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सत्यमेव जयते

# AGRICULTURAL SITUATION IN INDIA

JUNE, 2017

FARM SECTOR NEWS

GENERAL SURVEY OF AGRICULTURE

ARTICLES

Economics of Apple Production in Jammu and Kashmir

Evaluation of Post Harvest Losses during Marketing of Oranges

Farm Size and Economic Viability of Sugarcane Cultivation in Maharashtra: Some Evidence from Plot Level Cost of Cultivation Data

AGRO - ECONOMIC RESEARCH

Pilot Project to Ascertain the Use of Diesel for Irrigation

COMMODITY REVIEWS
Foodgrains
Commercial Crops

TRENDS IN AGRICULTURE:
Wages & Prices

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

## Note to Contributors

Articles on the State of Indian Agriculture and allied sectors are accepted for publication in the Directorate of Economics & Statistics, Department of Agriculture, Cooperation & Farmers Welfare's monthly Journal "Agricultural Situation in India". The Journal intends to provide a forum for scholarly work and also to promote technical competence for research in agricultural and allied subjects. Good articles in Hard Copy as well as Soft Copy (agri.situation@gmail.com) in MS Word, not exceeding five thounsand words, may be sent in duplicate, typed in double space on one side of foolscap paper in Times New Roman font size 12, addressed to the Editor, Publication Division, Directorate of Economics and Statistics, M/o Agriculture & Farmers Welfare, C-1, Hutments Dara Sekoha Road, New Delhi-110 011 along with a declaration by the author(s) that the article has neither been published nor submitted for publication elsewhere. The author (s) should furnish their e-mail address, Phone No. and their permanent address only on the forwarding letter so as to maintain anonymity of the author while seeking comments of the referees on the suitability of the article for publication.

Although authors are solely responsible for the factual accuracy and the opinion expressed in their articles, the Editorial Board of the Journal, reserves the right to edit, amend and delete any portion of the article with a view to making it more presentable or to reject any article, if not found suitable. Articles which are not found suitable will not be returned unless accompanied by a self-addressed and stamped envelope. No correspondence will be entertained on the articles rejected by the Editorial Board.

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**Disclaimer**: Views expressed in the articles and studies are of the authors only and may not necessarily represent those of Government of India.

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**Abbreviations used**

N.A. — Not Available.
N.Q. — Not Quoted.
N.T. — No Transactions.
N.S. — No Supply/No Stock.
R. — Revised.
M.C. — Market Closed.
N.R. — Not Reported.
Neg. — Negligible.
Kg. — Kilogram.
Q. — Quintal.
(P) — Provisional.
Plus (+) indicates surplus or increase.

We are pleased to inform that our monthly journal *Agricultural Situation in India* has been accredited by the National Academy of Agricultural Sciences (NAAS) and it has been given a score of 3.15 out of 6. The score is effective from January, 2017 onwards. The score may be seen in the following website: www.naasindia.org

The journal *Agricultural Situatiion in India* has been included in the UGC approved list of journals for promotion and recruitment in academic and non-academic posts.

Soft copy of the journal may be seen in PDF at the following URL : eands.dacnet.nic.in/publication.htm

# FARM SECTOR NEWS

**Central Government permitted States and UTs to earmark 25% of funds under centrally sponsored schemes as flexi-funds which, inter-alia, could be used for mitigation of natural calamities: said by Shri Radha Mohan Singh**

Union Agriculture & Farmers Welfare Minister, Shri Radha Mohan Singh, had written a letter to all the Chief Ministers of the States/UTs for the review of the state of preparedness in managing any weather related contingency, if any, in advance so that the possible adverse impact of sub-par rainfall on the farmers can be mitigated. Shri Singh, in his letter, mentioned that India Meteorological Department (IMD) projected a likely rainfall of 96% ($\pm$5%) of the Long Period Average during Kharif 2017 in its first stage forecast for the South-West Monsoon.

Shri Singh further wrote that 2016-17 was a very satisfactory year for the agriculture sector as a whole. The State Governments and farmers were able to take the best advantage of a normal monsoon to create record-breaking performance in the production of cereals, pulses and oilseeds. Yet, the normal rainfall notwithstanding, agricultural operations faced disruption in some States during 2016-17 on account of drought caused by aberrant weather conditions. It would, therefore, be helpful if a review of the state of preparedness in managing any weather related contingency is carried out in advance so that the possible adverse impact of sub-par rainfall, if at all, on the farmers can be mitigated.

Shri Singh also reminded the Chief Ministers that Hon'ble Prime Minister had discussed drought mitigation/ management measures in meetings with Chief Ministers of States affected by drought during 2015-16. Shri Singh expressed his confidence that the administration would have made arrangements to operationalise their drought mitigation strategies, in the event of failure of the monsoon rainfall. In this context, Shri Singh suggested to carry out a review which, inter alia, may include the following:

(i) State of preparedness in districts in line with the District Agricultural Contingency Plans (such as availability of biotic stress resilient seeds varieties etc.)

(ii) Progress in the implementation of schemes under District Irrigation Plans of the Pradhan Mantri Krishi Sinchai Yojana.

(iii) Status of progress of water conservation/ recharge/harvesting related works under MGNREGS and water-shed management.

(iv) Establishment and activation of Drought Management Centre at the State Headquarter and arrangements for the monitoring of drought.

(v) Progress in the restoration of irrigation infrastructure such as desiltaion of canals, repair/ energization of tube-wells and replacement/repair of faulty pumps; repair of transformers/power lines.

(vi) Progress in the repair of handpumps/drinking water projects.

Union Agriculture Minister further informed that the Central Government had permitted States and UTs to earmark 25% of funds under centrally sponsored schemes as flexi-funds which, inter-alia, could be used for mitigation of natural calamities. In addition, expanding the coverage of the Pradhan Mantri Fasal Bima Yojana would enable farmers to minimise risks associated with loss of production in the event of a disaster.

**Ministry of Agriculture & Farmers Welfare approved the procurement of one lakh MT of toor under PSS upto 31st May, 2017**

The proposal for implementation of Price Support Scheme (PSS) for procurement of toor during the current Kharif season 2016-17 was received from Government of Maharashtra. As per their proposal, it was mentioned that expected production of toor in Maharashtra would be 12.56 lakhs MT and they had requested for procurement of 2 lakhs quintal during 1st November, 2016 — 29th January, 2017.

This proposal was transferred to Department of Consumer Affairs to create a buffer stock of pulses by making procurement directly from the farmers at MSP plus bonus under Price Stabilization Fund (PSF). This procurement continued till 22nd April, 2017 and around 4 lakhs MT of toor was procured which was 31.95% of total expected production. Due to continuous arrival, State Government had decided to procure the toor from the farmers who had been registered or token had been issued till 22nd April, 2017 at various procurement centres from their own resources.

**Source:** www.pib.nic.in

On 5th May, 2017, request for implementation of PSS was again received from Government of Maharashtra. In the fresh proposal, they had requested for procurement of 20 lakhs quintal (2 lakhs MT) of toor upto 31st May, 2017. They had also informed that as per their third estimate, the expected production in the State would be 20.35 lakhs MT. The Notification for harvesting period of Kharif toor was revised from September to March and extended upto 31st May, 2017.

Considering the proposal, this Department had approved the procurement of one lakh MT of toor under PSS upto 31st May, 2017 with the condition that the procurement already made as per State Government Notification dated 27.4.2017 should not be reimbursed or adjusted from the procurement made under PSS and State Government would make necessary arrangements for godown space and other resources for smooth PSS operation in the State.

**Union Agriculture and Farmers Welfare Minister launched e-Krishi Samvad, an online interface**

Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers Welfare, launched e-Krishi Samvad at Krishi Bhawan. Shri Singh informed that the e-Krishi Samvad is on internet-based interface and is an unique platform that would provide direct and effective solutions to the problems faced by farmers and stakeholders in the agriculture sector.

Union Agriculture Minister said that people can directly connect to the ICAR website *http://icar.org.in* and get the appropriate solutions from the subject matter specialists and institutes through web or SMS. Stakeholders can upload photographs related to diseases of the crops, animals or fishes for diagnostics and remedial measures instantly from the specialists.

Shri Singh further said that those who have internet facility on the mobile phone can also avail this facility. e-Krishi Samvad would be useful to get information pertaining to welfare and development of agricultural stakeholders.

**'Women Can Strengthen Economic Status through Cooperatives in Small Industry Sector': said by the Union Agriculture and Farmers Welfare Minister**

Union Minister for Agriculture and Farmers Welfare Shri Radha Mohan Singh had inaugurated the Inter-state Cooperative Investment Summit & Exhibition in Dehradun, Uttarakhand. Speaking on the occasion, the Minister said that women rub shoulders with other family members and work hard to provide a better life to their families. These women can strengthen their economic status through cooperatives in the small industry sector such as forestry, vegetable and fruit farming and solar energy.

Talking about the role of cooperatives in the development of Uttarakhand, Shri Radha Mohan Singh said that he was happy to learn that the State's cooperative department had selected cooperative entrepreneurship as a medium to boost entrepreneurship in the state and organised the exhibition. He also said that cooperatives are not new to our country and that the cooperative movement had first started in a village in Gujarat and the movement led to the enactment of Cooperative Credit Societies Act, 1904.

Shri Radha Mohan Singh further added that it is important to implement Pradhan Mantri Fasal Bima Yojana in Uttarakhand through cooperative societies and help affected farmers because the state's agriculture sector is totally dependent upon monsoon. The Minister pointed out that the Government had taken concrete steps for the revival of cooperative societies to transform them into a dynamic, democratic organisation, so that they can face the challenges of a competitive global economy. He further said that considering the importance of cooperative societies in improving rural economy, the Government is committed to boosting cooperative societies through various programmes. Shri Singh also congratulated the representatives of cooperative societies representing various States for their appreciable contribution in the cooperative sector and said that he hoped to continue the trend of such programmes being organised in other parts of the country.

