpur and Nagaur. The Bell 206-B3 helicopter would have single pilot operation, and a pesticide carrying capacity of 250 litres in one trip and can cover about 25 to 50 hectare area in one flight. An Empowered Committee finalized the firm for deploying one helicopter for aerial spray in desert area after getting all the clearances from DGCA and Ministry of Civil Aviation.

Later, interacting with the media, Shri Narendra Singh Tomar said it was after a long gap of 26 years that last year locust attack took place. Government of India and State Governments worked in coordination to effectively control it. It was estimated that this year there would be greater locust problem, but Government is in full preparedness and all the State Governments have been alerted and are working in close coordination with the Centre. Deployment of machines, vehicles and manpower has been increased and concerned states are utilizing SDRF funds to tackle the problem. Drones have been used for the first time for locust control and today aerial spraying of insecticides with the use of helicopter has also been launched. He expressed gratitude to Ministry of Civil Aviation for enabling the deployment of drones and helicopter. Shri Tomar informed that order has been placed for 05 numbers of aerial spraying machines from a UK-based company, and once these are received, they would be deployed in IAF helicopters and pressed into operation for locust control. Shri Kailash Choudhary, Union Minister of State for Agriculture and Farmers Welfare, Shri Mahesh Sharma, Member of Parliament and former Union Minister, and Shri Sanjay Agarwal, Secretary, Agriculture were also present.

The deployment of the helicopter for locust control operations follows the need to strengthen air control capabilities for locust control through drones, helicopters and aircrafts. Cabinet Secretary reviewed the locust situation on 27th May, 2020 and directed the Ministry of Civil Aviation to assist the Department of Agriculture Cooperation & Farmers Welfare in facilitating the procurement of goods and services for aerial spray of pesticides through drones, aircraft/helicopter. Thereafter an inter-ministerial Empowered Committee under the chairmanship of the Additional Secretary, Agriculture was constituted for facilitating the procurement of goods and services for aerial spray of pesticides through drones, aircraft and helicopter. Officers of the MoCA, Pawan Hans, DGCA, Air India and DAC&FW are members of the committee.

On the recommendation of the Empowered Committee for effective control of locusts settling on tall trees and inaccessible areas, DAC&FW engaged 5 companies to provide services of five drones each for locust control. Till now 12 drones have been deployed for locust control in Jaisalmer, Barmer, Jodhpur, Bikaner and Nagaur. India has become the first country in the world to use drones for locust control after finalizing the protocols. Use of Drones opens the possibility of their effective use for tall trees in inaccessible areas. One drone can cover 16-17 hectare area in one hour and in 4 hours it can cover upto 70 hectare area. MoCA has further relaxed the terms and conditions of the conditional exemption granted for drone in anti-locust operations and permitted the use of engine-powered drones upto 50kg and use of drones during night times also for anti-locust operations.

Presently major strategy of locust control is through 60 control teams with spray equipment mounted vehicles and more than 200 Central Government personnel are engaged in such operations in states of Rajasthan, Madhya Pradesh, Punjab, Gujarat, Maharashtra, Chhattisgarh, Haryana, Uttar Pradesh and Bihar. Locust Warning Organization (LWO) and ten Locust Circle Offices (LCOs) of Government of India are situated in Rajasthan (Jaisalmer, Bikaner, Phalodi, Barmer, Jalore, Churu, Nagaur, Suratgarh) and Gujarat (Palanpur and Bhuj), who primarily monitor, survey and control Desert Locust in two lakh square kilometer Scheduled Desert Area of Rajasthan and Gujarat. For effective control of locust beyond Scheduled Desert Areas, temporary control camps of LCOs have been established in Jaipur, Ajmer in Rajasthan, Shivpur in Madhya Pradesh, Fazilka in Punjab and Jhansi in Uttar Pradesh.

State Governments undertake control operations deploying tractor mounted sprayers and fire tender vehicles. Starting from 11th April, 2020 till 28th June, 2020, control operations have been done in 2,33,487 hectares in States of Rajasthan, Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh, Maharashtra Chhattisgarh, Haryana and Bihar. No significant crop losses have been reported in the States of Gujarat, Uttar Pradesh, Madhya Pradesh, Maharashtra, Chhattisgarh, Bihar and Haryana. However, some minor crop losses have been reported in some districts of Rajasthan.

As per the Food and Agriculture Organization's Locust Status Update of 27.06.2020, swarms that accumulate in northern Somalia are likely to migrate across the Indian Ocean to the summer breeding areas along the Indo-Pakistan border. In Pakistan, swarms have already started laying eggs in Sindh and swarms are present in the Indus Valley. Virtual meetings of the technical officers of South West Asian countries (Afghanistan, India, Iran and Pakistan) have taken place on weekly basis. So far 15 SWAC-TOC meeting have been done this year. Technical information related to locust control in the region is being shared.

Steps taken to strengthen capacity of Locust control -

i. To strengthen locust control capabilities in India, 10 ground spray equipments were imported from Micron, UK, during January, 2020 and 15 equipments in June, 2020. Additional 45 ground spray equipments would reach in the month of July, 2020 and Locust Circle Offices have more than 100 ground control equipment by July.

ii. Presently 60 control teams with spray equipment mounted vehicles and more than 200 Central Government personnel are engaged in locust control operations.

iii. 55 additional vehicles have been purchased to strengthen the control capabilities.

iv. Approval given for the purchase of 3,00,000 liters of Malathion 96% ULV. Sufficient stock

of pesticides is being maintained.

v. Government of India has also issued a supply order of 5 aerial spray kits from M/s Micron, UK in March, 2020. The first 2 kits are to be delivered in September, 2020 and the balance 3 kits, one month after the successful commissioning of the first kit. These kits would be fitted in Indian Air Force helicopters as agreed by Indian Air Force.

vi. Under Sub-mission on Agriculture Mechanization assistance for purchase of 800 tractors mounted spray equipments sanctioned for Rajasthan State Government. (2.86 crores).

vii. Financial assistance of Rs. 14 Crore sanctioned for Rajasthan State under RKVY for hiring of vehicles, tractors and for purchase of pesticides.

viii. Financial assistance of Rs. 1.80 crore sanctioned for Gujarat State for purchase of vehicles, spray equipments, safety uniform, android application, training with regard to locust.

ix. Ministry of Home Affairs has included admissibility of 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 under new norms of assistance under SDRF and NDRF.

x. Review meetings were organized at different levels (Hon'ble Agriculture Minister, Cabinet Secretary, Secretary (DAC&FW), VCs were organized for different State Governments and Locust control preparedness is being reviewed. Local awareness literature, SOP of approved pesticides and awareness videos were also shared with all stakeholder States and all the States were requested to make all necessary preparations for control as per SOP.

xi. No significant crop losses have been reported in the States of Gujarat, Uttar Pradesh, Madhya Pradesh, Maharashtra, Chhattisgarh, Bihar and Haryana. However, some minor crop losses have been reported in some districts of Rajasthan.

xii. Virtual meetings of the technical officers of South West Asian countries (Afghanistan, India, Iran and Pakistan) have taken place on weekly basis. So far 14 SWAC-TOC meeting have been done this year. Technical information related to locust control in the region is being shared. It is being coordinated by FAO.

Total area controlled in States as on 28th June, 2020

Sl. No.	Name of State	No. of Districts	Area Treated (hectare)
1.	Rajasthan	31	2,13,173
2.	Punjab	01	640
3.	Gujarat	05	1070
4.	Madhya Pradesh	40	15533
5.	Maharashtra	04	1435
6.	Uttar Pradesh	13	1398
7.	Chhattisgarh	01	82
8.	Bihar	04	41
9.	Haryana	02	115
	Total	**101**	**2,33,487**

General Survey of Agriculture

Trends in Foodgrain Prices

Based on Wholesale Price Index (WPI) (2011-12=100), WPI in case of foodgrains increased by 3.69 percent in May, 2020 over May, 2019.

Among foodgrains, WPI of pulses and cereals increased by 11.91 percent and 1.97 percent, respectively, in May, 2020 over May, 2019.

Among cereals, WPI for wheat and paddy increased by 6.04 percent and 1.21 percent, respectively, in May, 2020 over May, 2019.

Similarly, WPI in case of foodgrains decreased by 0.06 percent in May, 2020 over April, 2020.

Among foodgrains, WPI of pulses increased by 2.39 percent and cereals decreased by 0.68 percent in May, 2020 over April, 2020.

Among cereals, WPI for wheat decreased by 1.66 percent and paddy increased by 0.19 percent in May, 2020 over April, 2020.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative monsoon season, 2020 rainfall for the country as a whole during the period 1st June, 2020 to 29th June, 2020 has been 19% 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 32% in Central India, by 19% in East & North East India, by 7% in North-West India and by 4% in South Peninsula.

Out of 36 meteorological sub-divisions, 13 meteorological sub-divisions received large excess/ excess rainfall, 17 meteorological sub-divisions received normal rainfall and 6 meteorological sub-divisions received deficient/large deficient rainfall.

Out of 681 districts for which rainfall data available, 157(23%) districts received large excess rainfall, 147(22%) districts received excess rainfall, 205(30%) districts received normal rainfall, 134(20%) districts received deficient rainfall and 38(5%) districts received large deficient rainfall.

Current live storage in 123 reservoirs (as on 25th June, 2020) monitored by Central Water Commission having Total Live Capacity of 171.09 BCM was 56.73 BCM as against 29.17 BCM on 25.06.2019 (last year) and 33.21 BCM of normal storage (average storage of last 10 years). Current year's storage is 194% of last year's storage and 171% of the normal storage.

Articles

Rural Transformation and Farmers' Income in Punjab

DR. NIRMAL SINGH*

Abstract

The present study examines farmers' income from agriculture along with changes in the structure of the economy over the years taking Punjab as the case studied. The study highlights the relative importance of the agriculture sector in the economy in the wake of improvements in agricultural production. The income earned by farmers has seen moderate growth with some squeeze over the years. The growth in output and farm income was accompanied by a high growth in wage bill. Factors that contribute to farm income are gross cropped area, fertilizer and electricity consumption for agriculture. Since the dominance of paddy-wheat mono-cropping pattern has led to deterioration of ground water level, study found that decent growth in farmers' income requires appreciable growth in agricultural output, crop diversification and favourable fixed prices for farm produce. It is suggested that the policy makers must keep close vigilance on the movement of both cost and value of output so as to announce the minimum support prices for major crops in consonance with the cost of cultivation.

Keywords: *Agricultural growth, yield, productivity, farmers' income, agricultural diversification.*

1. Introduction

Punjab has emerged as the most prosperous state in the country as it adopted an agriculture-centered growth policy since the mid-sixties. During this period, Punjab recorded the highest per capita income in the country and retained the top position till Maharashtra overtook it in mid-nineties. Punjab's economy grew at an average rate of 4.4 percent per annum which was higher than the national average of 2.1 percent per annum during the seventies. In the late nineties, the state experienced sluggish growth rate in agriculture. However, the state economy has continued to be one of the most prosperous in the country.

1.1. Sectoral composition of Punjab economy

Punjab is one of the smallest states of India, accounting for 1.5 percent of the total geographical area of the country and about 2.3 percent of its population**.** The economy of Punjab, in its ability to stabilize and expand despite undergoing severe socio –political crisis, has been a symbol of resilience and fortitude for the country. Within a few years after this shattering experience, Punjab was able not only to rehabilitate its economy but also to emerge as the richest state in India. No doubt all sectors of the Punjab economy have been growing at impressive rates, but the growth has been particularly high in the secondary and tertiary sectors**.** Among the major non-farm activities transport, trade, hotels & restaurant, banking and insurance registered significant increase in net state domestic product (NSDP). This fact shows the emerging dominance of non-farm sector activities in the state.

The comparative contribution in real NSDP at constant prices 2004-05 can be viewed as an indicator of performance of different sectors of the economy. The figure 1 clearly highlights the growing importance of non-farm activities in the state over the years. The share of farm sector which includes agriculture and livestock was 32.94 percent in 2004-05 of the total NSDP, declined to 18.2 percent during 2017-18. On the other hand, the corresponding share of non-farm sectors has been found to be higher and increasing during the same period. This fact shows the emerging importance of non-farm activities in the rural parts of the state. It emerges from this comparison that in the absence of market reforms, the agriculture growth remained low and the sector could not keep pace with the growth in the non-farm sector.

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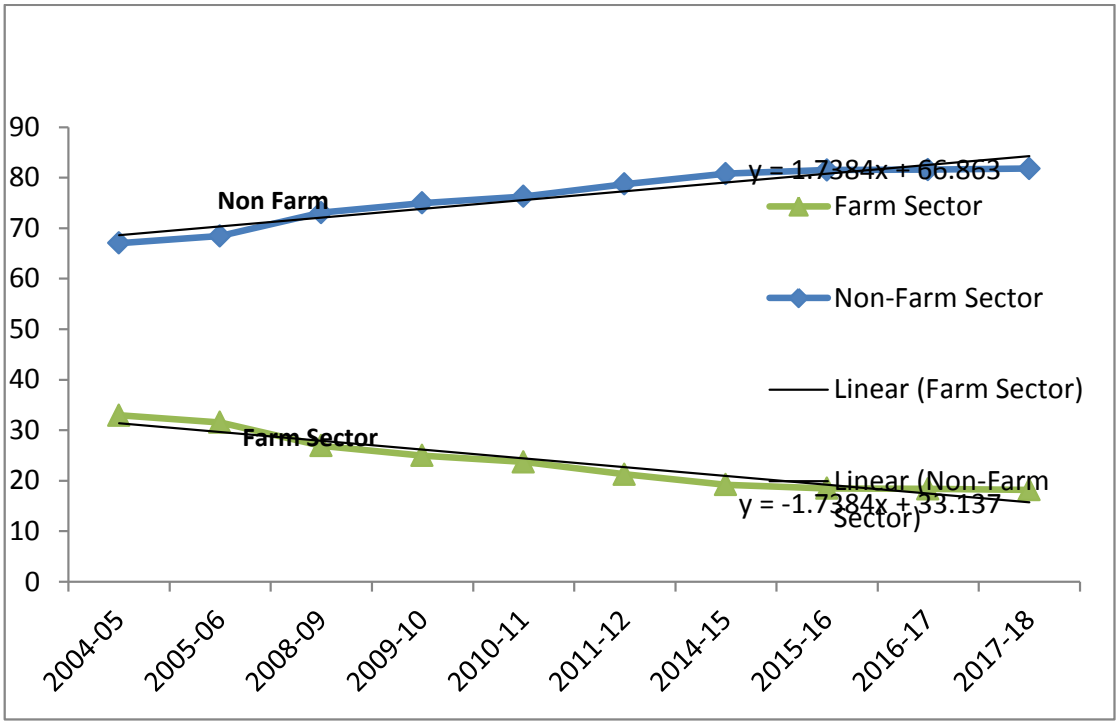
Figure 1: Comparative Share of Farm and Non-Farm Sector in NSDP in Punjab



Source: Economic Adviser, Government of Punjab.

1.2. Growth and transformation of Punjab agriculture

The importance of agriculture in the state can be seen from the fact that it contributes the largest share to the state domestic product. It is clear from Appendix Table 1 and 2 that the share of agriculture in the gross state domestic product (GSDP) was 44 percent during 1990-91 whereas contribution at the national level was 29 percent. Owing to the dominance of the agricultural sector, the growth had been instrumental in providing a major boost to the GSDP. The fact is that more than half (55.3 percent) of the total workforce was engaged in agricultural activities against the national average of 65 percent in 1990-91. However, the relative importance of agriculture sector *vis-à-vis* the rest of the economy has been declining over the years. Its contribution to the GSDP has declined from 44 percent in 1990-91 to 11.4 percent in 2017-18. In terms of employment, the share of the agriculture sector in Punjab declined from 55.3 percent in 1990-91 to its present level of 34 percent in 2015-16.

The thrust provided to the agriculture sector through green revolution had helped Punjab to maintain a higher growth in this sector compared to the rest of the country. The growth in Punjab agricultural NSDP had been higher than the national average till 1990-93.The growth rate had been declining after 1993, while the all-India figures were increasing, leading to a convergence of growth rates. The sluggish growth rate of Punjab agriculture in the recent years has attracted criticism from various quarters on the long term sustainability of the hybrid seed, intensive fertilizer and irrigation strategy.

1.3. Objectives of the study

The study has the following main objectives:

(i) To analyze the growth performance of agriculture in Punjab with special reference to food grains and other commercial crops.

(ii) To undertake a comparative analysis of cost and returns of major crops grown in Punjab.

(iii) To empirically examine whether crop diversification and government intervention have influenced farmers' income and agricultural productivity across the state.