Modern cooperatives have attained a comprehensive shape during the 112-year journey. Indian cooperative movement is one of the biggest cooperative movements in the world. There are 8 lakh cooperative societies in India, which includes the cooperative organisation at the village and national levels. The membership of cooperative societies in the country is more than 274 million and it includes 95% villages and 71% rural families.

Shri singh appreciated the participation of Uttarakhand in cooperative societies, he further informed that. there are 4, 381 societies in the state, which are associated with various professions. As many as 759 packs are operational and their membership is 12 lakh and it is also appreciable that hundred percent villages are covered under these packs.

**Cabinet approved proposal to establish Indian Agricultural Institute (IARI) in Assam**

The Cabinet Committee had approved the proposal of DARE/ICAR scheme for the establishment of the Indian Agricultural Institute (IARI) in Assam with hundred per cent outlay of central government on 587 acres of land provided by the government of Assam. Also, the proposal for 98 positions had been approved.

Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh said that IARI-Assam would be a Post-Graduate Institute of higher learning in Agricultural Education and it would have all the hallmark identities of IARI in New Delhi including all sectors of agriculture like

field crops, horticulture crops, agroforestry, animal husbandry, fisheries, poultry, piggery, silk rearing, honey production, etc.

Shri Singh informed that IARI-Assam would work on the agrarian challenges and complexities of North Eastern India in coordination with all existing central and state government R&D Institutions and private sector enterprises for undertaking research, education, extension programs in its mission towards developing quality human resource, generation of farmer-friendly technologies to enhance productivity, quality, profitability, promote agro-based industries and generate employment opportunities for holistic and sustainable development of the agriculture sector in the North Eastern region. It would be an off campus of IARI, New Delhi and integrated multi-disciplinary research would be undertaken in school mode i.e., Schools of Crop Sciences, Natural Resource Management, and Animal Sciences & Fisheries.

**The initiatives taken under the leadership of Prime Minister, Shri Narendra Modi for the welfare of farmers and the agriculture sector have started showing positive results: Shri Radha Mohan Singh**

Union Minister for Agriculture and Farmers Welfare, Shri Radha Mohan Singh said the initiatives taken under the leadership of Prime Minister, Shri Narendra Modi for the welfare of farmers and the agriculture sector have started showing positive and encouraging results. The commitment of the Modi government towards the welfare of the farmers is resulting in qualitative improvement in the lives of farmers. Shri Radha Mohan Singh said that the Ministry of Agriculture is working to double farmers' income by 2022, a goal set by the Prime Minister. Shri Singh said this at a press conference in National Media Centre on the completion of three years of the Modi government.

Shri Radha Mohan Singh said that in the last three years, the Modi government has created new and transparent working style for the growth of the nation. Under the guidance of the Prime Minister, the implementation of the farmers' welfare scheme was turned into a mission by the government. From the perspective of good governance, innovative and reformist approach, our government laid the foundation of future-oriented India.

Shri Singh further said the Modi Government had succeeded in creating awareness among the farmers about initiatives taken for the development of the agriculture sector. In three years, continuous and robust efforts had been made to bring qualitative changes in lives of farmers and rural areas.

Union Agriculture Minister also informed that during UPA government, the expenditure made by the Ministry used to be less than the budgetary allocation. For instance, during the year 2011-12 budgetary allocation was Rs. 24, 526 crore and the amount spent was just Rs. 23, 290 crore. Similarly, in the year 2012-13, budgetary allocation was Rs.28, 284 crore and the amount spent was Rs. 24, 630 crore. In the year 2013-14, the budgetary allocation was Rs. 30, 224 crore and the amount spent was Rs.25, 896 crores.

On the other hand, under Modi government, the Ministry is spending more than the budgetary allocation for the welfare of the farmers. For instance, in the year 2016-17, the budgetary allocation was Rs. 45,035 crore, but it was increased to Rs. 57,503 crore in the revised budget.

Keeping the welfare of the agriculture sector and farmers in mind, Modi government is increasing the budget every year. For example, the total budget for the welfare of the agriculture sector during the UPA government's four years (from 2010-11 to 2013-14) was Rs.1,04,337 crore, while the present government had allocated Rs.1,64,415 crore during the period of 2014-15 to 2017-18, which was 57.58 per cent more.

Shri Singh said that in the initial two years of the last three years, the government provided security and confidence to farmers during two consecutive years of monsoon shortfall. Apart from focusing on the distribution of Soil Health Card, extension of irrigation facilities, low-cost organic farming, national agricultural market, horticulture development, Agro-forestry, bee keeping, dairy, fish and egg production, it also focused on agricultural education, research and extension. More investment has been made to strengthen cooperatives. In the last three year, several initiatives were taken to make the country self-reliant in pulses and oilseeds. The farmers were provided unprecedented security through Prime Minister's Fasal Bima Yojana, which has the lowest premium and covers various risks. The government has given priority to the interests of farmers by providing the District-wise contingency action plans and increasing the relief funds for the farmers affected by drought and hailstorm.

**Prime Minister laid the foundation stone of the country's third Indian Agricultural Research Institute in Goghmukh, Dhemaji, Assam**

The Prime Minister, Shri Narendra Modi, laid the Foundation Stone of the Indian Agricultural Research Institute at Gogamukh in Assam on 26th May, 2017, while addressing a large public meeting on the occasion; the Prime Minister congratulated the State Government in Assam and Chief Minister Sarbananda Sonowal, for the work done by them in the State.

The Prime Minister said that the foundation of IARI would have the potential to impact the entire region in a positive way in the future. He further said that agriculture needs to be developed in line with the requirements of the 21st century. He added that farmers must benefit from the changing technology. The establishment of IARI in Assam

would usher another round of green revolution in the Northern-Eastern States of the country.

He stressed on the need of modern agriculture and technological interventions, keeping in mind the specific needs of the region. The Prime Minister spoke of his vision of doubling farmers' incomes by 2022, the 75th anniversary of independence.

Speaking on the occasion, the Agriculture Minister said the Prime Minister Shri Narendra Modi ji has pledged to double the farmers' income by 2022 and we are committed to fulfil his goal. In continuation, visualising the potential of north eastern states in improving the production of agriculture and allied sectors and farmers' knowledge enhancement, to impart appropriate agriculture information, to reach the top level of agricultural research and education in the country, a new branch of Indian agricultural Institute has been established in Assam. In these states of north-east, we see special glimpses of diversity and due to agro climatic condition cultivation of not only different types of crops but diverse types of spices has been successfully carried out. Now, we need to accelerate this further and in achieving this goal, establishment of the agricultural institute would be a decisive step. I would like to say that establishment of this institute would be an important initiative in enhancing agricultural production and productivity together with the high standard of education and research and in times to come, it would definitely improve the living standard of farmers of north eastern states of the country.

**Our Country is the Largest Producer of Milk in the World: Shri Radha Mohan Singh**

Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh said that the Government of India has undertaken several new initiatives in the field of animal husbandry in Gujarat. Under Rashtriya Gokul Mission, on the lines of Gokul Gram 'Gir, Cow Sanctuary' had been approved. This would be established in Dharampur, Porbandar under Livestock insurance coverage. Earlier, only two milk animals were included , now 5 milk animals and 50 small animals are included. This scheme had been implemented in all the districts of the state, whereas earlier only 15 districts were included. During the year 2014-16, about 26,000 animals had been insured in the state. To fulfil the shortage of veterinarians, a veterinary college had been established in Junagadh. The Agriculture Minister said this at the inauguration ceremony of polytechnic at Kamdhenu University, Sabarkantha.

The Agriculture Minister informed that it is a matter of immense pride that our country is number one in milk production in the world. In the year 2015-16, the growth rate of milk production had been 6.28 per cent due to which total production had reached 156 million tonnes. And now, per person milk availability is 337 gram on an average, while on the world level it is 229 gram. It is worth mentioning that in comparison to the years 2011-14, the growth in milk production during the years 2014-17 had been 16.9 per cent.

He further said that the standard of living of urban and rural families is rising, therefore, the demand for the animal protein is increasing. So, it is necessary that we constantly make effort to increase the production of our livestock, poultry and fish so that the country's citizens are well-nourished and healthy. That is why it is the responsibility of veterinarians to contribute in keeping the nation healthy by increasing availability of animal protein.

He further said that the Government is committed to double farmers' income by 2022 and veterinaries play a significant role in fulfilling the Government's resolution to double the farmers' income. A healthy animal would result in greater production which would automatically enhance the farmer's income and the country would proceed on the path of economic prosperity.

Agriculture Minister further informed that India is world's highest livestock owner at about 512.05 million out of which 199.1 million are bovines, 105.3 million buffaloes, 71.6 million sheep and 140.5 million goats. In the case of goats, India is at the second highest position in the world and it is approximately 25 % of the livestock. India is second largest poultry market in the world and it includes the production of 63 billion eggs and 649 million poultry meat. India's marine and fish industry are growing at around 7 percent compound annual growth rate. Overall, India's livestock sector is growing fast and emerging as a major contributor in the global market.

The Agriculture Minister said that the Government of India is ensuring the quality of education in universities is of international standards. In this direction, ICAR's Fifth Deans Committee Report had been approved. Schemes like 'Student' and 'Arya' had been started with scholarships. Students' scholarship amount had been increased.

**Scientists at BARC and National Research Centre on Litchi succeeded in treating litchi and preserving it for 60 days at low temperature: Shri Radha Mohan Singh**

Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh said that the main objective of the Central Government is focused on research to develop new varieties and techniques of litchi farming to increase its production and to share information with the Extension Division. Shri Singh said this at the inauguration and co-training of Litchi processing plant in Muzaffarpur,Bihar, on 29th May, 2017.

Union Minister said that Bihar is the top litchi producing State in the country. In Bihar, about 300 thousand metric tonnes of litchi is being produced from 32 thousand hectares of area. Bihar's contribution in the production of

litchi is about 40 per cent. Considering the importance of litchi, National Research Centre on Litchi was established on June 6, 2001.

Shri Singh informed that the contribution of Muzaffarpur district in litchi's production is impressive, but there is a need to increase the productivity of litchi, which is currently 8.0 tonnes/ha. For this, all the government institutions, cooperatives and farmers will have to come forward. Union Agriculture Minister said that it is a matter of immense pride that scientists at Bhabha Atomic Research Centre and National Research Centre on Litchi have succeeded in treating litchi and preserving it for 60 days at low temperature. One of its processing plants had also been developed. Shri Singh further said that this technique would be useful for the litchi producers and businessmen. Shri Singh also said that to make this technique effective, litchi producers would have to produce superior quality fruits for which National Research Centre on Litchi had developed several techniques. The National Research Centre on Litchi used to prove it about 35-40 thousand plants every year to various institutions/states in the country. Union Agriculture Minister said that the National Research Centre on Litchi is working closely with other institutions of ICAR and agricultural universities of the state and the development centres of the Central and State Governments like National Horticulture Board, APEDA, National Horticulture Mission etc.

Shri Radha Mohan Singh further added that our scientists are working day and night to develop advanced varieties and agricultural activities and that State Governments, KVKs and other institutions should take it to the masses. Through its limited resources, the centre has implemented ICAR's Farmers First project in East Champaran district. As many as 1,000 families from 8 villages (Mehsi Block-Uzhilpur, Bakri Najir, Damodarpur Village, Chakia Block- Khairwa, Ramgarha, Jishnupura, Ojha Tola- Vaishah and Chintanpur-Malahi Tola village) are reaping the benefits of several new techniques. And the unique initiative by the council allows farmers to test advanced technology themselves. And now there is a need to create awareness about it. Through 'Mera Gaon- Mera Gaurav' program, scientists have been successful in taking new techniques to some villages. The Centre has initiated Health Card scheme through which orchards are being examined and farmers are being sensitised. Not just Bihar, litchi fruit farming can be successfully done in other parts of the country too. Therefore, there is a need to promote research in these areas too.

**Second Advance Estimates of Area and Production of various Horticulture Crops for the year 2016-17**

The Department of Agriculture, Cooperation and Farmers Welfare released the Second Advance Estimates of Area and Production of Horticulture Crops for 2016-17. These estimates are based on the information received from different State/UTs in the country.

The following table summarizes the Second Advance Estimates of area and Production of horticulture crops for the year 2016-17 along with First Advance Estimates for 2016-17 and Final Estimates for 2015-16:

*(Area in '000 Ha, Production in '000MT)*

| Total Horticulture | 2016-17 (Second Advance Estimate) | 2016-17 (First Advance Estimate) | 2015-16 (Final) | % change of 2016-17 (Second Adv. Est.) with respect to: | |
|---|---|---|---|---|---|
| | | | | 2016-17 (First Adv. Est.) | 2015-16 (Final Est.) |
| Area | 24925 | 24369 | 24472 | 2.3 | 1.9 |
| Production | 295164 | 287323 | 286188 | 2.7 | 3.1 |

**Highlights of the "Second Advance Estimates" for 2016-17:**

- The production of horticulture crops in the country during 2016-17 is estimated to be more than 295 million tonnes which is 3.2 % higher as compared to the previous year's 2015-16 estimates.
- The area under horticulture crops has increased from 245 lakh ha to 249 lakh ha in 2016-17 recording an increase of 1.9% over previous year.
- Fruits production during the current year is estimated to be 93 million tonnes which is 2.9% higher than the previous year.
- Production of vegetables is estimated to be around 175 million tonnes which is 3.5% higher than the previous year.
- With 21.6 million tonnes estimated onion production in the country, there is an increase of 3% over the previous year. The major onion producing States are Maharashtra, Karnataka, Madhya Pradesh, Bihar and Gujarat.
- Potato production in the country has increased from 43.4 million tonnes to 46.5 million tonnes in the current year which is 7.2% higher than the previous year. Major Potato growing States are

Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh and Punjab.

- During the current year tomato production is estimated to be around 19.7 million tonnes which is 5.1% higher than the previous year. The major tomato growing States are Madhya Pradesh, Andhra Pradesh, Karnataka, Odisha and Gujarat etc.
- Production of flowers is estimated to be around 2.2 million tonnes which is 2.9% higher than the previous year.
- Production of aromatics & medicinal plants is estimated to be around 1.03 million tonnes which is marginally higher by 0.8% than the previous year.
- During the current year, the production of plantation crops is estimated to be around 17 million tonnes which is 1.3% higher than the previous year.
- Production of spices is estimated to be around 7.1 million tonnes which is 1.3% higher than the previous year.

# GENERAL SURVEY OF AGRICULTURE

**Important Policy decisions taken during the month of May, 2017**

The 3rd Advance Estimates of production of major crops for 2016-17 have been released by the Department of Agriculture, Cooperation and Farmers Welfare on 9th May, 2017. As per 3rd Advance Estimates, the estimated production of major crops during 2016-17 is as under:

Foodgrains – 273.38 million tonnes (record)

| | | |
|---|---|---|
| Rice | – | 109.15 million tonnes (record) |
| Wheat | – | 97.44 million tonnes (record) |
| Coarse Cereals | – | 44.39 million tonnes (record) |
| Maize | – | 26.14 million tonnes (record) |
| Pulses | – | 22.40 million tonnes (record) |
| Gram | – | 9.08 million tonnes |
| Tur | – | 4.60 million tonnes (record) |
| Urad | – | 2.93 million tonnes (record) |

Oilseeds – 32.52 million tonnes

| | | |
|---|---|---|
| Soyabean | – | 14.01 million tonnes |
| Groundnut | – | 7.65 million tonnes |
| Castorseed | – | 1.55 million tonnes |

Cotton – 32.58 million bales (of 170 kg each)

Sugarcane – 306.03 million tonnes

**Trends in foodgrain prices**

During the month of April, 2017 the All India Index Number of Wholesale Price (2011-12=100) of foodgrains decreased by 0.14 percent from 146.8 in March, 2017 to 146.6 in April, 2017.

The Wholesale Price Index (WPI) Number of cereals decreased by 0.48 percent from 145.2 to 144.5 and WPI of pulses increased by 1.17 percent from 154.0 to 155.8 during the same period. The WPI of wheat and rice decreased by 1.33 percent and 0.07 percent, respectively during the same period.

**Weather, Rainfall and Reservoir situation during May, 2017**

**Rainfall Situation**

Cumulative Pre-Monsoon Season rainfall for the country as a whole during the period 01st March to 24th May, 2017 has been 5% lower than the Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period has been higher than LPA by 13% in East & North East India but lower than LPA by 53% in Central India and by 12% in South Peninsula & North-West India each.

Out of total 36 meteorological Sub-divisions, 01 subdivision received large excess rainfall, 04 subdivisions received excess rainfall, 13 subdivisions received normal rainfall, 11 Sub-divisions received deficient rainfall and 07 subdivisions received large deficient rainfall.

**Water Storage in Major Reservoirs**

Central Water Commission monitors 91 major reservoirs in the country which have total live capacity of 157.80 Billion Cubic Metre (BCM) at Full Reservoir Level (FRL). Current live storage in these reservoirs (as on 25th May, 2017) is 35.05 BCM as against 27.59 BCM on 25.05.2016 (last year) and 32.30 BCM of normal storage (average storage of last 10 years). Current year's storage is higher than the last year's storage by 27% and 9% higher than the normal storage.

**Sowing Position during Kharif 2017**

As per latest information available on sowing of Kharif crops upto 26.05.2017, area sown under Kharif crops taken together has been reported to be 69.16 lakh hectares at All India level as compared to 62.62 lakh hectares in the corresponding period of last year i.e. higher by 6.54 lakh ha. than the last year.

Area reported has been higher by 3.9 lakh ha. under sugarcane and marginally higher by 0.3 lakh ha. under Jute & Mesta as compared to normal area as on date.

**Economic Growth**

As per the 2nd advance estimates of national income, released by CSO on February 28 2017, growth rate of Gross Domestic Product (GDP) at constant market prices is placed at 7.1 per cent in 2016-17 as compared to 7.9 per cent in 2015-16 (Table 1).

The growth in Gross Value Added (GVA) at constant (2011-12) basic prices for the year 2016-17 is estimated to be 6.7 per cent, as compared to 7.8 per cent in 2015-16. At the sectoral level, agriculture, industry and services sectors grew at the rate of 4.4 per cent, 5.8 per cent and 7.9 per cent respectively in 2016-17 (Table 1).

The share of total final consumption in GDP at

current prices in 2016-17 is estimated to be 69.3 per cent, as compared to 68.1 per cent in 2015-16. The fixed investment rate (ratio of gross fixed capital formation to GDP) declined from 29.2 per cent in 2015-16 to 26.9 per cent in 2016-17.

The saving rate (ratio of gross saving to GDP) for the years 2015-16 was 32.2 per cent, as compared to 33.0 per cent in 2014-15. The investment rate (rate of gross capital formation to GDP) in 2015-16 was 33.2 per cent, as compared to 34.2 per cent in 2014-15.