1.4. Literature review

The Punjab state made an outstanding progress in agriculture and contributed extensively to the food security of the nation. The state is among the highest ranking states in the country in terms of agricultural productivity. The sector is instrumental in ensuring national food security by consistently contributing a significant percentage of wheat and rice to the Central Pool (Bhalla *et al.,* 1990). However, the vibrant agriculture sector of Punjab is now facing serious challenges posed by deteriorating natural resource base due to mono-culture of wheat – rice crop rotation, stagnation in yields of principal crops, declining farm productivity and farm income. (Gandhi, 1997; Chand, 1999; Singh, 2007; Sidhu, 2002). But, still the economy of Punjab has the ability to stabilize farmers' income mainly through escalating agricultural growth. The shift of area out of 'wheat and paddy' strategy of the government seems to be effective in the state (Johl, 2002), as evident from the target of Doubling Farmers' Income (DFI) by 2022.The expected changes turn out to be satisfactory if Government play an effective role in facilitating an assured pricing and marketing structure for high value non-food grain crops. Instead of including numerous crops in the diversification portfolio, the government can look for optimal crop combinations for various agro-climatic zones that can be feasibly promoted for sustainable agrarian growth (Joshi *et al.,* 2002, Gulati & Verma, 2016). Success in agricultural growth should be measured by the growth of farmers' income and not just by production digits. If technology, input prices and labour use lead to per unit cost savings then farmers' income will rise at a much higher rate than the output. Past estimates of farm income show a significant difference between growth in output and growth in farmers' income. During 2004-05 and 2011-12, agricultural output at constant prices increased by 34 percent while real farm income per farmer increased by 63 percent at the national level (Chand, 2017). Therefore, DFI should not be viewed as same as doubling of farm output. It is obvious that if inflation in agricultural prices is high, farmers' income in nominal terms will double in a much shorter period. Inflation in agricultural prices also leads to increase in real farm income if agricultural prices received by farmers increase at a faster rate relative to the prices paid by farmers, *i.e.,* when terms of trade for agriculture improves. Precisely, the target of DFI could be achieved through: i) improvement in crop productivity, ii) improvement in resource use efficiency or total factor productivity, savings in cost of production, iii) increase in cropping intensity, iv) diversification towards high value crops, v) better price realization of crops, vi) shifting cultivators to non-farm activities, vii) improvement in terms of trade for farmers or real prices received by farmers (NITI Aayog, 2017).

The production technology available for wheat and rice, supported by the appropriate policies (including MSP and input subsidies) complemented with required investments and institutional infrastructure, resulted in a spurt in productivity and production in Punjab since the advent of green revolution in mid sixties, transforming Punjab from a food deficit economy to a 'food basket' of the country (Gulati,2017). Because of low production risk and assured marketing of wheat and rice, about eighty percent of the gross cropped area has come under these two crops (Shergill, 2007). For a long period, this cropping system continued yielding a high growth in agricultural production and farm incomes. The production potential of the available technology of these crops has almost been fully exploited (Chand, 1999). There is now stagnation in growth of yield, leading to decline in real farm incomes due to over exploitation of natural resources, particularly soil and ground water. Wheat paddy crop-rotation has led to over exploitation of ground water, resulting in rapid decline in water level in the state.

At present, the sustainability of the wheat–rice production system is under threat due to declining water level and has resulted in a high cost system. (Sukhpal, 2004; Sarkar & Das, 2014). To be precise declining water level coupled with climate change / global warming is posing new challenges for future agricultural growth. In order to increase farm income it has been suggested that there is a strong need of agricultural diversification in a big way (Ghuman, 2008). Maize, kharif pulses and soyabean are important kharif crops proposed to replace part of paddy area, which is possible only if their marketing and remunerative prices are assured. As per the above requirements, the Government of Punjab introduced the contract farming programme in 2013 as a solution for the agriculture sector. In the wake of realization of the target DFI, there is a need to examine the role of the state government in facilitating agri-business and infrastructure investments for reducing cost of production and improving resource use efficiency. Land and water

are the two important resources whose conservation and optimum use is required for sustainable development. India's experience in this regard is shocking, if damage of these resources and to the environment is taken into account, India, along with other south Asian countries is not moving forward but becoming even poorer over time. Policymakers should not treat water and land as abundant natural sources rather precious and scarce sources in this universe. Numerous effective and meaningful laws are required to conserve and regulate the use of these resources (Dasgupta, 2001). Worldwide the demand for traditional staple foods including rice has started to decline. In the context of upcoming globalization, greater diversification of agricultural production and high rural farm income is needed to ensure successful and sustainable cultivation practices. Through diversification, farmers will find alternative ways of using their resources more judiciously for higher returns. Diversification is also an effective way of optimizing the use of human capital in rural areas where unemployment is acute (International Food Policy Research Institute, 1997; World Bank Report, 2001; Pinglani, FAO, 2006; American Association for the Advancement of Science, 2011).

2. Methodology

An equation of farm income, which depicts that net return is a function of gross return minus the cost of production, has been applied. This includes three variables namely, productivity, cost of cultivation and remunerative price. Previously, a few attempts have been made by some researchers (Narayanamoorthy, 2006; Sen & Bhatia, 2004) to prepare estimates of farm income based on cost of cultivation data reported in CACP Reports. Chand, R. (2011), has derived an estimate of farm income from net value added in agriculture by deducting the cost of hired labour (wage bill).

In the present study, farm income was derived from NSDP (Agri. & Livestock) at current prices minus wage bill for hired labour. The wage bill for the agriculture sector was computed by multiplying the number of hired labourers employed in agriculture with per day agricultural wage earnings and the number of days of wage employment in a year. Data on the number of hired agricultural labourers, wage earnings and days of agricultural wage employment was estimated from the published NSS reports of various rounds on employment and unemployment. Information on days of wage employment in agriculture activities was also taken from rural labour enquiry reports (RLER). Factors (explanatory variables) determining farm income were estimated by a linear regression equation in double log functional form with the procedure to correct auto correlation / multi-collinearity between explanatory variables.

3. Results and Discussion

3.1. Growth of farmers' income

The estimates of farmers' income and sectoral income based on agricultural year are available in National Accounts Statistics. NSSO has also generated estimates and source of income of farmers based on its country wide national surveys on Situation Assessment of Farmers, 2003 and Situation Assessment of Agricultural Households, 2013. The average income of an agricultural household in Punjab during July 2012 to June 2013 was Rs.18039 as against its average monthly consumption expenditure of Rs.13404 which was higher than the national average.

The above mentioned two survey rounds adopted different definitions of farmer or farmer households and therefore, these two reports are not strictly comparable, as in the 59th round, land ownership was used as a criterion for the selection of a household, whereas in the 70th round, only those households were considered whose agricultural produce value was above Rs. 3,000. However, it may be mentioned that only 0.06 percent of the agricultural households covered in the NSSO 70th round do not possess land. Given these caveats, it is important to examine the income dynamics of agricultural household between the years 2002–03 and 2012–13 (Dalwai, 2017).

It is observed that increase in productivity, rise in real farm prices, and shift of labour force from agriculture, are the important determinants of growth in farm income. Thus, the level of farm income is crucial to examine the agrarian distress situation prevailing in the country. The low and highly fluctuating farm income is leading to a detrimental effect on the interest in farming and farm investment, and also forcing more and more cultivators to leave the farming sector. Realizing the need to pay special attention to farmer's income, the Government of India has fixed the target of DFI by the year 2022. In order to achieve this target in a time

TABLE 1: AVERAGE MONTHLY INCOME PER AGRICULTURAL HOUSEHOLD FROM DIFFERENT SOURCES BASED ON SIZE-CLASS OF LAND OWNED IN PUNJAB–DURING THE YEAR 2002-03

(in Rs.)

Size class of Land Owned (Hect.)	Income from wages	Net Receipts from			
		Cultivation	Dairy Farming	Non-Farm Business	Farm Income
Marginal	1726.3(58.9)	528.7(18.1)	206(7.1)	470.3(16.1)	2931.3(100)
Small	717(16.1)	3027(67.9)	377(8.5)	341(7.6)	4462(100)
Medium	429(4.2)	9229(90.6)	306(3.0)	225(2.2)	10189(100)
Large	3716(10.8)	26079(76.0)	4545(13.2)	0	34340(100)
All Classes	1462(29.5)	2822(56.9)	236(4.8)	440(8.9)	4960(100)

Source: Situation Assessment Survey Reports.

TABLE 2: AVERAGE MONTHLY INCOME PER AGRICULTURAL HOUSEHOLD FROM DIFFERENT SOURCES BASED ON SIZE-CLASS OF LAND OWNED IN PUNJAB–DURING THE YEAR 2012-13

Size class of Land Owned (Hect.)	Income from wages	Net Receipts from			
		Cultivation	Dairy Farming	Non-Farm Business	Farm Income
Marginal	5144(54.8)	2449(26.1)	1088.3(11.6)	701(7.5)	9382(100)
Small	3509(19.8)	12128(68.3)	1289(7.3)	841(4.7)	17767(100)
Medium	4133(11.5)	28893(80.1)	2397(6.7)	640(1.8)	36062(100)
Large	1564(1.7)	75813(83.5)	10601(11.7)	2789(3.1)	90767(100)
All Classes	4779(26.5)	10862(60.2)	1658(9.2)	760(4.2)	18059(100)

Source: Situation Assessment Survey Reports.

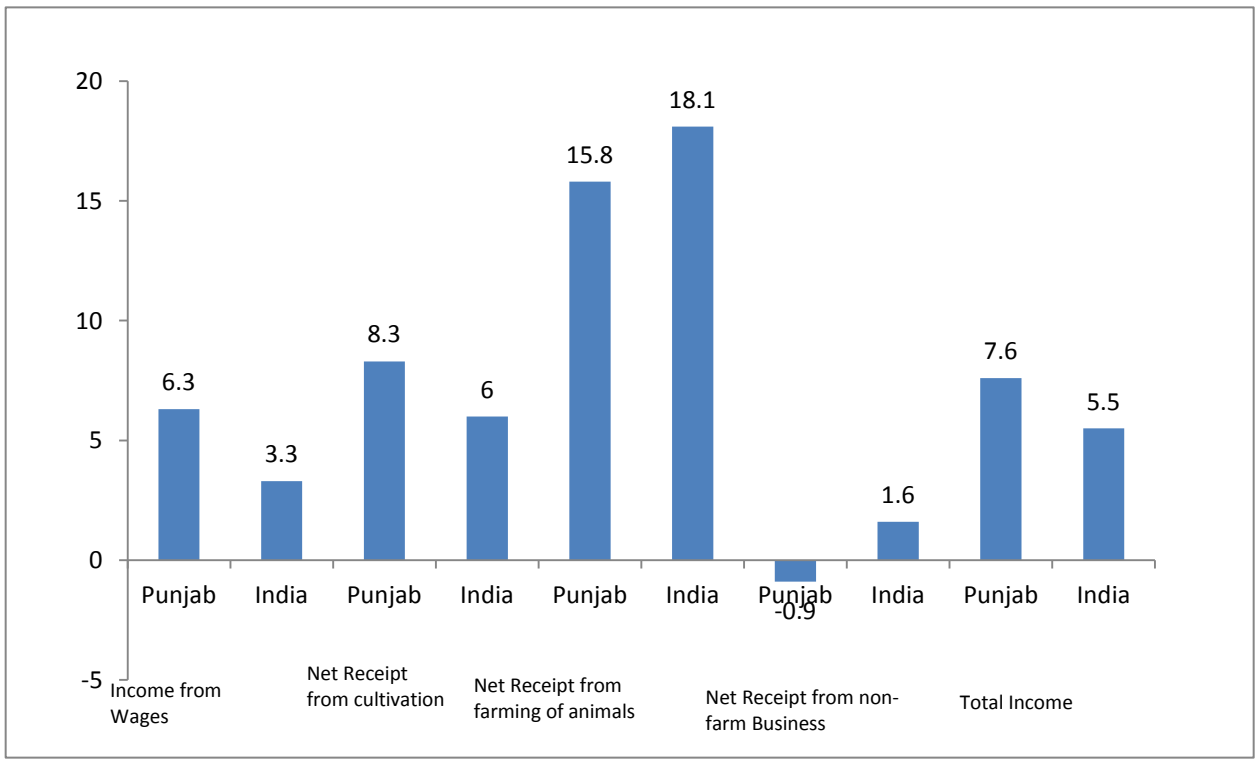
bound manner an appreciable exponential growth in agriculture sector is required which has not yet achieved in India.

The population of Punjab was 27.7 million in 2011 and the estimated population for 2016 is 29.5 million, which is 2.3 percent of India's population. In Punjab, 39 percent of the workforce was engaged in agriculture according to census 2001, which fell to 35.6 percent in 2011 (34 percent according to Labour Bureau 2015-16). The number of persons engaged in cultivation is 19.35 lakh (19.55percent of the total work force) and 15.88 lakh (16.04 percent of total work force) working as agricultural labourers. Although, Punjab became the one of the prosperous state in the country by improving its agriculture, a structural change is taking place in the state economy with the relative share of agriculture in workforce and its contribution in state GDP is declining over the years. But, the sector is still quite important for the state economy. The average monthly income per agricultural household stood at Rs. 18059 in 2012-13, which is still highest in India. Real total income from farm and non-farm sector activities grew at 7.6 percent per annum at 2004-05 base year prices during the period of 2002-03 to 2012-13.

3.2. Diversification towards high value crops

In order to improve farm income it has been suggested that there is a strong need for the diversification of agriculture sector towards high value crops. It has also been realized that the economic conditions of the vast majority of the farming community cannot be changed unless farmers diversify their cropping pattern according to the fast-changing tastes of the global community. Diversification and technology up-gradation is needed more urgently in growing fruits, vegetables and other high value cash crops to stabilize income and employment in the farming sector. It has been authenticated that the green revolution (wheat and rice) technology supported by the MSP system is no longer a viable option both for the state as well as the farming community (Nadkarni, 1988; Johl, 1996). It would be essential to diversify crop production

Figure 2: Percentage Growth in Income from Farm and Non-Farm Activities in Punjab and India during 2002-03 to 2012-13 at 2004-05 base Prices



Source: Situation Assessment Survey Reports.

in a big way to give a boost to agricultural growth in Punjab. Diversification towards high value crops offers ample scope to improve farmers' income. The staple crops (wheat and rice) occupy 87 percent of the total cropped area and contribute 91 percent of total output of the crop sector. For a long period, this cropping system continued giving a higher growth in agricultural production and farm income. But, the production potential of the available technology of these crops has almost been fully exploited. There is now stagnation in growth of yield, leading to a decline in real farm income due to over exploitation

TABLE 3: PER HECTARE VALUE OF OUTPUT OF MAJOR CROPS GROWN IN PUNJAB (2015-16)

Crops	Value (Rs. crore)	Area (000 hect.)	Productivity (Rs. /Hect.)	Share (%)	
				In Total Output	In Total Area
Wheat	24504	3506	69892	49.75	47.20296
Rice	16642	2970	56034	33.79	39.98654
Coarse	674	139	48489	1.37	1.871424
Pulses	48.7	18.1	26906	0.099	0.243689
Oilseed	181	47	38511	0.37	0.632784
Cotton	251	335	7493	0.51	4.510266
Sugar	147	92	15978	0.31	1.23864
Vegetables	4850	230	210870	9.85	3.0966
Fruit	1941	88	220568	3.94	1.184786
Contract Crops	12.4	2.4	51667	0.03	0.032312
All Crops	**49251.1**	**7427.5**	**281945**	**100**	**100**

Source: CACP Reports.

of natural resources, particularly soil and ground water (Sukhpal, 1997; Singh & Sidhu, 2004; Johl, 2002). At present, the smooth sustainability of the wheat–rice production system due to declining water level is under threat and has resulted in a high cost system.

3.3. Wheat-rice crop rotation

Currently, two crops are dominating in the Kharif–Rabi crop cycle in Punjab. On the basis of comparative returns from various crops, it has been proved that only wheat and rice crops are highly profitable and less risky. That's why the cropping pattern in Punjab is more inclined towards these two crops. The information on returns per hectare from the mono-cropping pattern of wheat- rice rotation and six other crop rotation combinations that can be grown as alternatives to it is given in Table-4. The substantial comparative advantage of wheat-rice rotation over its competing crop rotation combinations is quite evident. None of the other crop rotation combinations yields more than or equal to the returns per hectare given by the wheat-rice rotation, except sugarcane.

TABLE 4: RETURNS FROM WHEAT-RICE ROTATION AND COMPARISON OF CROP ROTATION COMBINATIONS (2014-15)

Crop rotation combinations		Returns (Rs. /Hect.)	Percentage returns (relative to wheat-rice rotation)
Kharif	Rabi		
Rice	Wheat	105034	100
Sugarcane	Sugarcane	104127	99
Cotton	Gram	51084	49
Cotton	Barley	59915	57
Cotton	Rapeseed & Mustard	59059	56
Basmati	Sunflower	68162	65
Moong	Rapeseed & Mustard	29730	28

Source: CACP Reports.

3.4. Estimation of farmers' income in Punjab

An estimate of farmers' income is derived from NSDP Agriculture and Livestock data reported by Central Statistical Organization, after deducting wage bill for hired labour. It has been found that income earned by farmers from agricultural activities after paying for input costs and the wages for hired labour has seen a moderate growth in different periods besides some squeeze in income of farming during 1993-94 to 2018-19. Farmer's income during 1993-94 to 2018-19 multiplied 8.3 times of nominal prices. In the same period, the CPIAL, this is used to represent change in prices in rural areas, increased by 6.3 percent. Taking away the effect of inflation, real farm income increased by 2.0 percent in the last 26 years.