**Agriculture And Food Management**

**Rainfall:** The cumulative rainfall received for the country as a whole, during the period 1st March - 21st May, 2017, has been 4 per cent below normal. The actual rainfall received during this period has been 104.5 mm as against the normal at 108.9 mm. Out of the total 36 meteorological subdivisions, 5 subdivisions received excess, 12 subdivisions received normal rainfall, 12 subdivisions received deficient rainfall and 7 subdivisions received large deficient rainfall.

**All India production of food grains:** As per the 3rd Advance Estimates released by Ministry of Agriculture & Farmers Welfare on 9th May 2017, production of foodgrains during 2016-17 is estimated at 273.4 million tonnes as compared to 251.6 million tonnes in 2015-16 (Table 3).

**Procurement:** Procurement of rice as on 18th May, 2017 was 36.0 million tonnes during Kharif Marketing Season 2016-17 whereas procurement of wheat was 23.0 million tonnes during Rabi Marketing Season 2016-17 (Table 4).

**Off-take:** Offtake of rice during the month of March 2017 was 33.6 lakh tonnes. This comprises 29.8 lakh tonnes under TPDS/NFSA and 3.8 lakh tonnes under other schemes. In respect of wheat, the total offtake was 22.9 lakh tonnes comprising 18.3 lakh tonnes under TPDS/ NFSA and 4.6 lakh tonnes under other schemes. The cumulative offlake of foodgrains during 2016-17 is 61.9 million tonnes (Table 5).

**Stocks:** Stocks of foodgrains (rice and wheat) held by FCI as on 1st May, 2017 was 56.8 million tonnes, compared to 59.2 million tonnes as on 1st May, 2016 (Table 6).

TABLE 1: GROWTH OF GVA AT BASIC PRICES BY ECONOMIC ACTIVITY AT CONSTANT (2011-12) PRICES (IN PERCENT)

| Sectors | Growth Rate(%) | | | Share in GVA or GDP(%) | | |
|---|---|---|---|---|---|---|
| | 2014-15 2nd RE | 2015-16 1st RE | 2016-17 2nd AE | 2014-15 2nd RE | 2015-16 1st RE | 2016-17 2nd AE |
| **Agriculture, forestry & fishing** | **-0.3** | **0.8** | **4.4** | **16.5** | **15.4** | **15.1** |
| **Industry** | **6.9** | **8.2** | **5.8** | **31.3** | **31.4** | **31.1** |
| Mining & quarrying | 14.7 | 12.3 | 1.3 | 3.2 | 3.3 | 3.1 |
| Electrcity, gas, water supply & other utility services | 7.2 | 5.1 | 6.6 | 2.2 | 2.1 | 2.1 |
| Construction | 3.0 | 2.8 | 3.1 | 8.5 | 8.1 | 7.9 |
| **Services** | **9.5** | **9.8** | **7.9** | **52.2** | **53.2** | **53.8** |
| Trade, Hotel, Transport storage | 8.6 | 10.7 | 7.3 | 18.5 | 19.0 | 19.1 |
| Financial, rest estate & prof servs | 11.1 | 10.8 | 6.5 | 21.3 | 21.9 | 21.9 |
| Public Administration, defence and | | | | | | |
| Other services | 8.1 | 6.9 | 11.2 | 12.4 | 12.3 | 12;.8 |
| **GVA at basic prices** | **6.9** | **7.8** | **6.7** | **100.0** | **100.0** | **100.0** |
| **GDP** | **7.2** | **7.9** | **7.9** | **...** | **...** | **...** |

**Source:** Central Statistics Office (CSO). 2nd RE: Second Revised Estimates 1st RE: First Revised Estimates, 2nd AE: as per second advance estimates of GDP released on 28th February 2017.

TABLE 2: QUARTER-WISE GROWTH OF GVA AT CONSTANT (2011-12) BASIC PRICES (PER CENT)

| Sectors | 2014-15 | | | | 2015-16 | | | | 2016-17 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 |
| **Agriculture, forestry & Fishing** | **3.4** | **4.9** | **-1.7** | **-0.2** | **2.6** | **2.3** | **-2.2** | **1.7** | **1.9** | **3.8** | **6.0** |
| **Industry** | **8.2** | **5.8** | **3.6** | **6.1** | **7.4** | **7.4** | **9.5** | **8.6** | **6.1** | **5.1** | **6.6** |
| Mining & quarrying | 22.3 | 9.3 | 12.1 | 14.7 | 11.2 | 13.9 | 13.3 | 11.5 | -0.3 | -1.3 | 7.5 |
| Manufacturing | 9.1 | 7.2 | 2.7 | 7.7 | 8.5 | 10.3 | 12.8 | 10.8 | 9.0 | 6.9 | 8.3 |
| Electricity, gas, water supply & other utility services | 8.4 | 7.0 | 7.0 | 2.7 | 2.5 | 5.9 | 4.1 | 7.8 | 9.6 | 3.8 | 6.8 |
| Construction | 1.6 | 1.9 | 1.6 | 0.6 | 4.8 | 0.0 | 3.2 | 3.0 | 1.7 | 3.4 | 2.7 |
| **Services** | **7.9** | **9.8** | **11.9** | **8.5** | **9.5** | **10.4** | **9.4** | **10.1** | **8.8** | **8.2** | **6.8** |
| Trade, hotels. transport communication and services related to broadcasting | 9.3 | 6.2 | 3.9 | 10.8 | 10.6 | 8.9 | 9.6 | 13.2 | 8.2 | 6.9 | 7.2 |
| Financial, real estate & professional services | 10.2 | 14.1 | 14.0 | 10.9 | 10.2 | 13.1 | 10.4 | 8.9 | 8.7 | 7.6 | 3.1 |
| Public administration, defence and other Services | 1.5 | 7.2 | 21.8 | 1.3 | 6.3 | 7.2 | 7.5 | 6.7 | 9.9 | 11.0 | 11.9 |
| **GVA at Basic Price** | **7.3** | **7.9** | **6.3** | **6.1** | **7.8** | **8.4** | **7.0** | **8.2** | **6.9** | **6.9** | **6.7** |
| **GDP at market prices** | **7.4** | **7.8** | **6.1** | **6.5** | **7.8** | **8.4** | **6.9** | **8.6** | **7.2** | **7.4** | **7.0** |

**Source:** Central Statistics Office (CSO)

TABLE 3: PRODUCTION OF MAJOR AGRICULTURAL CROPS (3RD ADV. EST.)

*Production (Million Tonnes)*

| Crops | 2012-13 | 2013-14 | 2014-15 | 2015-16 (Final) | 2016-17 (3rd AE) |
|---|---|---|---|---|---|
| Total Foodgrains | 257.1 | 265.0 | 252.0 | 251.6 | 273.4 |
| Rice | 105.2 | 106.7 | 105.5 | 104.4 | 109.2 |
| Wheat | 93.5 | 95.9 | 86.5 | 92.3 | 97.4 |
| Total Coarse Cereals | 40.0 | 43.4 | 42.9 | 38.5 | 44.4 |
| Total Pulses | 18.3 | 19.3 | 17.2 | 16.4 | 22.4 |
| Total Oilseeds | 30.9 | 32.8 | 27.5 | 25.3 | 32.5 |
| Surgarcane | 341.2 | 352.1 | 362.3 | 348.4 | 306.0 |
| Cotton# | 34.2 | 35.9 | 34.8 | 30.0 | 32.6 |

**Source:** DES, DAC&FW, M.o Agriculture & Framers Welfare. 3rd AE: 3rd Advance Estimates, # Million bales of 170 kgs. each.

TABLE 4: PROCUREMENT OF CROPS (MILLION TONNES)

| Crops | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|
| Rice# | 35.0 | 34.0 | 31.8 | 32.0 | 34.2 | 36.0s |
| Wheat@ | 28.3 | 38.2 | 25.1 | 28.0 | 28.1 | 23.0 |
| Total | 63.3 | 72.2 | 56.9 | 60.2 | 62.3 | 59.0 |

#Kharif Marketing Season (October-September), @ Rabi Marketing Season (April-March), $Position as on 18.05.2017

**Source:** FCI and DFPD, M/o Consumer Affairs and Public Distribution.

TABLE 5: OFFTAKE OF FOODGRAINS (MILLION TONNES)

| Crops | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17(P) |
|---|---|---|---|---|---|
| Rice | 32.6 | 29.2 | 30.7 | 31.8 | 32.8 |
| Wheat | 33.2 | 30.6 | 25.2 | 31.8 | 29.1 |
| Total (Rice & Wheat | 65.8 | 59.8 | 55.9 | 63.6 | 61.9 |

**Source:** DFPD, M/o Consumer Affairs and Public Distribution. P: Provisional

TABLE 6: STOCKS OF FOODGRAINS (MILLION TONNES)

| Crops | May 1, 2016 | May 1, 2017 |
|---|---|---|
| 1. Rice | 21.3 | 22.8 |
| 2. Unmilled Paddy# | 9.7 | 9.3 |
| 3. Converted Unmilled Paddy in terms of Rice | 6.5 | 6.3 |
| 4. Wheat | 31.4 | 27.7 |
| Total (Rice & Wheat ( 1+3+4) | 59.2 | 56.8 |

#Since September, 2013 FCI gives separate figures for rice and unmilled paddy lying with FCI & state agencies in terms of rice.

# ARTICLES

## Economics of Apple Production in Jammu and Kashmir

Dr. Abdul Rauf*

### Introduction

Apple (*Malus domestica Borkh*) accounts for 50% of the world's deciduous fruit tree production. The leading apple growing country is China, producing about 41% of the world's apples; followed by the United states, India and Turkey The top ten countries that lead in apple production include china (37000000 tonnes), USA(4110046 tonnes), Turkey (2,889000 tonnes), Poland (2877336 tonnes), India (2497678 tonnes), Italy (1991312 tonnes), Iran (1700000 tonnes), Chile (1,625000 tonnes), Russia (1,403000 tonnes), France (1,382901 tonnes), and others (19196743 tonnes). The total world production of apple is about 76673016 tonnes (FAO-Feb, 2015). Apple is the main horticultural crop of Kashmir. Hundred and ten varieties of apple are found in Jammu and Kashmir. The chief varieties of apple found in Jammu and Kashmir are Delicious, American, Ambri, Moharaji, Kesari, Hazaratbali and Bulgarian. Though the cultivation of apple in India is concentrated in Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, yet, Kashmir enjoys the distinction of being the hub of apple industry of the country. This happens because the state has a higher order production and marketing base. According to the State's Horticulture Department, around 1.5 million tonnes of apples are produced in Kashmir annually. The production of apples in the state is growing every year; as a result the percentage share of Jammu & Kashmir in national production has also been increasing steadily. It has increased from 63.5% in FY2006 to 65.96% in FY2014. As a dominant crop of the valley, "Apple" proudly represents the fruit industry of Kashmir, representing 98% of the total fruit production. A number of apple varieties are found indigenous to the state of which Ambri is "par excellence". The production of apple in the State is confined to six districts of the Kashmir Valley viz, Anantnag, Baramulla, Budgam, Pulwama, Kupwara, and Shopian. The area under fruits in Jammu and Kashmir has increased significantly from

47361.75 hectares in 1975-76 to 160900 hectares in 2013-14 while production increased from 348011 metric tonnes (MT) to 1647700 MT and productivity increased from 7.34 Mt/Hect. to 10.24 MT/Hect during the same period. Export of fruit from Kashmir during year 2012-13 has registered a turnover of Rs.4.200 crore. The apples exported in 2008-09 were priced at Rs 11,721 per tonnes, it was Rs 11,942 in 2009-10(SKUAST-K).The vibrant fruit industry of Kashmir holds key to remedying the economic ills as well as containing the widespread joblessness in the state. Under such a situation, maximizing the income from scare land resource has been the prime objective. Switching over to commercial agriculture has been an effective strategy to save farmers from the vicious circle of less income from low investment in case of traditional agriculture. The growing fruit industry in Kashmir has helped its people in reshaping their economy to some extent. However, there are lots of problems in this sector. The fruits business is very uncertain, it requires a long gestation period, the capital employed can be used only once a year, the labour cost is very high and opportunities exist only for those farm owners who can put in long hours of manual labour. In changing world economy marketing has become a necessity. Marketing of apple produce include activities like assembling, grading, processing, transportation, handling, financing, risk bearing, wholesaling, retailing etc. For a country to survive and grow, it is necessary that adequate marketing infrastructure must exist for performance of various marketing functions and transfer of appropriate price signals leading to improved marketing efficiency. In the present study, an attempt has been made to study the Economics of apple cultivation in Kashmir orchards. Baramulla district is purposively selected because it leads in apple production in the country. Reference period for the study is FY 2014-15.

### Methodology

*Sampling frame*

A cross-sectional survey using a questionnaire was conducted in Baramulla district Kashmir valley to collect data from apple growers. Multistage sampling techniques were used to select the sample. The sampling designed followed in the study is a three stage random sampling design. Block formed the first stage, village formed the second stage and the holding along with apple formed the third and the ultimate stage of the sample. Block Dangerpora from selected district was chosen because of higher concentration of apple area under apple crop. In the second stage, a list of villages from selected block was prepared along with the area under apple. From the selected villages, three villages were selected randomly. From three

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villages, the list of commercial apple growers was prepared. Finally twenty households each from three villages were selected based on probability proportion method. Thus, a sample of 60 apple growers from Baramulla district was drawn at random. Data collection was carried out both at primary and secondary level. The secondary data was collected from the department of Horticulture Kashmir. To judge the resource use efficiency, the unrestricted form of Cobb-Douglas production function was fitted to cross section of data. Cobb-Douglas type of production function is the most popular in farm analysis. The necessary data on marketing infrastructure such as agricultural produce markets, storage and warehousing facilities, transport vehicles, grading and standardisation, market information system, market research etc was collected from directorate of horticulture Kashmir. Moreover, the following regression model is used in order to judge the resource use efficiency.

**Log linear equations**

$$\text{Log } Y = \text{Log}_a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + u.$$

Y = Gross returns per hundred plants (Rupees)

$X_1$ = Human labour days (No.)

$X_2$ = Expenditure on manure and fertilizers (Rs.)

$X_3$= Expenditure on plant protection measures (Rs.)

$X_4$ = Expenditure on fixed capital (Rs.)

$X_5$ = Expenditure on irrigation (Rs)

u = Random error term

$\text{Log}_a$ = Intercept and $b_1$ to $b_5$ are the elasticity coefficients of respective factor inputs.

The marginal value product (MVP) of each input is worked out at its geometric mean level.

**Standard error of MVPs**

To calculate the standard error of Marginal Value Productivity (MVP) of resources $X_i$, the following formula has been used**:**

$$\text{S.E. } (MVPx_i) = \frac{\bar{\hat{Y}}}{\overline{Xi}} \text{ SE (bi)},$$

Where MVP ($X_i$) is the Marginal Value Productivity of $i^{th}$ resource, $b_i$ is the regression coefficient.

The following methodologies are used to analyse producers share and marketing efficiency**.**

(a) Producer's price = $P_r$ = Pa- Cr

Where, Pa = Wholesale price in the primary assembling market and

Cr = Marketing cost incurred by the farmer

The Marginal Value Product (MVP) of each input is worked out at its geometric mean level.

(b) Producer's share in consumer's rupee has been worked as under.

$$P_s = (P_F / P_r) \times 100$$

Where,

$P_s$ = Producer's share in consumer's rupee.
$P_F$ = Price received by farmer per unit.
$P_r$ = Retail price per unit.

(c) Efficiency Methods

Therefore, the marketing efficiency of various marketing channels in the study area has been computed by employing the following formula.

(i) Conventional method

$$E = \frac{RP - FP}{MC}$$

(ii) Shepherd's method

$$ME = \frac{RP}{MC}$$

(iii) Acharya & Aggarwal method

$$ME = \frac{RP}{MC + MM} - 1$$

Where,

RP = Retailer's price
FP = Net price received by the orchardist
MC = Total marketing costs.
MM = Total marketing margins

**Results and Discussion**

Distribution of operational holdings is depicted in Table 1. The area recorded under apple crop at all India level during year 1991-92 was 194.5 thousand hectares which increased to its peak of 321.9 thousand hectares in 2011-12, but during 2012-13, it decreased to 311.5 thousand hectares and again increased to 313.0 thousand hectares during year 2013-14. In percentile terms total area under apple fruit to total fruit area was highest (6.8 %) during 1991-92 but afterwards it started to show a fluctuating trend till it decreased to 4.5 percent during 2013-14. The total apple production recorded during year 1991-92 was 1147.7 thousand metric tonnes (MT) that during 2010-11 increased to maximum of 2891.0 thousand metric tonnes (MT) but again decreased to 1915.40 thousand tonnes during year 2013-14. In percentile terms, during 1991-92, percentage of apple fruit to total fruit production was 4.0, afterward it showed a downward trend till its share was recorded a lowest of 2.4 % during 2012- 13.The productivity level in percentage terms during 2001-02 was found to be lowest (4.8 Mt/Ha) and highest (10.0 Mt/Ha) during 2010-11 but again decreased to 6.1 Mt/Ha during 2012-13 (NHB-2014).

Table 1: Distribution of Operational Holdings According to Area, Production and Productivity of Apple at all India level

| Year | area (in '000 Ha) | % of total fruit area | Production (in 000 MT) | % of total Fruit Production | Productivity (in Mt/Ha) |
|---|---|---|---|---|---|
| 1991-92 | 194.5 | 6.8 | 1147.7 , | 4.0 | 5.9 |
| 2000 - 01 | 239.8 | 6.2 | 1226.6 | 2.8 | 5.1 |
| 2001- 02 | 241.0 | 6.0 | 1158.4 | 2.7 | 4.8 |
| 2002- 03 | 193.1 | 5.1 | 1348.4 | 3.0 | 7.0 |
| 2003- 04 | 201.2 | 4.3 | 1521.6 | 3.3 | 7.6 |
| 2004- 05 | 230.7 | 4.6 | 1739.0 | 3.5 | 7.5 |
| 2005- 06 | 226.6 | 4.3 | 1814.0 | 3.3 | 8.0 |
| 2006- 07 | 252.0 | 4.5 | 1627.0 | 2.7 | 6.4 |
| 2007- 08 | 264.0 | 4.5 | 2001.0 | 3.1 | 7.6 |
| 2008- 09 | 274.0 | 4.5 | 1685.0 | 2.9 | 7.2 |
| 2009-10 | 282.9 | 4.5 | 1777.2 | 2.5 | 6.3 |
| 2010- 11 | 289.1 | 4.5 | 2891.0 | 3.9 | 10.0 |
| 2011- 12 | 321.9 | 4.8 | 2203.4 | 2.9 | 6.8 |
| 2012- 13 | 311.5 | 4.5 | 1915.4 | 2.4 | 6.1 |
| 2013- 14 | 313.0 | 4.3 | 2497.7 | 2.8 | 8.0 |

**Source:** Indian Horticulture database – 2014

Table-2 reveals that state wise area, production and productivity of apple crop in Jammu & Kashmir was always highest followed by Himachal Pradesh, Uttrakhand, Arunachal Pradesh and in other apple pockets of India. During year 2011-12, area brought under apple in Jammu & Kashmir was 170.6 thousand hectares, production was 1775.0 thousand metric tonnes and productivity level was 10.4 Mt/Ha. During 2012-13, area under apple was decreased to 157.28 thousand hectares, production 1348.20 thousand metric tonnes and productivity level was recorded 8.6 Mt/Ha. During 2013-14, area under apple in Jammu & Kashmir increased to 160.9 thousand hectares, production was 1647.7 thousand metric tonnes and productivity increased to 10.2 Mt/Ha. Similarly during 2013-14, in Himachal Pradesh area under apple was 107.7 thousand hectares, production increased to 738.7 thousand metric tonnes and productivity level was recorded 6.9 Mt/Ha followed by Utrakhand where, during 2013-14 area under apple was 30.0 thousand hectares, production was recorded 77.5 thousand metric tonnes and productivity was 2.6 Mt/Ha. In Arunachal Pradesh, during 2013-14, area covered under apple was 14.3 thousand hectares, production was 31.9 thousand metric tonnes and productivity recorded lowest at 2.2 Mt/Ha. In other apple pockets of India, area and production of apple was negligible, however, productivity level was recorded 8.5 Mt/Ha. At all India level, during year 2013-14, the total area cultivated under apple was 313.0 thousand hectares, production increased to 2494.7 thousand metric tonnes and productivity was recorded 8.0 Mt/Ha. In India, apple productivity is far lesser than that of advanced countries where apple productivity has touched to 40.0 Mt/Ha (NHB-2014).