TABLE 5: NSDP (AGRICULTURE & LIVESTOCK) AT CURRENT PRICES, AGRICULTURAL LABOURERS, WAGE BILL AND RELATED VARIABLES TO COMPUTE FARM INCOME IN PUNJAB

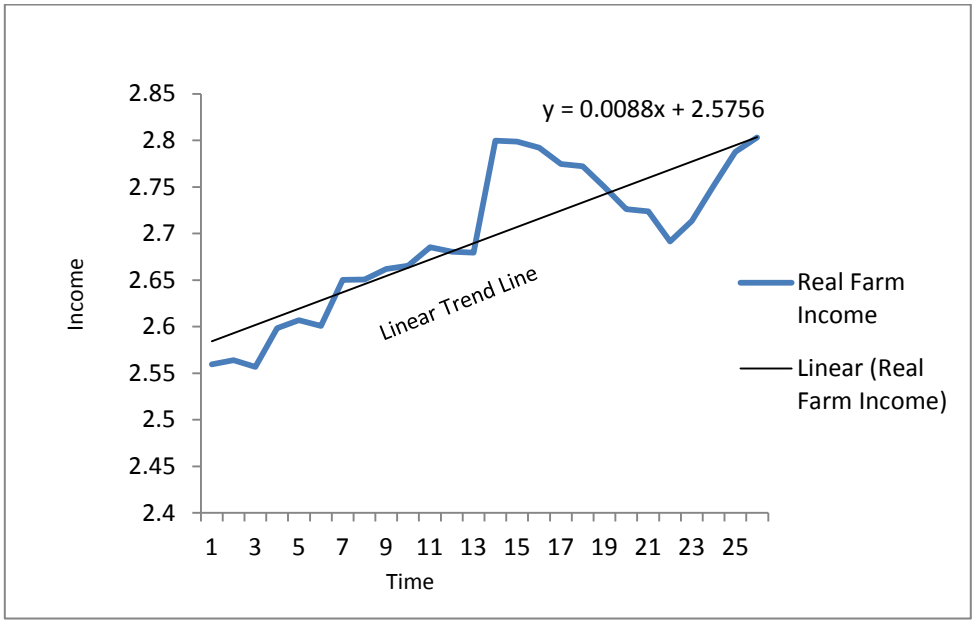
Year	NSDP (agri. & livestock (Rs. crore)	Wage bill (Rs. crore)	Farm income (Rs. crore)	CPIAL base (2011-12)	Real farm income (Rs. crore)	Farm income per hectare net sown area
1993-94	12978	1371.07	11606.92	32	36271.63	47581.83
1994-95	14264	1371.25	12892.74	35.186	36639.4	47626.93
1995-96	15369	1393.75	13975.246	38.781	36029.01	46718.11
1996-97	18013	1394.01	16618.99	41.89	39664.87	50735.31
1997-98	18900	1416.49	17483.50	43.20	40463.72	51658.02
1998-99	20559	1441.31	19117.68	47.95	39866.58	51507.21
1999-00	23826	1443.64	22382.35	50.08	44691.56	56953.69
2000-01	23900	1578.99	22321.01	49.91	44715.2	56351.86
2001-02	24800	1581.54	23218.45	50.57	45910.93	57815.04

TABLE 5: NSDP (AGRICULTURE & LIVESTOCK) AT CURRENT PRICES, AGRICULTURAL LABOURERS, WAGE BILL AND RELATED VARIABLES TO COMPUTE FARM INCOME IN PUNJAB-*CONTD.*

Year	NSDP (agri. & livestock (Rs. crore)	Wage bill (Rs. crore)	Farm income (Rs. crore)	CPIAL base (2011-12)	Real farm income (Rs. crore)	Farm income per hectare net sown area
2002-03	25780	1624.87	24155.12	52.20	46265.78	59118.04
2003-04	27890	1647.75	26242.24	54.17	48441.12	61279.09
2004-05	28368	1716.41	26651.58	55.64	47894.47	60381.33
2005-06	31041	3432.82	27608.17	57.77	47786.39	60735.11
2006-07	42879	3661.68	39217.32	62.19	63057.32	80215.4
2007-08	45875	3776.11	42098.89	66.93	62891.01	79922.49
2008-09	49514	3890.53	45623.46	73.65	61946.53	78294.4
2009-10	54028	4058.07	49969.93	83.96	59515.84	75566.08
2010-11	59392	4774.21	54617.8	92.31	59169.28	75068.87
2011-12	67507	11303.82	56203.17	100	56203.18	71287.64
2012-13	72013	13456.92	58556.07	110	53232.79	67743.44
2013-14	78565	13457.41	65107.58	123	52933	67447.75
2014-15	80676	16310.51	64365.48	131	49133.96	62535.26
2015-16	87715	16902.64	70812.35	137	51687.85	65660.38
2016-17	97337	17225.62	80111.37	142	56416.46	72291.72
2017-18	108243	17494.77	90748.22	148	61316.37	78359.57
2018-19	115039	17763.92	97275.07	153	63578.48	81229.69
Exponential Growth %	****8.8%**	****12.7%**	****8.3%**	****6.3%**	****2.0%**	****2.0%**

Source: National Accounts Statistics, Government of India.
**Significant at 1%.

Figure 3: Growth of Real Farm Income in Punjab



Source: National Accounts Statistics.

3.5. Elasticity estimates of farm income

The analysis begins with an estimation of factors determining farm income estimated by a linear regression equation in double log functional form based on net value of agriculture and livestock, gross cropped area (GCA), irrigated area, cropping intensity, fertilizer and electricity consumption. Table 6 provides elasticity estimates with level of significance for each explanatory variable. Elasticity was significantly much higher for GCA, fertilizer and electricity consumption than that for other variables. The negative non-significant regression coefficients of net value added and cropping intensity indicate constraining factors in determination of farm income.

TABLE 6: ELASTICITY ESTIMATES OF FARM INCOME IN DOUBLE LOG REGRESSION EQUATION (1993-94 TO 2018-19)

(Dependent variable)	Explanatory variables						
	Constant	NSDP (agriculture & livestock)	GCA	Fertilizeruse	Electricity use for agriculture	Irrigated area	Cropping intensity
Real farm income	-30.3** (-2.57)	-0.048 (-0.42)	7.152** (2.0)	0.641** (2.2)	0.296* (1.72)	0.719 (0.28)	-2.33 (-0.63)
N 26	Adjusted R Square 0.697						

Source: Statistical Abstract of Punjab.
** and * denote significance at 1% and 5%, respectively.

With rapid modernization and changes in factor proportions, significant changes seem to have taken place in the shares of various factor incomes in value added through the process of agricultural production. Furthermore, with increased labour productivity, a corresponding increase in wage rates over the years would have been expected. But nominal wage bill, when regressed on the money value of agriculture output per worker (labour productivity), gives the following equation:

Log (Wage bill) = 5.73 – 2.134** (labour productivity)

(-9.3)

R^2 = 0.78 N = 26

A confirmed conclusion can be drawn concerning the share of wages in value added and labour productivity in wage bill. The negative regression coefficient symbolizes the declining trend of labour productivity and its share in wage bill over the years. On the other hand, the relationship between real farm income and wage bill turns out to be positive and significant when real farm income regressed on the nominal wage bill over time. It implies that the high growth in output and farm income was accompanied by a high growth in wage earnings. The result is important in explaining the emerging significant and positive share of wage bill in real farm income along with changes in the structure of production.

Log (Real farm income) = 2.25 + 0.124** (Wage bill)

(4.7)

R^2 = 0.47 N = 26

3.6. Sources of growth in farmers' income

The targeted DFI over a span of six years requires a compound annual income growth rate of 10.41 percent. This implies that the ongoing and previously achieved rate of growth in farm income has to be sharply accelerated (Gulati, 2016). Farmers' income can be improved only when productivity goes up, cost of production comes down, risk is reduced, post-harvest loss is minimized and commodities produced get a remunerative price. Additional income should flow from allied activities of agriculture too. The strategy will have to integrate all these avenues in a meaningful manner, by building on supplementary and complementary relations (Dalwai, 2017).

3.7. Agricultural productivity / yield of major crops in Punjab

Productivity of major crops in Punjab is considerably higher than the other states in India. But, over the

years there is stagnation in the yield of major crops in Punjab with complete exhaustion of green revolution technology. On the other hand, there is considerable rise in cost of cultivation which makes the farming sector no longer profitable which is evident from the following table 7, 8 and 9.

Profitability in crops cultivation has been calculated both in relation to A2 and C2 cost. Between TE 2014-15 and TE 2015-16 the profit computed in relation to C2 cost relatively low in the case of cotton, except rice and wheat. In fact, in crops like wheat and rice farmers have reaped high profits with high C2 cost. With the increased irrigation coverage, farmers are encouraged to adopt the modern yield increasing inputs for crops cultivation which resulted in high cost of cultivation. Another question which needs to be studied in the context of farm profitability is: can we increase the farm income by increasing the productivity of crops? It is often believed that the increased productivity would help the farmers to reap higher profit. NITI Aayog has also highlighted this argument explicitly to have more income from farming. Although, increased productivity is

TABLE 7: GROWTH IN COST A2, C2 AND YIELD OF WHEAT IN PUNJAB (PER HECT.)

Year	Wheat (Rs./ Hect.)						
	A2+FL	C2	Yield/Qtl.	MSP	GVO	Gross returns over A2+FL (Rs./Hec)	Net returns over C2 (Rs./Hec)
1998-99	9161	19479	47	550	25850	16689	6371
1999-00	10000	21312	48.34	580	28037.2	18037.2	6725.2
2002-03	13445	22997	40.7	620	25234	11789	2237
2003-04	13714	22415	40	630	25200	11486	2785
2013-14	23265	47891	50.2	1350	67770	44505	19879
2014-15	23091	47909	45	1400	63000	39909	15091
2015-16	28184	52169	45.8	1540	70532	42348	18363

Source: CACP Reports.
NOTE: GVO means Gross Value of Output; A2 means Actual expenses plus rent paid for leased-in land; FL means family labour; C2 means Total cost plus imputed value of family labour; MSP means minimum support price.

TABLE 8: GROWTH IN COST A2, C2 AND YIELD OF RICE IN PUNJAB (PER HECT.)

Year	Rice (Rs./ Hect)						
	A2+FL	C2	Yield /Qtl.	MSP	GVO	Gross returns over A2+FL (Rs./Hect.)	Net returns over C2 (Rs./Hect.)
1997-98	9559	18993	34	415	14110	4551	-4883
1998-99	10729	19126	46.45	440	20438	9709	1312
2008-09	25155	45291	67.41	950	64039.5	38884.5	18748.5
2009-10	29032	50650	64.7	1050	67935	38903	17285
2011-12	30358	51914	40	1080	43200	12842	-8714
2013-14	32383	68383	39.5	1120	44240	11857	-24143
2014-15	33188	66811	38.4	1360	52224	19036	-14587
2015-16	33951	67435	39.7	1470	58359	24408	-9076

Source: CACP Reports.
NOTE: GVO means Gross Value of Output; A2 means Actual expenses plus rent paid for leased-in land; FL means family labour; C2 means Total cost plus imputed value of family labour; MSP means minimum support price.

TABLE 9: GROWTH IN COST A2, C2 AND YIELD OF COTTON IN PUNJAB (PER HECT.)

Year	Cotton (Rs./ Hect)						
	A2+FL	C2	Yield/Qtl.	MSP	GVO	Gross returns over A2+FL (Rs./Hect.)	Net returns over C2 (Rs./Hect.)
1997-98	9586	14129	4.1	1330	5453	-4133	-8676
1998-99	10799	15459	4.6	1440	6624	-4175	-8835
2008-09	29047	50828	2.5	3000	7500	-21547	-43328
2009-10	30056	53072	2.2	3000	6600	-23456	-46472
2013-14	43580	65124	5.1	3900	19890	-23690	-45234
2014-15	45243	76778	4.7	3950	18565	-26678	-58213
2015-16	42691	58290	4.2	4000	16800	-25891	-41490

Source: CACP Reports.
NOTE: GVO means Gross Value of Output; A2 means Actual expenses plus rent paid for leased-in land; FL means family labour; C2 means Total cost plus imputed value of family labour; MSP means minimum support price.

necessary for augmenting the farm income, many researchers fail to understand that rising productivity alone would not help in increasing the farm income since it depends upon many other factors. Well structured marketing chain is a key requirement for raising farm income. If procurement arrangements are not made adequately at appropriate time, any amount of increase in productivity would not benefit the farmers. On the other hand, if the increase in cost of cultivation is higher than that of the income realized through increased productivity, then farmers would not get benefitted from increased productivity. Therefore, it is necessary to analyze whether productivity of crops play any significant role in deciding the farm profitability. From the Table 8, it is evident that although the value of output of crops substantially higher, the increased cost of cultivation has reduced the profitability.

To increase productivity, progress is required across three dimensions: i) quality and judicious use of inputs, such as water, seed, fertilizers, pesticides, ii) judicious and safe exploitation of modern technology, including genetically modified seeds,

TABLE 10: GROSS AND NET RETURNS ON ACTUAL ESTIMATES OF COST OF CULTIVATION OF RABI CROPS IN PUNJAB

Crop	Cost A2+FL (Rs./ Hect.)	Cost C2 (Rs./ Hect.)	GVO (Rs./ Hect.)	Gross returns over A2+FL (Rs./Hect.)	Rate of gross returns over A2+FL (%)	Net returns over cost C2 (Rs./Hect.)	Net rate of returns over C2 (%)
Wheat (2011-12)	22999	43522	60300	37301	162	16779	39
Wheat (2014-15)	28184	52169	72748	44564	158	20579	39
Rice (2014-15)	38807	68794	99277	60470	156	30484	44
Rice (2015-16)	34242	40152	103688	69446	203	63536	158
Maize (2014-15)	38427	51749	49761	11334	29	-1988	-4
Maize (2015-16)	31248	39091	49672	18423	59	10580	27
Cotton (2014-15)	48924	74887	85135	36211	74	10248	14
Cotton (2015-16)	40819	48819	69379	28560	70	20560	42

Source: CACP Reports.
NOTE: GVO means Gross Value of Output; A2 means Actual expenses plus rent paid for leased-in land; FL means family labour; C2 means Total cost plus imputed value of family labour; MSP means minimum support price.

and iii) shift into high value commodities, such as fruits and vegetables. Increase in productivity is surely not a solution, if market price crashes during bumper harvest. Therefore, this strategy alone would not help the farmers to get sufficient income from farming. Raising productivity might help the consumers and the country to further strengthen the food security and reduced food inflation. But, farmers at large would not benefit through increased productivity unless efforts are made simultaneously to control the cost of cultivation and improve the procurement arrangements.

4. Conclusion and Policy Implications

Pointing to the relative share of different sectors in Punjab's economy it has been confirmed that the relative share of farm sector has declined, whereas that of non–farm sector has increased. The income earned by farmers from agricultural activities after paying for input costs and the wages for hired labour, has been increasing and fluctuating during last three decades.

(i) The study found that appreciable growth in farmers' income requires high growth in farm output, favorable prices for farm produce, and shifting of some cultivators away from agriculture, which is clearly evident from the declining workforce engaged in agriculture. Recently, with the declining growth in agriculture sector in Punjab, the percentage share of farm sector in NSDP is also declining.

(ii) Farmers often complain of a decline in profitability from farming. The analysis of different crops presented in the study shows that the farmers have either realized low profits or suffered huge losses in cultivating major investigated crops. Cost of cultivation of crops has been increasing over the years because of rise in wage rate of hired labour, input prices and other farm managerial costs. High use of various yield increasing inputs leads to rise in cost of cultivation for most of the crops. The rise in cost of cultivation is found to be higher than that of the value of output in many crops, made a significant impact on the profit margins of the farmers.

(iii) Therefore, the policy makers must keep close vigilance on the movement of both cost and value of output so as to announce the MSP for major crops in consonance with the cost of cultivation.

TABLE-1 (APPENDIX): DISTRIBUTION OF NSVA (NET STATE VALUE ADDED) AT FACTOR COST AMONG DIFFERENT SECTORS IN PUNJAB AT CONSTANT PRICES (2011-12)

(Rs. in Lacs)

Year	Primary	Secondary	Tertiary	NSVA	NSDP at market prices
2011-12	7513447(33.2)	5300930(23.4)	9822918(43.4)	22637295(100)	23922695
2017-18	8479302(27.8)	7071180(23.2)	14932222(49.0)	30482704(100)	33554641
CAGR %	2.1	4.92	7.23	5.1	5.8

Source: Statistical Abstract of Punjab.