Table 2: Distribution of Operational Holdings According to Area, Production and Productivity of Apple at State Level

| Area in '000 Ha | | 2011-12 | Production in '000 Mt | | 2012-13 | Productivity= Mt/Ha | | 2013-14 | |
|---|---|---|---|---|---|---|---|---|---|
| State | *area* | *Production* | *Productivity* | *area* | *Production* | *Productivity* | *area* | *Production* | *Productivity* |
| Jammu & Kashmir | 170.6 | 1775.0 | 10.4 | 157.28 | 1348.2 | 8.6 | *160.9* | *1647.7* | *10.2* |
| HimachaL Pradesh | 103.6 | 275.0 | 2.7 | 106.23 | 412.40 | 3.9 | 107.7 | 738.7 | 6.9 |
| UttraKhand | 33.7 | 122.7 | 3.6 | 33.76 | 123.2 | 3.7 | 30.0 | 77.5 | 2.6 |
| Arunachal Pradesh | 13.9 | 30.5 | 2.2 | 14.07 | 31.0 | 2.2 | 14.3 | 31.9 | 2.2 |
| Others | 0.0 | 0.1 | 4.3 | 0.2 | 0.6 | 3.0 | 0.2 | 2.0 | 8.5 |
| Total | 321.8 | 2203.4 | 6.8 | 311.5 | 1915.4 | 6.1 | 313.0 | 2497.7 | 8.0 |

**Source:** Indian Horticulture database – 2014

Table 3.0 reveals that state wise area, production and productivity of apple crop in Jammu & Kashmir. During 2000-01, area under apple crop was 88.20 thousand hectare, Production was recorded 757.61 thousand metric tonnes and productivity level was 8.58 Mt/Ha. During year 2013-14, area under apple increased to 160.90 thousand hectare, Production increased to 1647.70 thousand metric tonnes and productivity level was enhanced to 10.20 Mt/Ha. Highest Productivity level during these years was found to be 11.99 Mt/ha in year 2006-07.

TABLE 3: DISTRIBUTION OF OPERATIONAL HOLDINGS ACCORDING TO SIZE

Total Area, and Production and Productivity of Apple in Jammu and Kashmir (2001-01 to 2013-14)

| Year | Area (in '000 Ha) | Production (in 000 MT) | Productivity (in Mt/Ha) |
|---|---|---|---|
| 2000-01 | 88.20 | 757.61 | 8.59 |
| 2001-02 | 90.12 | 909.58 | 10.09 |
| 2002-03 | 94.92 | 953.94 | 10.05 |
| 2003-04 | 221.77 | 1041.53 | 4.70 |
| 2004-05 | 107.97 | 1093.27 | 10.13 |
| 2005-06 | 111.881 | 1151.71 | 10.29 |
| 2006-07 | 119.041 | 1342.41 | 11.28 |
| 2007-08 | 127.795 | 1311.84 | 10.27 |
| 2008-09 | 133.102 | 1222.18 | 9.18 |
| 2009-10 | 138.191 | 1372.97 | 9.94 |
| 2010-11 | 141.717 | 1852.41 | 13.07 |
| 2011-12 | 154.720 | 1756.19 | 11.35 |
| 2012-13 | 157.280 | 1348.20 | 8.57 |
| 2013-14 | 160.90 | 1647.70 | 10.24 |

**Source:** Directorate of Horticulture, Jammu & Kashmir.

### Distribution and marketing channels

Distribution comprises movement of apples from producer to ultimate consumer. In this process, the fruits have to pass through more than one hand, except when it is directly sold to consumer by the producer, which is a rare phenomenon. In this chain, various agencies like growers, pre-harvest contractors, wholesalers, retailers, etc, are engaged. This chain of intermediaries/ functionaries is called the marketing channel. The following channels were identified as important channels on sampled farms of Himachal Pradesh and Jammu and Kashmir for marketing of their produce.

A. Producer - pre-harvest contractor-commission agent/wholesaler-retailer – consumer.

B. Producer - Forwarding agent - commission agent/ wholesaler-retailer – consumer

C. Producer - commission agent/wholesaler-retailer – consumer

D. Producer – Producers Cooperative Society-commission agent/wholesaler- consumer.

E. Producer - HPMC-Processing unit

### (e) Price spread

The price spread consists of marketing costs and margins of intermediaries. It explains the variance in the price received by the producers and price paid by the consumer. The study of price spread is very essential from the stand point of efficiency of the marketing system. The channel-wise and market-wise price spread in respect of apple is given in Table-4. A closer examination of the Table-4 revealed that orchardists have to incur more expenses when they sell their produce in Delhi market. It comes out to about 21 percent of consumer price for the most important channels in this market. Bangalore was found next important expensive market from producers' angle. Chandigarh market was least expensive to the producers of J&K state. In absolute terms, the share of orchardists in consumer rupee was found maximum in Bangalore market, whereas in per cent terms it was highest in Ambala market, followed by Delhi for the apples of J&K origin. The producer's share in consumer's price was also highest in direct channel, followed by commission agent channel (channel-C), forwarding agent channel (channel-B) and cooperative channel-D for the produce of Kashmir origin. In real sense, after channel-F, it is the cooperative channel which can be ranked as efficient channel among all the market channels as the marketing charges levied by the cooperatives are ultimately invested for the welfare of orchardists in their villages.The wholesalers' margin were 10.17 per cent in Delhi market, 9.18 per cent in Bangalore, 10.12 percent in Ambala and 8.79 per cent of consumer's price in Chandigarh market. However, in absolute terms, these margins were highest in Bangalore market followed by Delhi, Ambala and Chandigarh markets in all the channels, barring direct channel. Wholesaler's expenses followed the similar trends in all the channels and markets. The share of retailer in consumer's price worked out to be highest in Ambala market, followed by Chandigarh, Bangalore and Delhi market. In real terms, these margins were maximum in Bangalore market followed by Chandigarh, Delhi and Ambala markets. Similar sort of pattern was observed for retailers expenses in different study markets.

### Marketing efficiency

Marketing efficiency essentially reflects the degree of market performance. An efficient marketing system is an effective agent of change and an important means of raising income level of orchardists and satisfaction level of consumers. It can be harnessed to improve the quality of life of the masses. An efficient marketing system should ensure fair trading practices and no restrictions on movement, storage and marketing of commodities.

Necessary market information and facilities (infrastructure) for farmers are available. Marketing of produce must ensure existence of remunerative prices for producers and reasonable price to consumers. The traders' margin should be low. Estimates of total marketing costs, margins and efficiency are given in Table-5 for Kashmir apples. A closer examination of both the tables revealed that the retailers channel was most efficient, followed by commission agents channel (Ch-C), forwarding agents channel (Ch-B), and cooperative channel (Ch-D) in all the study markets and for the apples of Kashmir origin. The conventional method suggests that Chandigarh is the most efficient market, followed by Bangalore, Ambala and Delhi markets for Himachal apples in case of all the channels. Shepherd's method of marketing efficiency again suggested Chandigarh as the most efficient market than Ambala market, which in turn is more efficient than Bangalore market and Delhi market for all the channels. The modified method as suggested by Acharya revealed Ambala market to be most efficient than other markets in case of all the study channels. The next in importance were Chandigarh, Bangalore, Delhi markets, for the channel-B, C and D. However, in direct channel, Delhi proved to be next most important market followed by Bangalore, and Chandigarh for the produce of Himachal Pradesh. The marketing efficiency index varied from 0.76 (Delhi market) to 1.06 (Ambala market) for channel-B and from 0.77 to 1.08 in channel-C, 0.75 to 1.05 in channel-D and 0.90 (Bangalore market) to 1.12 (Ambala market).The Acharyas method indicated again Ambala as an efficient market, followed by Bangalore, Chandigarh and Delhi market for the channels B, C and D. However, in retailers channel, Delhi turned out to be the most efficient market followed by Bangalore and Chandigarh market.