TABLE-2 (APPENDIX): COMPOUND GROWTH RATES OF NSDP AT CONSTANT PRICES (BASE YEAR 2004-05)

Year	India		Punjab	
	NDP	NDP (Agriculture)	NSDP	NSDP (Agriculture)
1970-80	2.1	0.2	4.4	2.5
1980-90	4.8	3.0	5.0	5.2
1990-00	5.1	2.8	3.9	2.1
2000-10	6.3	1.7	5.2	1.2
2010-18	7.6	2.3	4.93	0.74

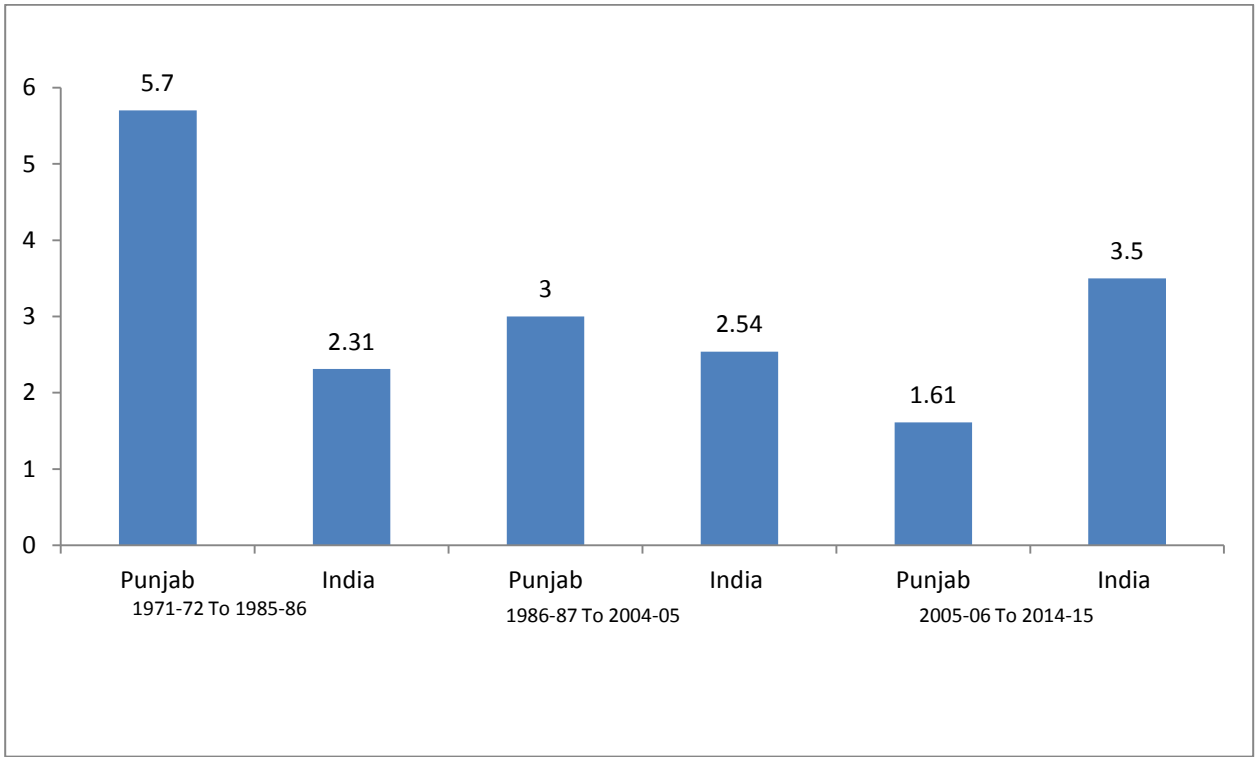
Source: National Accounts Statistics.

TABLE-3 (APPENDIX): PERCENTAGE SHARE OF AGRICULTURE IN THE GROSS DOMESTIC PRODUCT (AT CONSTANT PRICES) BASE YEAR 2004-05

Year	Percentage share of agriculture in GSDP (Punjab)	Percentage of total workforce engaged in agriculture (Punjab)	Percentage share of Agriculture in the GDP (India)	Percentage of total workforce engaged in agriculture (India)
1990-91	44.00	-	28.75	-
1991-92	46.00	55.3	27.69	64.8
1992-93	47.00	-	28.13	-
1996-97	46.00	-	25.52	-
1997-98	43.00	-	23.74	-
1998-99	41.00		23.83	-
1999-00	39.91	-	22.93	-
2000-01	42.00	-	21.84	-
2001-02	37.66	39.4	27.97	58.4
2002-03	35.33	-	19.44	-
2004-05	34.63	-	18.49	-
2005-06	33.78	-	17.89	-
2006-07	34.32	-	16.96	-
2007-08	34.95	-	16.34	-
2011-12	32.45	35.6	14.3	55
2015-16	22.34	34	9.75	47
2017-18	11.4	-	8.7	-

Source: Data compiled from various Issues of Statistical Abstract of Punjab and National Income Accounts.

Figure 1 (Appendix): Comparative Agriculture Growth in Punjab and India (2004-05 base Prices)



Source: National Accounts Statistics.

TABLE-4 (APPENDIX): GROWTH OF GSVA (GROSS STATE VALUE ADDED) IN AGRICULTURE & ALLIED SECTOR AT CONSTANT PRICES (2011-12)

Year	India (Rs. crore)	Punjab (Rs. crore)
2011-12	1501947	78205
2018-19	1855632	89198
CAGR/7 Years	**3.12**	**1.92**

Source: National Accounts Statistics.

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Ecological, Economic and Social Sustainability of Sugarcane Cultivation in Maharashtra: A Farm Level Analysis

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Abstract

Sugarcane sector plays an important role in Indian economy and this is why it has been receiving extensive attention by Government in terms of support for inputs, extension services, etc. However, Indian sugarcane sector has witnessed a remarkable concern for risk associated with sugarcane cultivation. Therefore, some measures have been introduced in the sugar sector by efforts of scientists and extension workers to promote the adoption of sustainable sugarcane practices. The adoption of sustainable sugarcane practices might be having an influence of the knowledge level and attitude of sugarcane growers. Therefore, an attempt has been made in this study to find out the adoption, knowledge level and attitude of sugarcane growers towards sustainable sugarcane cultivation practices in Maharashtra. This present analysis is based on primary data and carried out in Maharashtra, India. The stratified multi-stage sampling method was used. The result revealed that actual adoption level of sustainable sugarcane practices in Maharashtra has not shown much progress, even though the knowledge level among sugarcane growers is recorded higher than the actual adoption level. Therefore, there is a need to reduce the gap between knowledge and actual adoption level. In order to achieve or maintain sustainability, a positive attitude is required to be developed among sugarcane growers towards extensions and major constraints, stated by the respondents need to be taken into consideration on a priority basis, to make a larger number of best adopters of sustainable practices among sugarcane growers.

Keywords: *Adoption, attitudes, knowledge, sugarcane, sustainable practices.*

1. Introduction

Sugarcane sector has been receiving extensive attention, emphasized through government support in the extension services, adoption and use of external inputs. However, it has witnessed a remarkable concern for risk associated with sugarcane cultivation. Some of the sugarcane cultivation practices have been considered harmful for long-term sugarcane sustainability. Therefore, it is felt that the use of some of the inputs in the sugarcane production process is damaging and troublesome for natural resources. In this connection, some measures have been introduced in the sugarcane sector by the efforts of scientists and extension workers to promote the adoption of sustainable sugarcane practices and to improve the overall sugarcane sustainability. However, it is found that the viable and adaptive technologies have been developed but still many of these have not reached at farm level (Jaiswal *et al.*, 2014). Sengupta & Sonwani (2012) also identified that the adoption level of sustainable practices is hampered by the lack of acceptability by society and ignorance of these practices. The awareness level about recommended sugarcane practices is also very low and poor (Muhammad *et al.*, 2001). The adoption of sustainable sugarcane cultivation practices might be having an influence of the knowledge level and attitude towards sustainable sugarcane practices. And, it also depends on a number of factors like age, education, experience, feasibility of practices, economic status, extension facilities, knowledge level, perceptions, etc., (Maraddi *et al.*, 2007; Chouhan *et al.*, 2013; Ghosh & Hasan, 2013). The final decision of sugarcane growers to use sustainable sugarcane practices is usually the result of their knowledge level, because it is one of the important factors which play a crucial role in the decision-making process (Kshash, 2017).

1.1. Objectives of the study

The present study has been conducted with a view to achieve the following objectives:

(i) To understand the attitudes of the sugarcane growers towards sustainable sugarcane cultivation.

(ii) To look at adoption of sustainable practices, by assessing the level of knowledge and adoption

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of sustainable sugarcane cultivation practices.

(iii) To examine the constraints faced by the sugarcane growers in the adoption of sustainable practices.

2. Methodology

The present investigation was carried out in four districts, namely, Pune, Solapur, Osmanabad and Latur of Maharashtra during 2017-18. The stratified multi-stage sampling method was used. Total 197 respondents were selected based on criteria that these sugarcane growers should have successfully cultivated sugarcane for at least five consecutive seasons. The data was collected from sugarcane growers by an interview with the help of an interview schedule prepared for this purpose. Sustainable sugarcane practices were listed out from the review of literature and package of practices which were developed by the agricultural universities, government and non-governmental organizations / institutions / agencies, after testing, and discussed with subject experts from this field.

A total of eighteen sustainable sugarcane practices were identified and found to be relevant and important. Practice-wise knowledge classification was made in three categories, *i.e.,* low (0-1), medium (1.1 -2), and high 2.1 – 3). Scales assigned to the various statements related to attitudes as: 1 = disagree, 2 = undecided and 3 = agree for positive statements and a reverse system of scoring used for negative statements. In this study, the knowledge is considered as the realistic information possessed by sugarcane growers about sustainable sugarcane practices at the time of discussion and interview. To know the extent of adoption of sustainable sugarcane practices, the adoption index is used which is developed by Karthikeyan (1994), which was calculated as respondents' total score divided by the total possible score multiplied by 100. After the calculation of the adoption index, the level of adoption by sugarcane growers was classified into three groups: (1) Low level (mean -SD and below), (2) Medium level (mean –SD to mean +SD) and, (3) High level (mean +SD and above).

3. Results and Discussion

3.1. Characteristics of the selected sugarcane growers

Various characteristic features of the sample sugarcane growers show that the middle age group having secondary level education growers is dominating the sugarcane sector in Maharashtra. Age distribution of respondents indicates that around 24 percent of sugarcane growers are in the young age category, around 63 percent in the middle age, and finally those who are aged more than 60 years were 13 percent. It further reveals that a majority of sugarcane growers acquired primary and secondary education i.e. 29 and 43 percent, respectively. Around 15 percent of sugarcane growers attained higher education, whereas 10 percent are illiterate. This may be one of the main obstacles to adopt and understood disseminated innovations. Family size and family type also have greater influence to provide additional family farm labour at low cost. Joint family growers are less in percentage (20 percent) as compared to nuclear family type (80 percent).

A majority of the sugarcane growers (43 percent) are having more than 15 years of farming experience of sugarcane cultivation and this may be because sugarcane cultivation is still dominated by middle and old age sugarcane growers. The distribution of farm size shows that it is still dominated by small and marginal holdings. Around 80 percent of sugarcane growers cultivate their own land. Due to higher productivity, a majority of sugarcane growers have a preference of adsali season to grow sugarcane. At present, most of the sugarcane growers (86 percent) consider ratoon crop as a free crop. Some of the sugarcane growers (14 percent) are avoiding ratooning of the sugarcane crop which has a low plant production for the successive harvest, non-suitability of soil for ratoon and is infected by the pests and diseases. However, the ratoon crop also has an advantage in that it does not take more than twelve months to harvest.

3.2. Knowledge level about sustainable sugarcane cultivation

The knowledge level of sugarcane growers with respect to sustainable sugarcane practices in Maharashtra (Table 1) reveals that a majority of sugarcane growers have knowledge about the required soil, land preparation practices, use of manure, weeding with hand tools, earthing, crop rotation, inter-cropping, etc. They also have a high level of awareness about the green manure and residue application which helps improve soil quality and water holding capacity of soil. It may be due to contact with extension workers or that some of the sustainable practices are simple

to adopt. Moreover, the possible reason might be that sugarcane growers' own experience (learning by doing) due to cultivation of sugarcane for many years. Adjaye (2008) identified that the growers who have been participating in extension programmes are more knowledgeable about the effect of soil erosion and adoption of soil conservation practices. Sugarcane growers are not much aware of buds selection, buds rate, buds treatment, frequency of watering, mulching, de-trashing and propping. The possible reasons for this situation might be less awareness, lack of demonstration, being more labour oriented or require more credit and less social participation, etc. The sugarcane growers who are unaware of the recommended package of practices, generally consult with their friends and fertilizer shop owners for the requirement of fertilizer doses. However, the problem with this mechanism is that sugar mills provide fixed per acre fertilizers quota to the sugarcane growers which may or may not be suitable for the benchmark of adoption criteria.

Sugarcane growers (in the range of around 25 to 30 percent) are bearing in their minds that some practices are useless, *i.e.*, sugarcane sowing in adsali season, watering frequency and inter-cropping. As mentioned above regarding adsali season, it takes a long duration to harvest, which results in a high cost

TABLE 1: KNOWLEDGE LEVEL TOWARDS SUSTAINABLE SUGARCANE CULTIVATION (IN PERCENT)

S. No.	Practices	Useful	To some extent useful	Not aware/ can't say	Useless	Mean	Knowledge Category
1.	Cropping rotation	89.85	10.15	0	0	2.69	High
2.	Residue use	83.76	16.24	0	0	2.57	High
3.	Land preparation: 4-6 times ploughing before planting	56.85	40.1	2.03	1.02	2.33	High
4.	Weeding with hand tools	80.2	15.23	3.55	1.02	2.28	High
5.	Use of well drained loamy soil for sugarcane crop	90.05	3.55	0	6.4	1.93	Medium
6.	Partial earthing for newly developed root and full earthing during peak tillering	50.25	42.13	5.08	2.54	1.76	Medium
7.	Method of planting: flat method and row distance should be 75 cm	53.81	30.46	10.15	5.58	1.53	Medium
8.	Weed control with chemicals	24.88	46.19	22.84	6.09	1.48	Medium
9.	Inter-cropping (potato, moong & urad gram, wheat, etc.)	41.63	22.84	8.12	27.41	1.38	Medium
10.	Use of appropriate quantity of manure (10-12 tonne /hect.)	49.75	12.18	38.07	0	1.25	Medium.
11.	Mulching (1.5 tonne/acre within 3 days of planting)	45.18	16.24	38.58	0	1.23	Medium
12.	De-trashing (Remove dry leaves during 5th and 7th months)	33.5	26.91	39.59	0	1.08	Medium
13.	Bud treatment before sugarcane planting	39.59	16.25	44.16	0	0.91	Low
14.	Sowing of sugarcane in Adsali season	37.56	16.76	20.81	24.87	0.79	Low
15.	Bud rate: up to 50,000 three budded sets/hect	22.34	24.51	42.49	10.66	0.52	Low
16.	Buds selection: top two-thirds portion of sugarcane	18.27	25.89	51.27	4.57	0.47	Low
17.	Propping (during 7th month)	10.14	12.2	74.5	3.16	0.29	Low
18.	6-7 times watering excluding monsoon season	3.55	4.06	62.44	29.95	0.14	Low

Source: Field Survey, 2017-18.

of cultivation. There is no doubt that some portion of the cost of cultivation can be recovered from inter-crops income. Though this advantage, sometimes inter-cropping have some adverse impacts on main sugarcane crop as it could not get sufficient sunlight and air due to lack of space and most importantly inter-crops are growing at a higher rate as compared to sugarcane due to its short duration. Therefore, it cannot be said that inter-cropping is always good for sugarcane crop, which mostly depends on the selection of inter-crops.

3.3. Adoption of recommended sustainable sugarcane practices

Adoption is a rational process that starts when a person or operation learns of innovation and ends at the final adoption stage (Rogers, 1962). In order to find out the level of adoption of sustainable sugarcane practices, the responses of sugarcane growers were collected on 18 practices. The overall adoption of sustainable sugarcane practices by sugarcane growers is presented in Table 2. The results show that the practices having a high rate of adoption are related to the application of fertilizers, time of plantation and sugarcane varieties. On the other hand, the low rates of adoption are related to the use of improved practices of sugarcane, *i.e.*, harvesting, propping, use of treated buds, de-trashing, adoption of mulching, recommended fertilizers application, improved practices of diseases control, etc. The adoption of sustainable sugarcane practices by growers depends on a number of factors like age, education, experience, feasibility of practices, economic status, extension

TABLE 2: EXTENT OF ADOPTION / USE OF RECOMMENDED PACKAGE OF PRACTICES FOR SUGARCANE CULTIVATION BY GROWERS

S. No.	Practices	Level of adoption							
		More than recommended		As per recommendation		Partially		Not applied	
		%	Rank	%	Rank	%	Rank	%	Rank
1.	Soil preparation practices	19.29	III	12.18	VI	44.67	III	23.86	XIII
2.	Sugarcane varieties	0.00	-	56.35	II	25.38	VI	18.27	XIV
3.	Appropriate time of planting	2.54	VIII	69.54	I	15.23	VIII	12.69	XV
4.	Improved method of planting	0.00	-	10.66	VII	8.63	XI	80.71	IX
5.	Bud rate in sugarcane planting	0.00	-	9.14	X	26.90	V	63.96	X
6.	Treated buds in sugarcane planting	0.00	-	1.52	XVII	3.55	XV	94.92	II
7.	Recommended distance between two furrows	13.71	IV	15.23	IV	47.21	II	23.86	XIII
8.	Doses of fertilizers	68.02	I	10.15	VIII	15.23	VIII	6.60	XVI
9.	Time of fertilizers application	6.09	VI	21.32	III	35.53	IV	37.06	XII
10.	Recommended method of fertilizers application	1.52	IX	5.06	XIV	8.12	XII	85.30	V
11.	Improved practices in irrigation management	0.00	-	6.09	XII	11.68	IX	82.23	VII
12.	Improved practices of weed control	26.90	II	8.63	XI	24.37	VII	40.10	XI
13.	Improved practices of diseases control	7.00	V	2.03	XVI	10.15	X	80.82	VIII
14.	Improved practices of plant support (earthing)	2.94	VII	13.20	V	60.00	I	23.86	XIII
15.	Adoption of mulching	0.00	-	10.08	IX	7.11	XIII	82.81	VI
16.	De-trashing	0.00	-	3.00	XV	6.09	XIV	90.91	IV
17.	Propping	0.00	-	5.12	XIII	1.52	XVI	93.36	III
18.	Improved practices of sugarcane harvesting	0.00	-	0.00	-	5.02	XVII	94.98	I

Source: Field Survey, 2017-18.

facilities, knowledge level, perceptions, etc. (Maraddi *et al*., 2007; Chouhan *et al*., 2013; Ghosh & Hasan, 2013). A mismatch has been found between the knowledge level and adoption of sustainable sugarcane practices in Maharashtra. The possible reasons for this mismatch may be the higher cost, complication to use and perception of not getting higher productivity. Moreover, there may also be some limitations which are responsible for this mismatch like unavailability of inputs, soil structure, absence of guidance, etc. A main concern is regarding land preparation; some of the sugarcane growers are growing sugarcane in the same field which was used before for different crops as it is without any ploughing and land preparation. In addition to these factors, the high return from existing sugarcane fields is also a factor responsible to grow sugarcane without crop rotation and taking out earlier crops from the field. On the other hand, the adoption of some recommended practices appear complicated to the sugarcane growers. The size of the land holding is also a constraint in adoption, as large land holders totally depend on hired labourers, who are sometimes difficult to obtain within the required time period.

It is also interesting to note that a majority of sugarcane growers (in the range 90 to 98 percent) did not adopt treated buds, mulching, propping, de-trashing and improved harvesting due to the complicated and costly labour intensive and time consuming process. Low awareness among sugarcane growers may be one of the important factors in this regard. The use of sugarcane varieties suggested by sugar mills and research stations found a better adoption level due to new varieties provided by the sugar mills on a credit basis through co-operative credit societies. As per field experts' recommendations, the selection of buds should be done only on the upper one-third to half portion. Unfortunately, almost all sugarcane growers are using the whole part of sugarcane as seed which may have less chance of germination. However, some of the growers, who have no option to get fresh sugarcane seed, are using ratoon crop for seed purpose. Some of the growers use 3-4 times sugarcane ratoon crop as a cost-cutting strategy due to better sugarcane prices for the last few seasons, a majority of the growers do not want to take out sugarcane from the planted field. It is also observed that the sugarcane growers (68 percent) are using more than recommended doses of fertilizers and at the same time the fertilizers application time table is not followed due to timely unavailability of water, and most important, timely unavailability of credit and other inputs. Improved practices of sugarcane harvesting are not used much, but there is a hope that use of machines in sugarcane harvesting would be more economical in the future, as there will be no need to pay extra money for harvesting and small pieces of dry trash can be used as manure.

To reduce the labour cost of weeding, generally the large land holding growers prefer chemical weedicides, and it being easy to use too. There is less chance of weeds growing immediately like after hand weeding, one weedicides are sprayed. Improved practices of irrigation management like drip and sprinkle irrigation (around 18 percent) were found unsatisfactory. Some of the issues faced by sugarcane growers who have not used modern facilities of irrigation *are* high maintenance cost as water source is not clean, little bit of soil and salt portion existence. Therefore, the maintenance of water filter is not affordable. A majority of sugarcane growers had burnt sugarcane trash after harvesting and only a few growers are using trash as a residue. Only a few growers (7 percent) are partially using trash for preparation of compost and mulching. Those who are not using trash for compost and mulching say that it is a challenge to clean sugarcane ratoon crop field and make inter-ploughing of the field. From Table 3, it can be noticed that the majority (46 percent) of the sugarcane growers belonged to the low level adoption category followed by medium and high level of sustainable sugarcane practices adoption.

From Figure 1, it is interesting to note that the actual adoption level of sustainable sugarcane practices in Maharashtra has not shown much progress, even though the knowledge level among

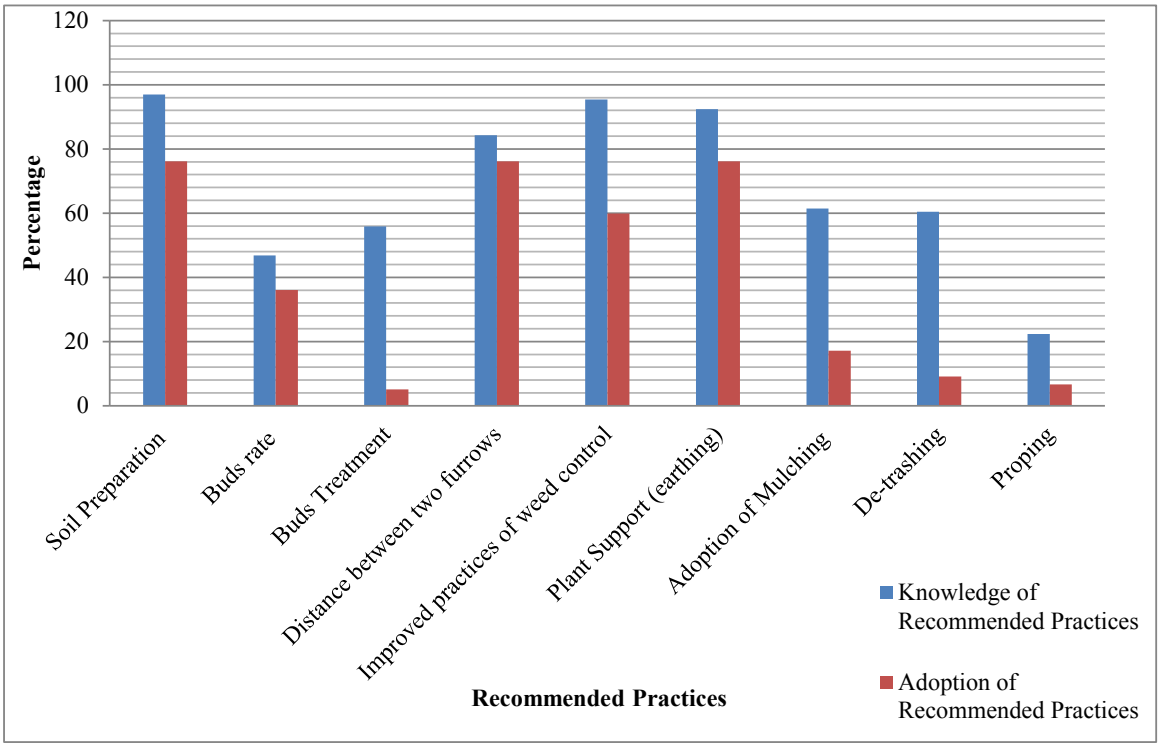
TABLE 3: DISTRIBUTION OF THE RESPONDENTS ACCORDING TO THEIR OVERALL ADOPTION OF THE RECOMMENDED SUSTAINABLE SUGARCANE CULTIVATION PRACTICES

S.No.	Adoption Level based on Adoption Index	Frequency	Percentage
1.	Low level adoption	91	46.19
2.	Medium level adoption	61	30.96
3.	High level adoption	45	22.84

Source: Field Survey, 2017-18.

sugarcane growers is recorded at higher than the actual adoption level. This might be due to shortage of labour, costly inputs, complicated process and non-suitability of land to adopt such kind of practices. There is a need to reduce the gap between knowledge and actual adoption level to achieve sustainability of sugarcane cultivation in Maharashtra. Otherwise, it might be very difficult to achieve the development of sugarcane sector in the future. In spite of various efforts made by the government and extension agencies, there has not been much impact at field level. Therefore, the continuous efforts by extension agencies are necessary to educate the growers about the adoption of modern and scientific sugarcane cultivation practices (Rout & Bar, 2015). To improve the adoption level, effective linkage of research and extension services and farmers should help in identifying the problems faced by growers in the adoption of sustainable practices (Maraddi *et al.*, 2007; Chouhan, *et al.*, 2013).

Figure 1: Gap between Knowledge Level and Actual Adoption of Recommended Sustainable Sugarcane Practices (in percent)



Source: Field Survey, 2017-18.

3.4. Field evidence of triple sustainability

The attitudes of sugarcane growers are also equally important to adopt sustainable sugarcane practices. Therefore, questions pertaining to triple sustainability, *i.e.*, environmental (resources), economic (market) and social (household) sustainability aspects are presented in Table 4. With regard to environmental sustainability, all the sample sugarcane growers agreed that irrigation is a deciding factor to grow sugarcane. Around 87 percent of growers opined that higher doses of chemical reduce soil fertility. Furthermore, about 82 percent agreed that manure helps to improve productivity and soil health. On the use of chemical fertilizers, their claim was that the use of chemical fertilizers with manure is also equally important. The attitude of sugarcane growers to the use of micro-nutrients to grow sugarcane was that the price of micro-nutrients (10 kg. bag) is very high as compared to a 50 kg. bag of chemical fertilizers. Some of the sugarcane growers had the mindset that micro-nutrients help to accumulate sucrose content in sugarcane which is most helpful for the sugar mills as the sugarcane prices are decided on the weight of sugarcane rather than individual sugarcane consideration of sucrose content. In addition to this, one more reason noticed was that the sugarcane growers are not aware about the micro-nutrients

which are required for sugarcane crop and suitable for different soil structure. It is also interesting to note that a large number of sugarcane growers were undecided whether farm labour should be replaced with machines or not and after some specific time, whether soil testing is needed or not. The water use indicator was not important for about 57 percent of sugarcane growers, because their perception was that sugarcane fields should keep always wet to get better productivity and also to recharge nearby water sources, though around 55 percent of them felt micro irrigation was beneficial. Unfortunately, the rate of actual adoption of micro-irrigation was recorded very poor inspite of the government's steps towards making it compulsory for sugarcane crop upto certain extent. This type of compulsion would succeed only when there was a positive perception on the part of sugarcane growers towards sustainable practices.

TABLE 4: FIELD EVIDENCE OF TRIPLE SUSTAINABILITY TO ASSESS SUGARCANE GROWER'S ATTITUDE

(in percent)

S.No.	STATEMENT	Agree	Undecided	Disagree
A. Resource / Environmental Sustainability				
Positive Statements				
1.	Will high doses of chemical fertilizers reduce fertility of soil?	86.80	11.68	1.52
2.	Will use of organic manure help to get better productivity compared to chemical fertilizers?	57.87	3.05	39.09
3.	Can new methods of farming give better results to farmers than the old methods?	55.33	10.66	34.01
4.	Is irrigation a deciding factor for continuing sugarcane cultivation?	100	0.00	0.00
5.	Use of micro irrigation is costly.	51.27	14.21	34.52
6.	Use of micro irrigation is beneficial.	55.84	19.80	24.37
7.	Crop rotation is essential for sustainable sugarcane farming.	97.57	2.43	0.00
8.	Do you think using green manure helps to increase productivity and soil health?	82.23	17.77	0.00
9.	After some specific period, soil testing is needed.	44.67	55.33	0.00
10.	Ratoon crop helps to reduce cost of cultivation.	74.62	23.35	2.03
11.	Is rainfall an important factor for continuing sugarcane cultivation?	100	0.00	0.00
Negative Statements				
12.	Will high doses of chemical fertilizers help to get better productivity?	49.75	13.71	36.55
13.	Should we use large quantity of inputs in sugarcane cultivation as long as it is profitable?	14.72	7.11	78.17
14.	Should farm labour be replaced with machines?	20.81	69.54	9.64
15.	Do you think ratoon crop gives a better productivity than the first time planted crop?	38.58	28.43	32.99
16.	Do you think the sugarcane field should be kept always wet to get better productivity?	57.36	8.12	34.52
B. Market / Economic Sustainability				
Positive Statements				
1.	Do you think the cultivation of sugarcane fetches better income than other crops?	33.50	47.72	18.78
2.	Selling sugarcane to the sugar mills will be profitable compared to other purposes.	71.07	9.64	19.29
3.	Do you think various policies, schemes and Acts enacted by the government influence sugarcane production?	46.19	40.61	13.20
4.	Tradable inputs for sugarcane crop are easily available and financially feasible for growers.	15.74	8.63	75.63

TABLE 4: FIELD EVIDENCE OF TRIPLE SUSTAINABILITY TO ASSESS SUGARCANE GROWER'S ATTITUDE-*CONTD.*

(in percent)

S.No.	STATEMENT	Agree	Undecided	Disagree
5.	Do you take the decision of continuing sugarcane cultivation on the basis of good planting materials?	31.98	44.67	23.35
6.	Do you think sugarcane labourers are getting reasonable wages?	51.27	37.06	11.68
Negative Statements				
7.	Cultivation of sugarcane requires more credit	89.34	2.54	8.12
8.	Do you think the cultivation of sugarcane has become complicated?	48.22	30.46	21.32
9.	Do you think sugarcane cultivation is not profitable?	69.03	2.03	28.94
10.	Do you think politics are affecting sugarcane at farm level?	88.32	1.02	10.66
11.	Will labour non-availability impact on your decision of sugarcane cultivation?	89.34	2.54	8.12
C. Household / Social Sustainability				
Positive Statements				
1.	The sustainability issue will be the key factor for the future success of sugarcane cultivation.	100	0.00	0.00
2.	Do you think income from sugarcane cultivation will be the same for the future also?	4.06	63.45	32.49
3.	Do you think the income from sugarcane farming will meet the required consumption expenditure of the family?	29.95	41.62	28.43
4.	Can sugarcane cultivation help in the emergence of sugarcane based ancillary activities?	84.26	15.74	0.00
5.	Social participation is required to fulfill needs regarding sugarcane cultivation.	78.17	18.27	3.55
6.	Information about sugarcane cultivation from friends and other farmers is useful.	47.72	32.99	19.29
7.	Sustainability is a direct derivative of generation of net income.	59.90	40.10	0.00
Negative Statements				
8.	After switching over to sugarcane cultivation, there has been a remarkable increase in household income.	14.72	46.19	39.09
9.	Sugarcane cultivation exploits the labour through less wages, over work load, etc.	17.77	61.42	20.81
10.	Do you think sugarcane crop is harmful to other crops?	6.09	53.81	40.10

Source: Field Survey, 2017-18.

Only 33 percent of sugarcane growers agreed that the cultivation of sugarcane crop fetches better income than other crops. However, it is also difficult to capture their satisfaction level towards income from sugarcane cultivation as it varies from grower to grower. One of the determining factors of the decision to grow sugarcane is the amount of crop loan as compared to other crops. To avail the facility of crop loan, some of the growers cultivate sugarcane crop rather than other crops. Some of the growers are not fully growing sugarcane, because they have to fulfill their other family requirement of foodgrains, animal fodder, and more important is to fulfill day-to-day household expenses, it is required for them to grow vegetables and other food crops in some portion of the field. The attitudes of sugarcane growers towards the availability of tradable inputs were found unsatisfactory due to only around 16 percent growers have agreed with the statement. It is also interesting to note that only a few sugarcane growers take decisions based on the supply of better planting materials. They generally give more importance to the productivity and availability of irrigation facilities. The sugarcane growers are strongly agreed that selling sugarcane to the sugar mills would be more profitable than selling it for other purposes as not many options are available. Almost all sugarcane growers agreed that the sustainability issue is one of the key factors for

the future success of sugarcane cultivation. About 84 percent of growers agreed that sugarcane cultivation helps in the emergence of sugarcane-based ancillary activities. Unfortunately, 63 percent of sugarcane growers are not sure whether the future income from the sugarcane cultivation will remain the same or not. It is not a good sign for the future of sugarcane cultivation and all stakeholders. Sugarcane growers are found to strongly agree over the need for social participation. It shows that social participation is very much needed to cultivate sugarcane as around 89 percent of growers have agreed that sugarcane requires more credit.

In order to improve the adoption of sustainable sugarcane cultivation practices, the following suggestions were made by the sugarcane growers: timely availability of suitable inputs and its demonstration at the village level, training programmes, reasonable inputs prices, etc. In addition, green manure seeds should be available at reasonable rates. To reduce the use of chemical fertilizers, bio-fertilizers should be promoted. Scientists and extension workers have developed pest and diseases resistant sugarcane varieties that need to reach at the farm level.

4. Conclusion and Suggestions

To sum up, the actual adoption level of sustainable sugarcane practices in Maharashtra has not shown much progress, even though the knowledge level among sugarcane growers is recorded higher than the actual adoption level. The possible reasons for this mismatch identified that shortage of labour, costly inputs, complicated process and suitability of soil / land to adopt such kind of practices and negative perceptions towards sustainable practices.

Therefore, it is needed to reduce the gap between knowledge and actual adoption level. In order to achieve or maintain sustainability, a positive attitude is required to be developed among sugarcane growers towards extensions. Moreover, the constraints stated by the respondents as above need to be taken into consideration on a priority basis to make a larger number of best adopters of sustainable practices among sugarcane growers.