TABLE 4: PRICE SPREAD OF JAMMU & KASHMIR APPLES IN SELECTED MARKETS (2014-15)

*(Rs/box)*

| Particulars | Markets | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambala | | | | Bangalore | | | | Chandigarh | | | | Delhi | | | |
| | Ch-B | Ch-C | Ch-D | Ch-F | Ch-B | Ch-C | Ch-D | Ch-F | Ch-B | Ch-C | Ch-D | Ch-F | Ch-B | Ch-C | Ch-D | Ch-F |
| **(A) Grower's** | | | | | | | | | | | | | | | | |
| (a) Sale price | 389.00 | 389.00 | 389.00 | 389.00 | 439.00 | 439.00 | 439.00 | 459.00 | 339.00 | 339.00 | 339.00 | 349.00 | 390.00 | 390.00 | 390.00 | 416.00 |
| | (64.48) | (64.48) | (64.48) | (64.48) | (60.35) | (60.35) | (60.35) | (63.10) | (58.60) | (58.60) | (58.60) | (60.33) | (62.88) | (62.88) | (62.88) | (67.07) |
| (b) Expenses | 88.76 | 88.55 | 93.55 | 88.50 | 123.05 | 120.55 | 125.55 | 120.50 | 89.05 | 86.55 | 91.55 | 86.50 | 129.77 | 127.27 | 132.27 | 92.50 |
| | (14.71) | (14.67) | (15.51) | (14.67) | (16.91) | (16.57) | (17.27) | (16.56) | (15.39) | (14.96) | (15.84) | (14.95) | (20.92) | (20.52) | (21.32) | (14.91) |
| (c) Net price | 300.24 | 300.45 | 295.45 | 295.45 | 315.95 | 318.45 | 313.45 | 338.50 | 249.95 | 252.95 | 247.45 | 262.50 | 260.23 | 262.73 | 257.73 | 323.50 |
| received | (49.77) | (49.80) | (48.98) | (51.30) | (43.43) | (43.78) | (43.08) | (46.53) | (43.21) | (43.69) | (42.76) | (45.38) | (41.96) | (42.36) | (41.55) | (52.16) |
| **(B) Wholesaler's** | | | | | | | | | | | | | | | | |
| (a) Sale price | 478.00 | 478.00 | 478.00 | - | 529.00 | 529.00 | 529.00 | - | 410.00 | 410.00 | 410.00 | - | 479.00 | 479.00 | 479.00 | - |
| | (79.80) | (79.23) | (79.23) | | (72.72) | (72.72) | (72.72) | | (70.88) | (70.88) | (70.88) | | (77.23) | (77.23) | (77.23) | |
| (b) Expenses | 416.94 | 416.94 | 416.94 | - | 462.16 | 462.16 | 462.16 | - | 359.20 | 359.20 | 359.20 | - | 415.90 | 415.90 | 415.90 | - |
| | (69.11) | (69.11) | (69.11) | | (63.53) | (63.53) | (63.53) | | (62.09) | (62.09) | (62.09) | | (67.06) | (67.06) | (67.06) | |
| (c) Net margins | 61.06 | 61.06 | 61.06 | - | 66.84 | 66.84 | 66.84 | - | 50.80 | 50.80 | 50.80 | - | 63.10 | 63.10 | 63.10 | - |
| | (10.12) | (10.12) | (10.12) | | (9.18) | (9.18) | (9.18) | | (8.79) | (8.79) | (8.79) | | (10.17) | (10.17) | (10.17) | |
| (C) Retailer's | | | | | | | | | | | | | | | | |
| (a) Sale price | 603.25 | 603.25 | 603.25 | 603.25 | 727.36 | 727.36 | 727.36 | 727.36 | 578.44 | 578.44 | 578.44 | 578.44 | 620.18 | 620.18 | 620.18 | 620.18 |
| | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) |
| (b) Expenses | 549.77 | 549.77 | 549.77 | 469.77 | 609.84 | 609.84 | 609.84 | 539.84 | 473.85 | 473.85 | 473.85 | 412.45 | 548.09 | 548.09 | 548.09 | 485.09 |
| | (91.13) | (91.13) | (91.13) | (77.87) | (83.84) | (83.84) | (83.84) | (74.21) | (81.91) | (81.91) | (81.91) | (71.30) | (88.37) | (88.37) | (88.37) | (78.22) |
| (c) Net margins | 53.48 | 53.48 | 53.48 | 133.48 | 117.52 | 117.52 | 117.52 | 187.52 | 104.59 | 104.59 | 104.59 | 165.99 | 72.09 | 72.09 | 72.09 | 135.09 |
| | (8.86) | (8.86) | (8.86) | (22.13) | (16.15) | (16.15) | (16.15) | (25.78) | (18.08) | (18.08) | (18.08) | (28.69) | (11.62) | (11.62) | (11.62) | (21.78) |
| (D) Consumers' | 603.25 | 603.25 | 603.25 | 603.25 | 727.36 | 727.36 | 727.36 | 427.36 | 578.44 | 578.44 | 578.44 | 578.44 | 620.18 | 620.18 | 620.18 | 620.18 |
| price | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) | (100.0) |

TABLE 5: ESTIMATES OF TOTAL MARKETING COST, MARGINS AND MARKETING EFFICIENCY FROM KASHMIR APPLE IN SELECTED MARKETS

| Particulars | Channel B | | | | Channel C | | | | Channel D | | | | Channel F | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambala | Bang. | Chd. | Delhi | Ambala | Bang. | Chd. | Delhi | Ambala | Bang. | Chd. | Delhi | Ambala | Bang. | Chd. | Delhi |
| Total marketing cost | 188.76 (32.82) | 232.05 (31.90) | 177.02 (30.61) | 224.76 (36.24) | 186.26 (30.87) | 229.55 (31.56) | 174.10 (30.09) | 222.25 (35.084) | 191.26 (31.70) | 234.55 (32.25) | 179.10 (30.96) | 227.28 (36.64) | 160.27 (26.56) | 201.34 (27.69) | 150.35 (25.99) | 161.59 (26.05) |
| Total market margin of intermediaries | 116.54 (19.31) | 179.36 (24.65) | 151.39 (26.17) | 135.19 (21.79) | 116.54 (19.31) | 179.36 (24.65) | 151.39 (26.17) | 135.20 (21.80) | 116.54 (19.31) | 179.36 (24.65) | 151.89 (26.25) | 135.19 (21.79) | 133.48 (22.12) | 187.52 (25.78) | 165.59 (28.63) | 135.89 (21.78) |
| Total costs margin | 305.30 (50.61) | 411.41 (56.56) | 328.41 (56.77) | 359.95 (58.03) | 302.80 (50.19) | 408.91 (56.22) | 325.49 (56.27) | 357.45 (57.63) | 307.80 (51.02) | 413.91 (56.90) | 330.99 (57.22) | 326.37 (58.43) | 293.75 (48.70) | 338.86 (54.47) | 315.94 (54.61) | 296.68 (47.83) |
| Net price received by growers | 297.95 (49.40) | 315.95 (43.43) | 249.95 (43.21) | 260.23 (41.97) | 300.45 (49.80) | 318.45 (43.78) | 252.95 (43.72) | 262.73 (42.37) | 295.45 (48.97) | 313.45 (43.10) | 247.45 (42.78) | 257.73 (41.55) | 309.50 (51.30) | 338.50 (46.53) | 262.50 (45.39) | 323.50 (52.16) |
| Consumer price | 603.25 | 727.36 | 578.44 | 620.18 | 603.25 | 727.36 | 578.44 | 620.18 | 603.25 | 727.36 | 578.44 | 620.18 | 603.25 | 727.36 | 578.44 | 620.18 |
| ***Index of marketing efficiency*** | | | | | | | | | | | | | | | | |
| Conventional method | 1.62 | 1.77 | 1.85 | 1.60 | 1.62 | 1.79 | 1.86 | 1.60 | 1.61 | 1.77 | 1.84 | 1.59 | 1.84 | 1.94 | 2.11 | 1.83 |
| Shepherds method | 3.19 | 3.14 | 3.26 | 2.75 | 3.23 | 3.16 | 3.33 | 2.80 | 3.16 | 3.11 | 3.22 | 2.72 | 3.77 | 3.61 | 3.84 | 3.83 |
| Acharayas method | 0.98 | 0.77 | 0.76 | 0.72 | 0.99 | 0.78 | 0.77 | 0.74 | 0.96 | 0.75 | 0.74 | 0.71 | 1.05 | 0.88 | 0.84 | 1.09 |

Note: Figures in parenthesis are percentage to consumer price

## Fluctuation in Apple Prices in Selected Markets

The wide spread fluctuations in the prices of apple produce overtime and space introduce an element of uncertainty in the income levels of the growers. In this section, an attempt has been made to analyse and understand the extent of price instability in selected markets during the period 1998-2014. The inter-year, intra-year and inter-market price behaviour have been studied with a view to formulate appropriate policies for reducing price instabilities in apple. This will also provide guidelines to the growers as well as traders in making right marketing decisions.

### Inter - year price and arrival trend

The trends in the price indices of apple in various selected markets have been placed in Table-6. A closer examination of price prevailing during the period 1998-2014 showed wide fluctuations in different years and in different selected markets.