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Agro-Economic Research

Assessment of Livestock Feed and Fodder in Gujarat*

S. S. KALAMKAR, H. SHARMA & M. MAKWANA

1. Introduction

Animal husbandry in India is closely interwoven with agriculture. It plays an important role in the socio-economic development of millions of rural households thereby contributing importantly in the national economy. Livestock rearing is one of the most important economic activities in the rural areas providing supplementary as well as stable income round the year. This sector has also emerged as a vital sector for ensuring a more inclusive and sustainable agriculture system. Evidence from the National Sample Survey Office's (NSSO) 70th round survey (2014 & 2014a) showed that more than one-fifth (23 percent) of agricultural households with very small holdings of land (less than 0.01 hectare) reported livestock as their principal source of income. More than 70 million of the reported 147 million rural households depend on dairy, in varying degrees, for their livelihoods. Marginal, small and semi-medium farmers with average operational holdings of area less than 4 hectare own about 87.7 percent of the livestock of India. By controlling 64 percent of the bovine, 70 percent of ovine, 73 percent of caprine and 70 percent of the poultry population, the small holders contribute substantially to livestock production. Dairying has become an important secondary source of income for millions of poor and rural households and has assumed an important role in providing employment and income generating opportunities particularly for marginal and women farmers. This is the sector where the poor contribute to growth directly instead of deriving benefits from growth generated in other sectors of the economy. This sector has created a significant impact on equity in terms of employment and poverty alleviation as well. It cannot be merely a co-incidence that the level of rural poverty is significantly higher in states where livestock sector is under-developed.

1.1 Need for the study

Dairy Industry in the country has shown spectacular growth during the last few decades. With an expected production of about 188 million MT of milk by the end of 2018-19, it is estimated that annual requirement of green fodder will be to the tune of 1,100 million MT and dry fodder to the tune of 610 million MT. The current availability of green and dry fodder, however, is estimated at 500 million MT and 380 million MT, respectively. Efforts to increase livestock productivity / production is constrained by feed /fodder shortages. The shortages tend to be even more serious during natural calamities. To improve the availability of fodder, there is very little scope to increase the area under fodder cultivation, particularly in view of the growing demand of human beings for food, fiber and shelter. It is therefore necessary to increase the availability of fodder by increasing the productivity of available forage resources per unit area, improve the efficiency of fodder utilization and minimize the fodder wastages to increase and thereby reduce the gap between demand and supply. The present average green fodder yield of 40 MT/hectare/year of cultivated land and 0.75 MT/hectare/year for common grazing land are too low and there is huge potential to improve their productivity through adoption of latest technologies.

The country's estimated demand for milk is likely to be about 200 million tonnes in 2021-22 (NDDB, 2014 & 2014a). To meet the growing demand, there is a need to increase the annual incremental milk production from 4 million tonnes per year as was the case for the last10 years to 7.8 million tonnes in the next 8 years (total 210 million by 2021-22). To meet the growing demand, it is necessary to maintain the annual growth of over 4 percent in the next 15 years. Quantum jump in milk production is possible through increase in productivity, and linking small holders to dairy cooperatives/producer groups/ SHGs with forward linkages having milk processing facilities. Adequate availability of feed and fodder to livestock is vital to increase their productivity and also to sustain ongoing genetic improvement initiatives. The supply of feeds has always remained short of normative requirement. The situation is

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NOTE: Detailed report is available on the website of respective Agro-Economic Research Centres.

further aggravated in Rajasthan and Gujarat where considerable area falls in arid and semi-arid zones. Keeping this background, the study examines demand, supply, and a deficit of feed and fodder production in the Gujarat.

2. Data and Methodology

The study is based on both, the secondary and primary level data. The secondary data on livestock population of all selected states are compiled from published sources. To understand and analyze the demand for and supply of feed and fodder, primary data was collected from the field level through a sample survey method. As per the sampling framework, data was collected from three selected districts from three regions of the state, i.e., Banaskanatha (North Gujarat), Surat (South Gujarat), and Panchmahal (East Gujarat). The reference period of the study was 2019-20 agricultural year.

2.1. About study area

Gujarat has been consistently clocking impressive agricultural growth rates. This has been possible because the government has focused on improving not only irrigation, quality of seeds and power but also subsidiary sectors like animal husbandry. The growth of the animal husbandry sector has resulted not only in increased milk production but has also provided a boost to the overall agro-economy of the state. The livestock sector in Gujarat has achieved a remarkable success during last six decades due to collective efforts of government organizations, non-government organization and the milk producers. Gujarat is one of the leading states in terms of milk production. The cooperative sector has been the key driver of the tremendous increase in Gujarat's milk production. It is not a surprise that Gujarat, the birthplace of India's white revolution, has a thriving milk cooperative sector. The largest dairy co-operative in India, Amul, is based in Anand, Gujarat. 'Amul' pattern is well known & accepted by all states in India besides some of the countries in the world.

Animal husbandry has played a significant role in boosting the agrarian economy of the state. It is not only a subsidiary source of livelihood in rural Gujarat, it is a major economic activity, especially in the arid and semi-arid regions of the state. Thus, this sector plays a vital role in the rural economy of the state and has significant impact on employment generation for marginal, sub-marginal and landless farmers. Out of about total 102 lakhs household, about 43 lakh households have livestock in Gujarat as a primary or secondary source of income. Milk contributes around 20 percent to the agricultural GSDP of Gujarat and is one of the biggest sectors for supporting livelihood in the state. Share of milk in livestock output at constant prices was about 86 percent, which was not only the highest contribution but also was a noticeable share in the total livestock output.

Gujarat State has secured a remarkable position in the country as far as livestock wealth and development are concerned. As per Provisional figures of the 20th Livestock Census (2017) of India, 26.9 million livestock (5.02 % of all India) population was in the state of Gujarat. An increase in livestock population from 23.51 million in 2007 to 27.12 million in 2012 was observed and then declined between 2012 and 2017. In fact, the share of Gujarat in all India total stock of livestock increased by 0.86 percent points during 2007 to 2012 and then declined by 0.28 percent points in 2017. As per Livestock Census 2012, among various species in Gujarat livestock, buffalo comprised of the highest share (38.28 percent) in total livestock population followed by Cattle (36.80%), Goat (18.28 %) and Sheep (6.30 %), besides marginal share of other livestock species such as Camel, Mules, Donkeys, Horses and Ponies. Banaskantha (9.38 %) had the highest number of livestock population followed by Panchmahal (7.41%), Kachchh (7.14%), Sabarkantha (6.8%), Dahod (6.41%) and Vadodara (6.13%). These six districts together accounted for 44 percent of total livestock population in the state in 2012.

Gujarat is a leading state in terms of its quality in milch animals and milk production. Gujarat ranks third among the milk producing states in India, with 144.93 lakh MT in 2018- 19, an increase from the 30.9 lakh tonnes in 1983-84. Despite of increase in milk yield, there is still a wide scope for improving milk yield of milch animals. The reason cited for this is inappropriate feeding as well as inadequate supplies of quality feeds and fodder in addition to the low genetic profile of the indigenous breeds. It is not possible to achieve higher productivity in milching animal by merely increasing its genetic potential. Due attention needs to be given to proper feeding of milching animals. There is no shortcut to sustain livestock husbandry without addressing the development of fodder and feed resources.

As such there is lack of time series dataset regarding area under forage and fodder crops in India. While GOG 2018 (SAP & SIDP) report has highlighted area under forage crops in Gujarat which was estimated to be 2.32 lakh hectare in the year 2017-18 in Gujarat. Out of the total area under forage crops in Gujarat, about one fourth of total area was in Banaskantha district followed by Mehsana having about 10 percent of total area in the State. Other districts, having around 5 percent area under forage crop, were Vadodara, Sabarkanta, Kachchh and Kheda. As against the estimated animals' requirements, feed resources available in Gujarat are lower. During the period 2003 to 2011, shortage of fodder was observed in the state. In the context of dry matter, a reduction was observed from 137 percent of the requirement to 66 percent; total digestible nutrients from 200 percent to 73 percent while the crude protein availability increased from -98 percent to a surplus of 19 percent.

3. Findings from Field Survey

i. The various socio-economic factors for instance size of family, education and training of dairy producer, availability of land and off-farm income, experience in dairy, etc., have direct influence on dairy farmers' decision to whether they want to expand and improve their dairy operations. Average age of the selected household head/respondent was around 46 years of which almost half of them found to be illiterate. The remaining half of the household respondents were educated mostly up to the highest level of high schools except few of them were found graduated. Out of the total selected respondents, almost 46 percent were from backward classes, followed by around 28 percent from scheduled caste, 14 percent from scheduled tribe and rest of them belongs to open category. Most of the selected households respondents were male (92 percent) and very few (8 percent) were female respondents.

ii. The selected households had relatively higher experience in dairy business (20 years) followed by farming (18 years) and sheep and goat rearing (10 years). The average family size was found to be 6.66 persons and the highest share of family members were found to be primarily engaged in dairy business (44 percent) followed by 36 percent in farming and rest of them were in sheep and goat farming. The main occupation of the selected households was agriculture comprised of cultivation of land as a farmer along with supportive allied activity of animal husbandry and dairying. Agriculture was the primary occupation of 55 percent households followed by animal husbandry and dairy (22 percent) and around 12 percent depended on labour activities. Own farm establishment and self-employment were other major sources of occupation. The annual average income of the selected households was estimated to be Rs. 105756/- followed by Rs. 78705/- from dairy, Rs 6610/- from sheep and goat rearing. Around 73 percent of the selected households were found be a member of social and cooperative organizations.

iii. On an average, operational land holding was estimated to be marginal size of holdings having 0.91 hectare of which 92 percent land was irrigated. It was very surprising and pleasant to note that almost 44 percent of total operational holdings was devoted to fodder crops, while same was very significant in case of land under rainfed condition (72 percent) as compared to 42 percent land was under fodder by irrigated land holders. The groundwater was the main source of irrigation followed by surface sources such as canal and tank.

iv. The cropping pattern of the selected households indicates that highest area under fodder crops was recorded during Kharif and Rabi season. Besides, during Kharif seasons, supportive crops whose by-product can be used as fodder crops such as maize, bajra, moong, urad and groundnut were grown. The fodder cultivation is found to be relatively less profitable than other crops.

v. The details on fodder and feed fed to the animals indicate that more than 93 percent selected buffalo and cattle had average age of more than 2 years while around two fifth of sheep and goats were of same age. The average value of sheep and goat for the age of 2 years and above ranges between as high as around Rs. 6821/- and Rs. 6593/- in Banaskantha and as lowest as Rs. 1020/- in Panchmahal district and Rs. 1873 in Surat district, respectively.

vi. The average value of the buffalo, crossbreed cattle and indigenous cattle for the age 2 years

and above ranges around Rs. 48000/- , followed by Rs. 39000/- for crossbreed cattle and Rs. 30000/- for indigenous cows. The lowest value of indigenous cows was reported to be in Banaskantha and Panchamal district than in Surat. The average value of animals as per stage of life, i.e., heifer not pregnant, heifer pregnant, dry and mulching animals.

vii. The details on the fodder and feed fed to the milch animals indicate that the average feed and fodder consumption of milch animals was ranged between 14-16 kg of green fodder followed by 12-14 kg of dry fodder, 2-3 kg of concentrates and very few quantity of the supplements were fed to the adult animals. The quantity of feed and fodder fed to the animals were significantly high for milch animals followed by the heifer pregnant, dry animals and rest of them. Besides stall feeding, the animals were also taken out for grazing for few years on each day. The small ruminants were mostly fed outside by taking out for grazing and very few of the households had fed them with the dry fodder and some concentrates. On an average, animals were also taken out for grazing for 7-8 hours on each day.

viii. The total requirement of feed and fodder using the standards given by the NATP database and as per the available data of livestock census of 2012 was to be 85062 tonnes of green fodder, 415411 tonnes of dry fodder and 289746 tonnes of concentrates per day. With respect to green fodder availability, the production is estimated through a potential production per unit hectare from the land classification data of the State of Gujarat for the year 2016-17 and was estimated to be 71277 tonnes. The main crops residues available for livestock in the state are Bajra, Paddy, Wheat, Pulses, Oilseeds and Sugarcane. The percent gap between the requirement and availability has been computed which indicate that State deficit in dry fodder followed by availability of concentrates. The deficit in green fodder was estimated as 30 percent than the requirement.

ix. The major sources of livestock feed reported by the sample households are crop residues as major source of the livestock feed followed by grazing land. Half of the respondents depended on the improved forage and pastures, household left over and tree legumes grown as hedge. Very few household have reported use of feed preserved in storages. Very few households have cattle shed and majority of them are kuccha in nature of which few are within house. While in case of shed for sheep and goat, very few of the same were of kaccha nature.

x. As dairy activities are carried out as complimentary activity to agriculture activities, the labour use pattern by the selected sample households indicate the significant involvement of female in dairy activity (buffalo, crossbred cows and indigenous cows), while in case of sheep and goats, male were engaged may be mostly for grazing them on the field. The time spent on management of dairy business for the stall feed animals was estimated to be around 2-3 hours per day while same was about 3-5 hours for small ruminants. The net returns realised by the sample households shows that the highest milk yield realised by the sample households from crossbred cattles was (9.22 litre/day) followed 5.82 litre/day from buffalo and 5.17 litre/day from indigenous cows. While the milk yield of small ruminants animals was reported to be less than a litre per day. Therefore, there is a huge scope to enhance producers' income from dairy by enhancing animals' productivity, improving management practise, and ensuing remunerative prices.

xi. The details on constraints faced by the sample households indicate that the top most constraint faced as expected was small size of land holdings and therefore selected households cannot afford to put more land under fodder seed/crop production as they need to grow foodgrains and commercial crops. The other major constraints reported are no provision of quality seed by society on credit & non availability of quality fodder seed in market; high cost of cultivation/production and low return on fodder production; non-availability of grazing lands; and non-availability of adequate irrigation water.

xii. The adoption of post-harvest techniques plays important role in conservation of dry and green fodders for long period to be used during off seasons. It was very strange to note that despite the fact that fodder availability has direct

relation with milk productivity as well as health of the animals, almost all the households had not adopted any post-harvest technique, which indicate failure of the agricultural extension mechanism/department of animal husbandry in training the farmers for such techniques (e.g., hay making, silage, etc.). The major reasons for non-adoption of these post-harvest techniques were high expense to adopt the post-harvest techniques (55 percent), followed by lack of awareness on production and post-harvest management (29 percent) and considered it inferior in comparison to fresh one (14 percent) and more laborious (2 percent).

xiii. It was strange to note that hardly 3 percent of total households have reported that they have benefited from government and dairy cooperative, having availed cattle shed subsidy, fodder seed and loan of purchase of livestock as well as free medicine and availability of feed at dairy cooperative. Almost 97 percent of households reported that they did not received any support from the government net or dairy. The top three suggestions made by the selected households were availability of quality seed in time, seed availability at subsidized rate.

4. Conclusions and Policy Recommendations

i. Animal husbandry plays a vital role in Gujarat's rural economy contributing 5.32 percent to the state GSDP in 2013-14, while the contribution of agriculture to total GSDP was 16.83 percent. Milk contributes around 20 percent to the agricultural GSDP of Gujarat and is one of the biggest sectors for supporting livelihood in the state. This suggests that public investment in the livestock sector should be enhanced to help the smallholder livestock producer, which derives their larger share of income from the livestock sector.

ii. Dairy industry can serve as a cushion in the form of continuous flow of income as an industry complementary to the agricultural industry. While both agriculture and dairy industry if simultaneously operated, it can improve not only farmer's income but also compensate for unexpected losses faced due to agriculture especially for poor small and marginal farmers. Besides,it complementarily protects against seasonal and disguised unemployment and acts as a shield to protect farmer against the negative impact of climate change on agriculture.

iii. Shortage of quality dry fodder and concentrates is major constraint for livestock sector growth. The gap between the requirement and availability of feed and fodder is increasing due to decreasing area under fodder cultivations and reduced availability of crop residues as fodder. Also there is continuous shrinking of common property resources leading to over grazing on the existing grass land. Therefore, there is a need to work out the strategies for sufficient good quality feed and fodder for efficient utilisation of genetic potential; of the various livestock species and for sustainable improvement in productivity.

iv. Improvement in nutritional rationed balanced diet can create a positive impact on yield, thereby improving net income and optimum use of available fodder and feed with households. Ration Balancing Program (RBP) results in better health of animal, improves the milk composition and the yield, improves conception rate and thereby lactation cycle improves due to reduction in the dry rate. Hence, it is suggested that if the local educated youth of the village are involved in the form of Local Resource Persons (LRPs) it would result in the optimum utilization of the locally available resources in the form of fodder and labor as also the rural employment rate will improve. In the process, such positive interventions would have multifold effect in net dairy income and reduction in the quantity of BEP through reduction in cost and improvement in income through improved quality of milk. Such benefits can be assured through proper assessment mechanism form RBP.

v. Fodder forms a major component of the variable cost in the dairy industry. If the feed and fodder cost is reduced it can result in improvement in net income and reduce the BEP quantity.

vi. Fodder is the major component of the variable cost. Hence fodder community farming farms should be encouraged, benefits assessed, and should be effectively communicated to the dairy farmers. Co-operative farming of fodder particularly on the barren land of the village

can assure sufficient local availability of the fodder and thereby reduce the variable cost, create a positive impact on net income.

vii. The co-operative structure is very weak in Saurashtra and Kachchh regions of the state. Therefore, presence of Milk Producer Company's sales & distribution network is spread across Saurashtra & Kachchh region support the dairy development in this regions. Therefore, there is a need to support the MPCs in all the areas for balanced development of dairy sector.

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

Commodity Reviews

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2019-20 up to 29.05.2020 is 47.16 million tonnes as against 40.51 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 29.05.2020) 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

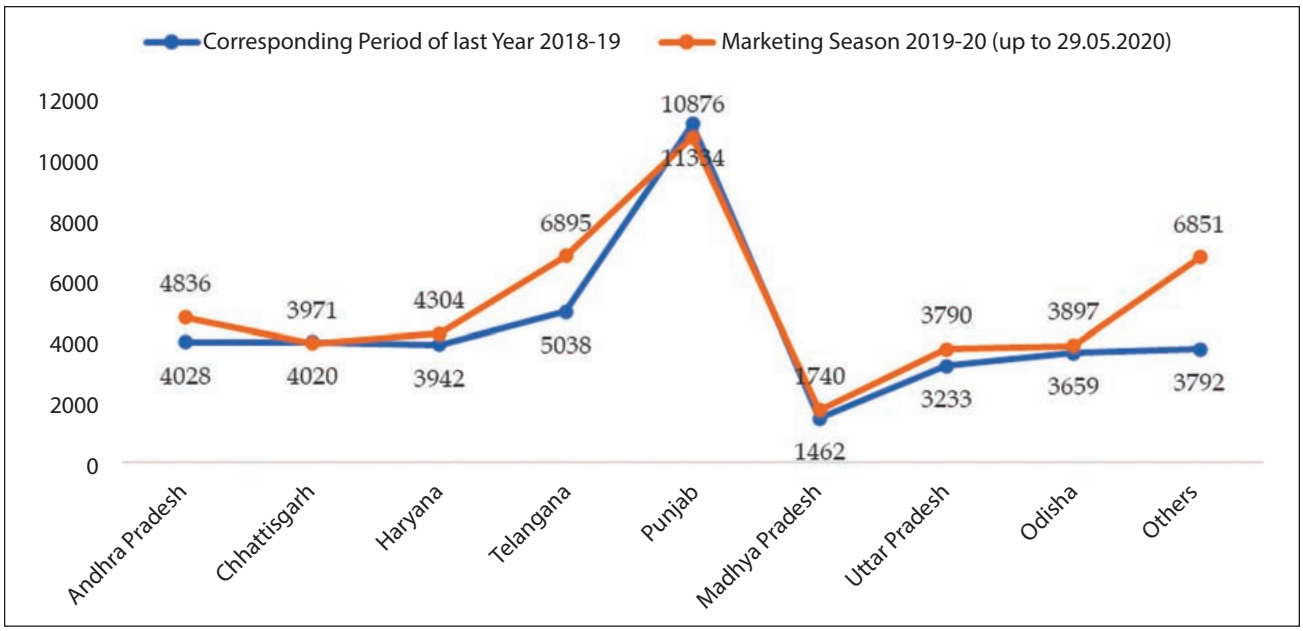
(In thousand tonnes)

State	Marketing Season 2019-20 (up to 29.05.2020)		Corresponding Period of last Year 2018-19	
	Procurement	% to Total	Procurement	% to Total
1	**2**	**3**	**4**	**5**
Andhra Pradesh	4836	10.3	4028	9.9
Chhattisgarh	3971	8.4	4020	9.9
Haryana	4304	9.1	3942	9.7
Telangana	6895	14.6	5038	12.4
Punjab	10876	23.1	11334	28.0
Madhya Pradesh	1740	3.7	1462	3.6
Uttar Pradesh	3790	8.0	3233	8.0
Odisha	3897	8.3	3659	9.0
Others	6851	14.5	3792	9.3
Total	47160	100.0	40508	100.0

Source: Department of Food & Public Distribution.

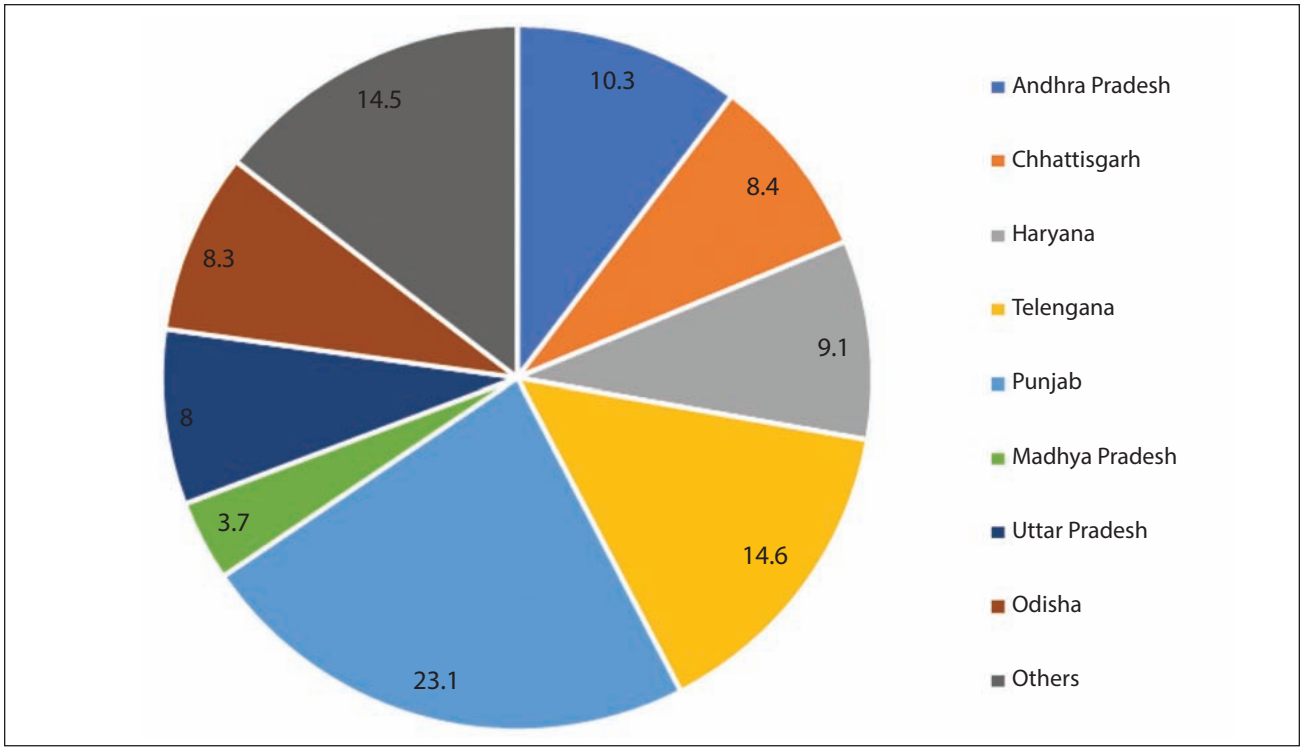
Figure 1: State-wise Procurement of Rice

(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 29.05.2020).



Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat during rabi marketing season 2020-21 up to 29.05.2020 is 35.41 million tonnes as against 34.03 million tonnes during the corresponding period of last year. The details are given in Table 2. The figure 3 depicts the comparison of procurement of wheat during the marketing season 2020-21 (up to 29.05.2020) 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

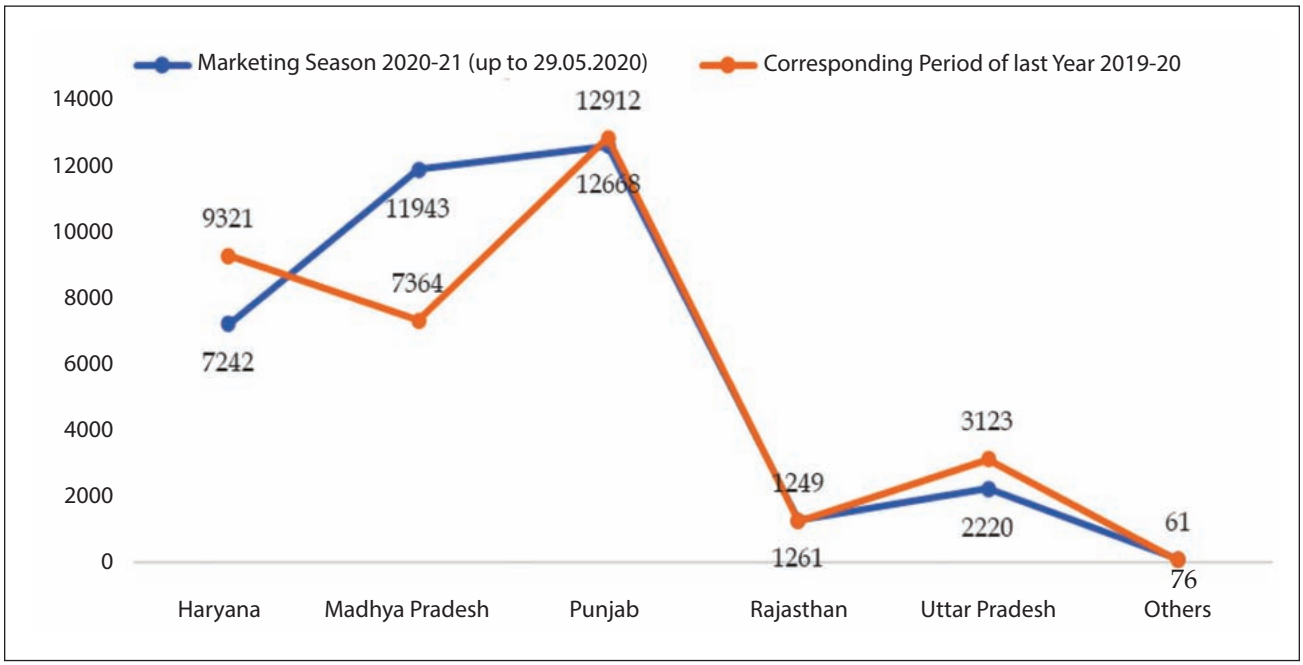
(In thousand tonnes)

State	Marketing Season 2020-21 (up to 29.05.2020)		Corresponding Period of last Year 2019-20	
	Procurement	% to Total	Procurement	% to Total
1	2	3	4	5
Haryana	7242	20.5	9321	27.4
Madhya Pradesh	11943	33.7	7364	21.6
Punjab	12668	35.8	12912	37.9
Rajasthan	1261	3.6	1249	3.7
Uttar Pradesh	2220	6.3	3123	9.2
Others	76	0.2	61	0.2
Total	35410	100.0	34030	100.0

Source: Department of Food & Public Distribution.

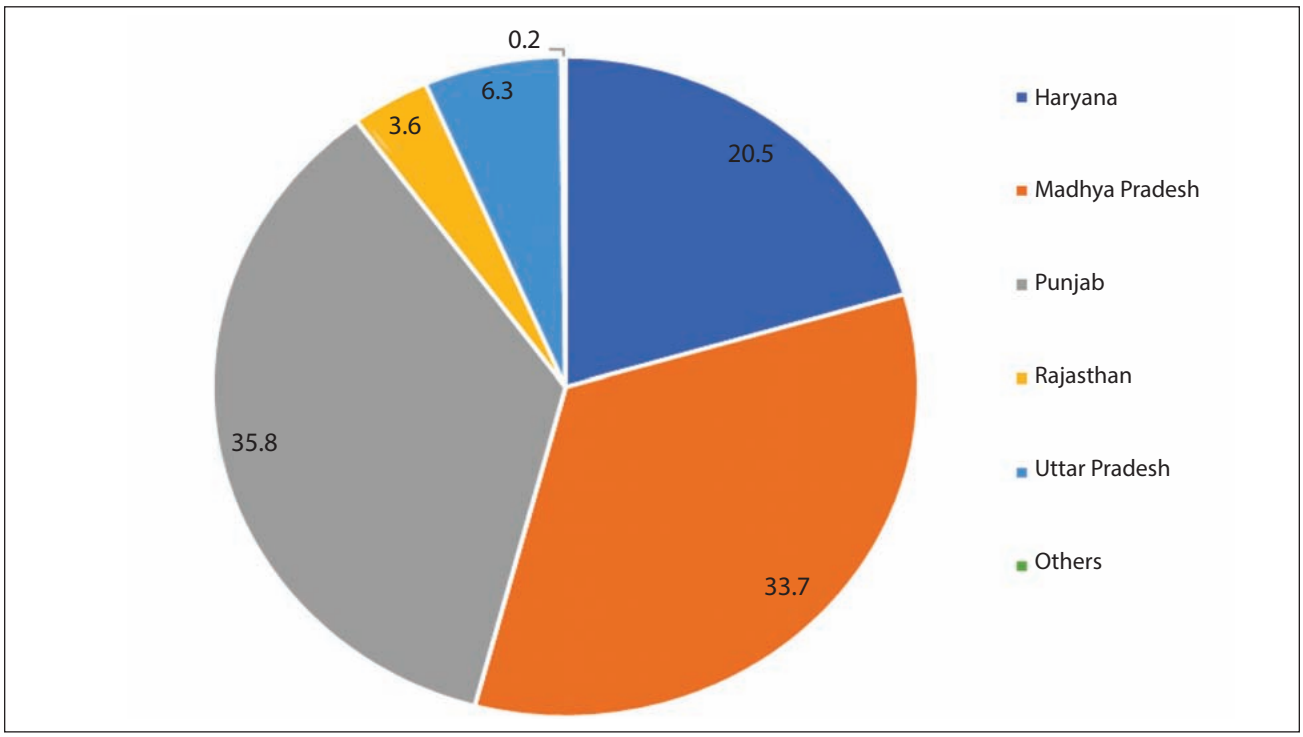
Figure 3: State-wise Procurement of Wheat

(In thousand tonnes)



Source: Department of Food & Public Distribution.

Figure 4: Percentage Share of Different States in Procurement of Wheat during Marketing Season 2020-21 (up to 29.05.2020).



Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 153.4 in May, 2020 showing an increase of 2.27% and increase of 3.79% over the previous month and year, respectively. WPI of groundnut seed increased by 2.42%, rape & mustard seed by 0.61%, cotton seed by 0.92%, gingelly seed by 1.84%, safflower (kardi seed) by 1.03% and soyabean by 4.79%. However, the WPI of copra (coconut) decreased by 1.52%, niger seed by 1.96% and sunflower by 2% 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 126.2 in May, 2020.

Fruits & Vegetable

The WPI of fruits & vegetable as a group stood at 152.3 in May, 2020 showing a decrease of 4.39% and a decrease of 6.96% over the previous month and year, respectively.

Potato

The WPI of potato stood at 240.4 in May, 2020 showing an increase of 5.39% and 52.25% over the previous month and year, respectively.

Onion

The WPI of onion stood at 117.7 in May, 2020 showing a decrease of 3.21% over the previous year.

Condiments & Spices

The WPI of condiments & spices (group) stood at 147.3 showing an increase of 0.34% and increase of 11.34% over the previous month and year, respectively. The WPI of black pepper increased by 1.56% and chillies (dry) by 0.62% while that of turmeric decreased by 0.26%.

Raw Cotton

The WPI of raw cotton stood at 104.4 in May, 2020 showing a decrease of 2.25% and a decrease of 16.61% over the previous month and year, respectively.

Raw Jute

The WPI of raw jute stood at 210.9 in May, 2020 showing an increase of 0.96% and increase of 5.56% over the previous month and year, respectively.

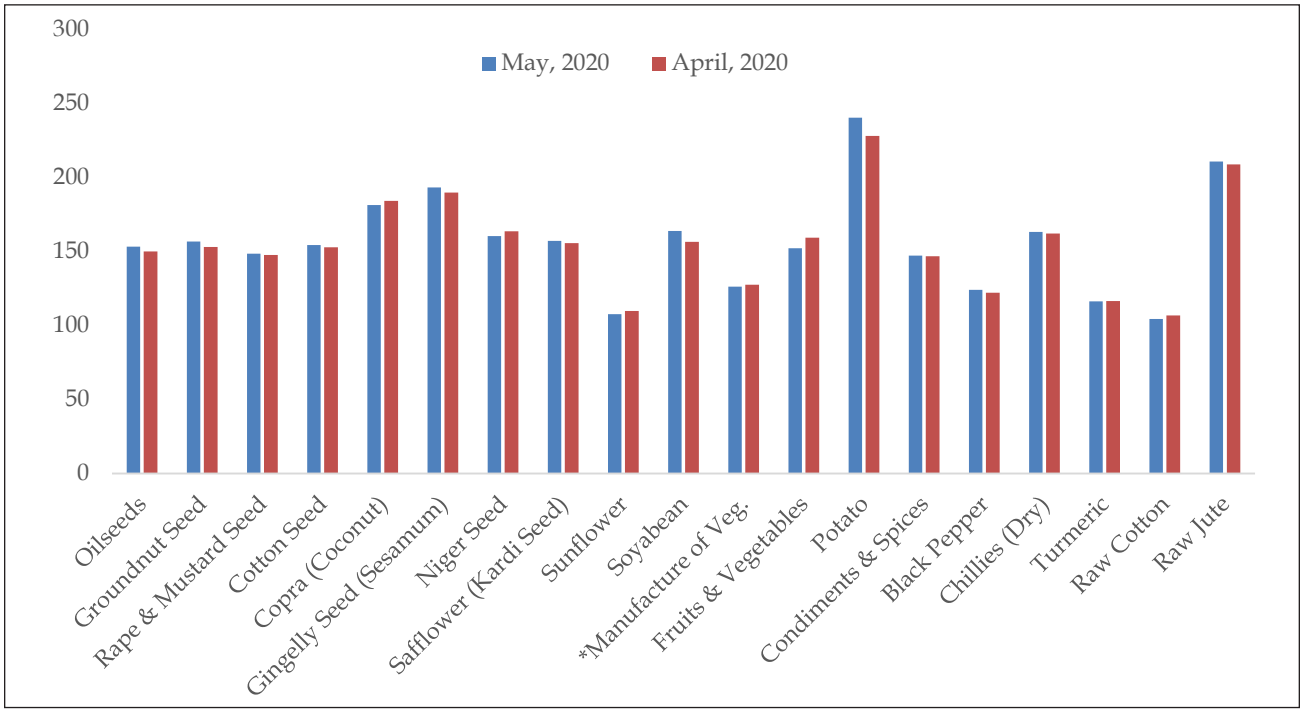
Wholesale Price Index of Commercial Crops is given in Table 3. A graphical comparison of WPI for the period of May, 2020 and April, 2020 is given in figure 5 and the comparison of WPI during the May, 2020 with the corresponding month of last year has been given in figure 6.

TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12=100)

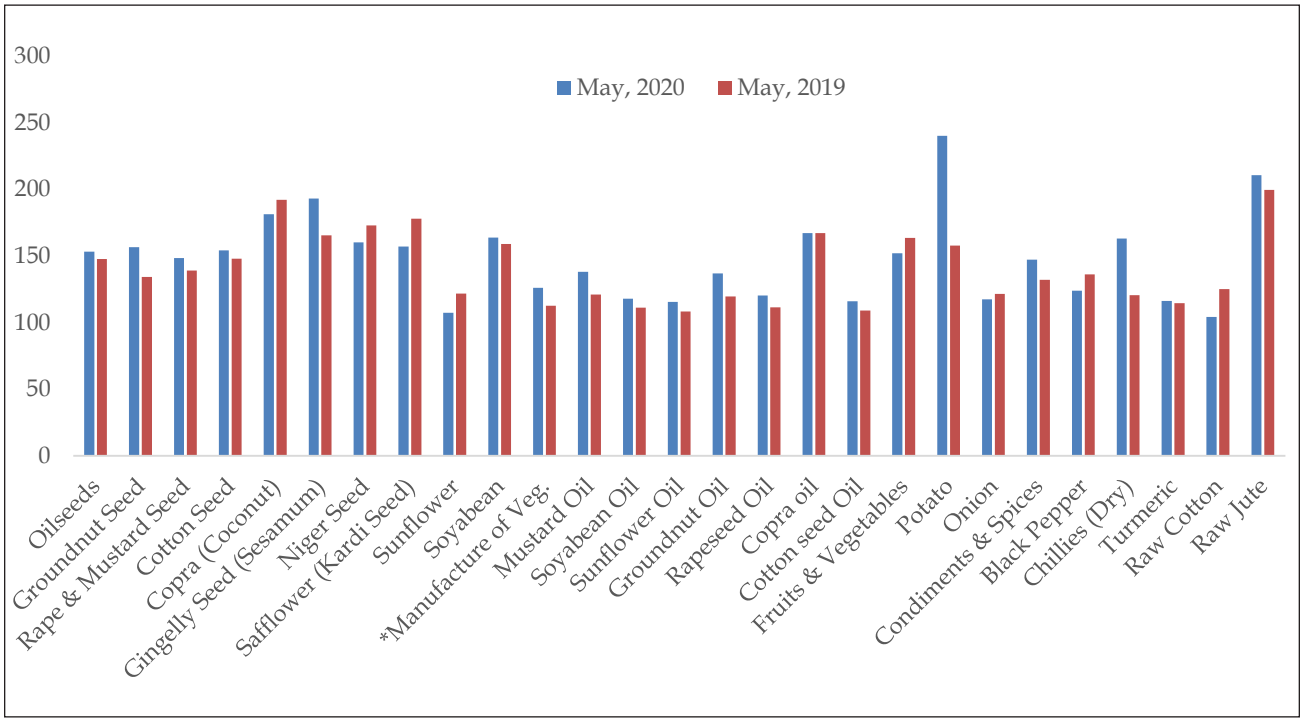
Commodity	Latest May-20	Month Apr-20	Year May-19	% variation over the	
				month	year
Oilseeds	153.4	150	147.8	2.27	3.79
Groundnut Seed	156.8	153.1	134.5	2.42	16.58
Rape & Mustard Seed	148.6	147.7	139.2	0.61	6.75
Cotton Seed	154.3	152.9	148	0.92	4.26
Copra (Coconut)	181.4	184.2	192.3	-1.52	-5.67
Gingelly Seed (Sesamum)	193.3	189.8	165.6	1.84	16.73
Niger Seed	160.4	163.6	173.1	-1.96	-7.34
Safflower (Kardi Seed)	157.2	155.6	178.1	1.03	-11.73
Sunflower	107.6	109.8	121.9	-2.00	-11.73
Soyabean	164	156.5	159.1	4.79	3.08
Manufacture of Vegetable, Animal Oils and fats	126.2	127.6	112.9	-1.10	11.78
Mustard Oil	138.3		121.2		14.11
Soyabean Oil	118		111.4		5.92
Sunflower Oil	115.7		108.5		6.64
Groundnut Oil	137		119.7		14.45
Rapeseed Oil	120.4		111.7		7.79
Copra oil	167.3		167.3		0.00
Cotton seed Oil	116.1		109.1		6.42
Fruits & Vegetables	152.3	159.3	163.7	-4.39	-6.96
Potato	240.4	228.1	157.9	5.39	52.25
Onion	117.7		121.6		-3.21
Condiments & Spices	147.3	146.8	132.3	0.34	11.34
Black Pepper	124	122.1	136.3	1.56	-9.02
Chillies (Dry)	163.2	162.2	120.6	0.62	35.32
Turmeric	116.3	116.6	114.7	-0.26	1.39
Raw Cotton	104.4	106.8	125.2	-2.25	-16.61
Raw Jute	210.9	208.9	199.8	0.96	5.56

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



* Manufacture of Vegetable, Animal Oils and Fats

Figure 6: WPI of commercial crops during May, 2020 and May, 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	Moth & 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	Feb,20	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 Working Hours	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	Jan,20	M	8	400	200	NA	180	180	160	320	300	200
				W	8	NA	175	NA	150	160	140	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 Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Gujarat*	Rajkot	Rajkot	March,20	M	8	287	287	287	287	253	200	483	483	450
				W	8	NA	203	287	287	253	200	NA	NA	NA
	Dahod	Dahod	Jan,20	M	8	300	300	150	150	150	NA	400	350	300
				W	8	NA	250	150	150	150	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Jan,20	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	March, 20	M	8	250	NA	200	200	250	150	400	400	NA
				W	8	NA	NA	200	200	200	NA	NA	NA	NA
	Satna	Kotar	March, 20	M	8	300	300	300	300	300	300	500	500	500
				W	8	NA	300	300	300	300	300	NA	NA	NA
	Shyopurkala	Vijaypur	March, 20	M	8	NA	300	NA	300	NA	400	400	400	NA
				W	8	NA	300	NA	300	NA	400	NA	NA	NA
Odisha	Bhadrak	Chandbali	Oct, 19	M	8	400	400	400	400	425	300	500	400	350
				W	8	NA	300	300	300	317	250	NA	NA	NA
	Ganjam	Aska	Oct, 19	M	8	300	250	250	300	333	250	500	500	500
				W	8	NA	220	220	250	275	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

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
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
Tamil Nadu*	Thanjavur	Pulvarnatham	April,20	M	8	NA	383	NA	362	413	NA	450	500	NA
				W	8	NA	NA	187	176	195	NA	NA	NA	NA
	Tirunelveli	Malayakulam	April,20	M	8	NA	458	NA	NA	675	NA	NA	500	NA
				W	8	NA	200	206	225	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	Feb, 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	Feb, 20	M	8	NA	NA	300	NA	300	NA	500	NA	.NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chandauli	Chandauli	Feb, 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	May-20	Apr-20	May-19
Wheat	PBW 343	Quintal	Punjab	Amritsar	2200	2200	1845
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1925	1950	1840
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	NA	NT	1890
Jowar	-	Quintal	Maharashtra	Mumbai	3400	3300	3500
Gram	No III	Quintal	Madhya Pradesh	Sehore	3981	3850	4050
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1800	1900	2115
Gram Split	-	Quintal	Bihar	Patna	6150	6200	5920
Gram Split	-	Quintal	Maharashtra	Mumbai	5800	6250	6000
Arhar Split	-	Quintal	Bihar	Patna	8600	8500	7270
Arhar Split	-	Quintal	Maharashtra	Mumbai	9000	9400	7200
Arhar Split	-	Quintal	NCT of Delhi	Delhi	7950	NA	6650
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	9000	9000	7800
Gur	-	Quintal	Maharashtra	Mumbai	4700	4700	4500
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4500	4500	4500
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2900	2800	2450
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	4100	3900	3415
Mustard Seed	Black	Quintal	West Bengal	Raniganj	4400	NA	4250
Mustard Seed	-	Quintal	West Bengal	Kolkata	4850	4600	4350
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	5200	5150	4215
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	4800	4600	4680
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2100	1800	2100
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3000	3000	2500
Castor Seed	-	Quintal	Telangana	Hyderabad	NT	NA	5150
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	10600	9500	10275
Copra	FAQ	Quintal	Kerala	Alleppey	9850	11250	8900
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	7000	5000	5300
Groundnut	-	Quintal	Maharashtra	Mumbai	9300	9100	7800
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1400	1385	1335
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1688	NA	1375
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2140	2000	1650
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2175	2175	1800
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1455	1445	1442
Castor Oil	-	15 Kg.	Telangana	Hyderabad	NT	NA	1800
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1840	NA	1760
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	3400	3400	3100
Coconut Oil	-	15 Kg.	Kerala	Cochin	2130	2355	1935
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2200	2100	1800
Groundnut Cake	-	Quintal	Telangana	Hyderabad	NT	NA	3214
Cotton/Kapas	NH 44	Quintal	Andhra pradesh	Nandyal	4600	NA	5900
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	NA	NA	5500

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

Commodity	Variety	Unit	State	Centre	May-20	Apr-20	May-19
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	NA	NA	4500
Jute Raw	W 5	Quintal	West Bengal	Kolkata	NA	NA	4550
Oranges	-	100 No	NCT of Delhi	Delhi	458	NA	667
Oranges	Big	100 No	Tamil Nadu	Chennai	620	650	520
Banana	-	100 No.	NCT of Delhi	Delhi	416	NA	417
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	400	300	650
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	88000	80000	76000
Almonds	-	Quintal	Maharashtra	Mumbai	65000	61000	63000
Walnuts	-	Quintal	Maharashtra	Mumbai	67000	65000	67500
Kishmish	-	Quintal	Maharashtra	Mumbai	21000	20000	26000
Peas Green	-	Quintal	Maharashtra	Mumbai	6000	7000	5000
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	850	1500	2850
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	1500	2400	2000
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1500	1800	1500
Potato	Red	Quintal	Bihar	Patna	1700	1900	1080
Potato	Desi	Quintal	West Bengal	Kolkata	1840	1900	1100
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	3390	NA	3550
Onion	Pole	Quintal	Maharashtra	Nashik	600	700	800
Turmeric	Nadan	Quintal	Kerala	Cochin	11000	11000	11000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	12000	12000	10500
Chillies	-	Quintal	Bihar	Patna	13050	13050	9920
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	29000	NT	31000
Ginger	Dry	Quintal	Kerala	Cochin	27000	27000	25000
Cardamom	Major	Quintal	NCT of Delhi	Delhi	134000	NA	120000
Cardamom	Small	Quintal	West Bengal	Kolkata	250000	NA	220000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	5200	NA	5200
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	73300	NA	73333
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	42000	42000	43000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	40000	40250	42500
Fish	Rohu	Quintal	NCT of Delhi	Delhi	15000	NA	16000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	35000	35000	48000
Eggs	Madras	1000 No.	West Bengal	Kolkata	3645	NA	3700
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	36300
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	29500	29500	28300
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	7800	8150	7150
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	4800	5250	3900
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	NA	NA	13200
Rubber	-	Quintal	Kerala	Kottayam	10500	NT	13000
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	63000	63000	59500

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2020

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY
CARDAMOM	Guatmala Bold Green	U.K.	-	Dollar/MT	40000	40000	40000	40000	40000
				Rs./Qtl	285880	288720	299760	305160	302840
CASHEW KERNELS	Spot U.K. 320s	U.K.	-	Dollar/MT	8935	8782	8407	8438	8317
				Rs./Qtl	63859	63387	63003	64373	62968
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands	-	Dollar/MT	1484	1453	1420	1420	1420
				Rs./Qtl	10604	10484	10641	10836	10754
CHILLIES	Birds eye 2005 crop	Africa	-	Dollar/MT	8000	8000	8000	8000	8000
				Rs./Qtl	57176	57744	59952	61032	60568
CLOVES	Singapore	Madagascar	-	Dollar/MT	7000	5620	5660	5100	6500
				Rs./Qtl	50029	40565	42416	38908	49212
COCONUT OIL	Crude Phillipine/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	932	842	822	822	822
				Rs./Qtl	6657	6081	6156	6275	6227
COPRA	Phillipines cif Rotterdam	Phillipine	-	Dollar/MT	593	530	517	515	503
				Rs./Qtl	4237	3825	3876	3926	3808
CORRIANDER		India	-	Dollar/MT	1700	1700	1700	1700	1700
				Rs./Qtl	12150	12271	12740	12969	12871
CUMMIN SEED		India	-	Dollar/MT	3900	3900	3400	3400	3400
				Rs./Qtl	27873	28150	25480	25939	25741
MAIZE		U.S.A.	Chicago	C/56 lbs	382	369	347	315	320
				Rs./Qtl	1073	1047	1022	944	952
OATS		CANADA	Winnipeg	Dollar/MT	405	383	375	417	450
				Rs./Qtl	2892	2763	2810	3181	3410
PALM KERNAL OIL	Crude Malaysia/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	880	732	688	723	642
				Rs./Qtl	6286	5286	5159	5519	4860
PALM OIL	Crude Malaysian/ Sumatra, cif Rotterdam	Netherlands	-	Dollar/MT	783	662	609	520	524
				Rs./Qtl	5596	4781	4566	3969	3967
PEPPER (Black)	Sarawak Black lable	Malaysia	-	Dollar/MT	3300	3300	3300	3300	3300
				Rs./Qtl	23585	23819	24730	25176	24984
RAPESEED	Canola	CANADA	Winnipeg	Can Dollar/ MT	458	449	465	454	472
				Rs./Qtl	2477	2413	2483	2461	2536
	UK delivered rapeseed, delivered Erith(buyer)	U.K.	-	Pound/ MT	304	325	325	325	325
				Rs./Qtl	2855	3014	2996	3061	2994

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR, 2020-*CONTD.*

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY
RAPESEED OIL	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/ MT	868	868	854	781	781
				Rs./Qtl	8152	8050	7872	7355	7195
SOYABEAN MEAL	UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk	U.K.	-	Pound/ MT	309	309	309	309	309
				Rs./Qtl	2902	2866	2848	2910	2847
SOYABEAN OIL		U.S.A.	-	C/lbs	31	29	27	26	26
				Rs./Qtl	4883	4613	4460	4372	4338
SOYABEANS		U.S.A.	-	C/60 lbs	887	881	883	833	836
				Rs./Qtl	2327	2334	2429	2332	2323
	US NO.2 yellow	Netherlands	Chicago	Dollar/MT	372	374	376	358	358
				Rs./Qtl	2661	2698	2817	2729	2712
SUNFLOWER SEED OIL	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/ MT	790	790	724	753	753
				Rs./Qtl	7420	7326	6674	7092	6937
Wheat		U.S.A.	Chicago	C/60 lbs	564	535	569	542	511
				Rs./Qtl	1479	1417	1565	1518	1420

Source: IEG Vu Agribusiness

Foreign Exchange Rates

Currency	JAN	FEB	MAR	APR	MAY
CanDollar	54.04	53.75	53.37	54.16	53.79
UK Pound	93.92	92.74	92.18	94.18	92.13
US Dollar	71.47	72.18	74.94	76.29	75.71

Crop Production

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF AUGUST, 2020

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

(K) – Kharif (R)~ Rabi

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N.A. — Not Available.
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N.T. — No Transactions.
N.S.—No Supply/No Stock.
R. — Revised.
M.C. — Market Closed.
N.R.—Not Reported.
Neg. — Negligible.
Kg. — Kilogram.
Q. — Quintal.
(P) — Provisional.
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Minus (-) indicates deficit or decrease.

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