TABLE 6: AVERAGE WHOLESALE PRICE INDICES OF APPLE IN SELECTED MARKETS

| Years | Ambala | | Bangalore | | Chandigarh | | Delhi | |
|---|---|---|---|---|---|---|---|---|
| | Wholesale price indices | % Change over previous year | Wholesale price indices | % Change over previous year | Wholesale price indices | % Change over previous year | Wholesale price indices | % Change over previous year |
| 1998 | 100 | - | 100 | - | 100 | - | 100 | - |
| 1999 | 98.27 | -1.73 | 96.92 | -3.08 | 96.30 | -3.70 | 92.75 | -7.25 |
| 2000 | 133.43 | 35.16 | 103.79 | 6.87 | 106.58 | 10.28 | 108.02 | 5.27 |
| 2001 | 91.42 | -42.01 | 121.03 | 17.24 | 110.83 | 4.25 | 123.35 | 15.33 |
| 2002 | 111.34 | 19.92 | 136.72 | 15.69 | 114.28 | 3.45 | 125.13 | 1.78 |
| 2003 | 113.56 | 2.22 | 160.92 | 24.20 | 99.84 | -14.44 | 88.24 | -36.89 |
| 2004 | 87.70 | -25.86 | 164.21 | 3.29 | 103.55 | 3.71 | 114.95 | 26.71 |
| 2005 | 111.27 | 23.57 | 168.71 | 4.25 | 100.93 | -2.62 | 95.79 | -19.16 |
| 2006 | 113.05 | 1.78 | 194.85 | 26.14 | 110.85 | 9.92 | 144.18 | 48.00 |
| 2007 | 118.67 | 5.62 | 215.75 | 20.90 | 85.78 | -25.07 | 86.55 | -57.63 |
| 2008 | 129.92 | 11.25 | 260.23 | 44.48 | 134.37 | 48.59 | 156.59 | 70.04 |
| 2009 | 94.21 | -35.11 | 217.23 | -4.30 | 105.91 | -28.46 | 75.26 | -81.33 |
| 2010 | 101.65 | 7.44 | 218.42 | 1.19 | 102.39 | -3.52 | 96.06 | 20.80 |
| 2011 | 94.48 | -7.17 | 217.27 | -1.15 | 113.80 | 11.41 | 101.85 | 5.79 |
| 2012 | 120.59 | 26.11 | 236.34 | 19.07 | 99.91 | -13.89 | 105.60 | 3.75 |
| 2013 | 115.43 | -5.16 | 235.23 | -1.11 | 124.43 | 24.52 | 168.35 | 62.75 |
| 2014 | 92.54 | -22.89 | 271.73 | 36.50 | 108.21 | -16.22 | 67.40 | -100.95 |

The price index varied from 91.42 per cent in the year 2001 to 133.43 per cent during 2000 in Ambala market. In Bangalore market, the price index was found highest during 2008 and lowest during 2014. In case of Chandigarh market, the price index ranged between 85.78 per cent in the year (2007) and 134.37 per cent during 2008. In Delhi market, this index was found to be highest in 2013 and lowest in 2014.The frequency distribution of number of year with positive and negative price variation showed that Ambala, Bangalore, Chandigarh and Delhi markets had 7, 4, 8, 6 negative price changes, respectively during the span of 17 years. Since in majority case, the markets are facing rising trends, therefore, the growth in the price has been found positive. The analysis of growth rate indicated that prices of apple has increased linearly by 7.38, 5.8, 6.64 and 7.05 per cent per annum in Ambala, Bangalore, Chandigarh and Delhi markets, respectively during (1998-2014) period (Table 8). These positive trends, in prices were found significant in all the markets. This indicates a positive signal to producers to enhance the level of production for income maximization through favourable price trends received in the markets.The arrival indices of apple for selected markets have been summarized in Table- 7

TABLE 7: ARRIVAL INDICES OF APPLE IN SELECTED MARKETS

| Years | Wholesale price indices | Ambala % Change over previous year | Wholesale price indices | Bangalore % Change over previous year | Wholesale price indices | Chandigarh % Change over previous year | Wholesale price indices | Delhi % Change over previous year |
|---|---|---|---|---|---|---|---|---|
| 1998 | 100 | - | 100.00 | - | 100 | - | 100 | - |
| 1999 | 101.85 | 1.85 | 128.58 | 28.58 | 143.17 | 43.17 | 114.52 | 14.52 |
| 2000 | 136.18 | 34.33 | 100.67 | -27.91 | 194.72 | 51.55 | 138.63 | 4.11 |
| 2001 | 56.72 | -79.46 | 82.66 | -18.01 | 112.26 | -82.46 | 99.56 | -39.07 |
| 2002 | 116.05 | 59.33 | 109.00 | 26.34 | 73.97 | -38.29 | 122.74 | 23.18 |
| 2003 | 90.23 | -25.82 | 116.79 | 7.79 | 84.26 | 10.29 | 121.15 | -1.59 |
| 2004 | 94.47 | 4.24 | 139.75 | 22.96 | 72.11 | -12.15 | 135.87 | 14.72 |
| 2005 | 93.88 | -0.59 | 153.03 | 13.28 | 186.63 | 114.52 | 156.21 | 20.34 |
| 2006 | 75.62 | -18.26 | 111.85 | -41.18 | 109.07 | -77.56 | 102.23 | -53.98 |
| 2007 | 150.67 | 75.05 | 111.93 | 0.08 | 124.18 | 15.11 | 110.71 | 8.48 |
| 2008 | 99.51 | -51.16 | 122.14 | 10.21 | 129.93 | 5.75 | 115.42 | 4.71 |
| 2009 | 163.43 | 63.92 | 113.98 | -8.16 | 132.96 | 3.03 | 152.74 | 37.32 |
| 2010 | 118.71 | -44.72 | 128.08 | 14.10 | 125.04 | -7.92 | 159.88 | 7.14 |
| 2011 | 55.82 | -62.89 | 66.00 | -62.08 | 352.49 | 227.45 | 162.46 | 2.58 |
| 2012 | 92.16 | 36.34 | 53.57 | -12.43 | 448.14 | 95.65 | 110.41 | -52.05 |
| 2013 | 110.02 | 17.86 | 52.52 | -1.05 | 541.16 | 93.02 | 101.40 | -9.01 |
| 2014 | 105.27 | -4.75 | 53.17 | 0.65 | 538.22 | -2.94 | 152.96 | 51.56 |

The arrival indices varied from 55.82 to 150.67 per cent; 55.52 to 153.02; 72.11 to 541.16 and 99.56 to 162.46 per cent in Ambala, Bangalore, Chandigarh and Delhi markets, respectively. Delhi market exhibited 12 positive changes in arrival while Ambala, Banglore and Chandigarh had 9, 10, 11 positive changes, respectively. The growth rate analysis revealed that Chandigarh market experienced a positive and significant growth of 11.31 per cent per annum in the case of arrivals, while Bangalore market exhibited significantly negative growth in the arrivals during the study period. Ambala and Delhi market did not register any significant growth in the arrival during 1998-2014 periods. The negative trends in arrival at Bangalore markets, despite significant positive price trends, provide a clue to the producers to dispatch more produce to this market for enhancing their income levels.

TABLE 8: ESTIMATES OF LINEAR TRENDS IN ANNUAL WHOLESALE PRICES AND ARRIVALS OF APPLE IN VARIOUS SELECTED MARKETS

(Prices = Rs/qt and arrivals in MT)

| Crop | Ambala | | Bangalore | | Chandigarh | | Delhi | |
|---|---|---|---|---|---|---|---|---|
| Apple | Prices | Arrival | Prices | Arrival | Prices | Arrival | Prices | Arrival |
| Intercept | 901.86 | 1499.09 | 1373.89 | 3207.60 | 819.46 | - 22.572 | 922.811 | 46139.51 |
| | (148.71) | (221.342) | (150.79) | (340.66) | (127.76) | (351.16) | (261.44) | (4602.334) |
| Time constant | 187.90*** | 2.56 | 167.60*** | - 76.99*** | 130.76*** | 140.56** | 166.80** | 635.04 |
| | (14.513) | (21.601) | (14.7159) | (33.242) | (12.46) | (34.269) | (25.514) | (449.141) |
| LGR. | 7.38 | 0.17 | 5.80 | - 3.06 | 6.64 | 11.31 | 7.05 | 1.22 |

Note: Figures in parentheses are standard errors.
*** Significant at 1 per cent level of significance.
** Significant at 5 per cent level of significanc

**Seasonal variation in wholesale prices and arrivals of prices index**

Seasonal movements are periodic and regular in time series with periods less than one year. The seasonal component is an attempt to identify these variations that are regularly associated with the seasons of the year. In the present study, only monthly seasonal indices were constructed to know the intra- year movements in prices and arrivals. For monthly data, a twelve month moving average technique eliminates the seasonal movements. The seasonal indices of wholesale prices and arrival for the period 1998-2014 for the selected markets have been computed and placed in Table-9. It can be observed from the table that price of apple was above the respective market average from February to June in Chandigarh and, March to July in Delhi market. However, the month of May was found dearest in all the markets and October month for Chandigarh and Delhi, November for Bangalore and December for Ambala were the cheapest months. In case of arrivals, the seasonal indices were above the average from July to December months in Ambala, Bangalore and Chandigarh market, and August to December for Delhi market. Between January and June, arrival indices remain below the average for Ambala, Bangalore and Chandigarh markets. In case of Delhi market, indices for arrivals were below average from January to July. It can be inferred from the above analysis that, during the peak arrival months, price indices normally go below average and during lean months, the price indices is more than the average prices. This situation was found to occur regularly and these changes repeat themselves year after year in all the study markets. Hence, the seasonality component was found quite prominent in apple marketing.

TABLE 9: SEASONAL INDICES OF ARRIVALS AND PRICES OF APPLE IN SELECTED MARKETS

| Months | Markets | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Ambala | | Banglore | | Chandigarh | | Delhi | |
| | Wholesale prices | Arrivals | Wholesale prices | Arrivals | Wholesale prices | Arrivals | Wholesale prices | Arrivals |
| January | 97.74 | 83.97 | 93.61 | 74.40 | 97.11 | 65.42 | 92.26 | 86.06 |
| Feburary | 101.85 | 47.23 | 98.21 | 55.73 | 100.26 | 55.01 | 97.33 | 64.88 |
| March | 112.10 | 14.91 | 109.22 | 28.93 | 104.21 | 37.07 | 103.43 | 27.67 |
| April | 114.20 | 10.15 | 115.23 | 13.61 | 115.76 | 16.97 | 105.04 | 3.66 |
| May | 122.24 | 3.86 | 121.64 | 7.94 | 120.38 | 5.23 | 114.30 | 0.96 |
| June | 100.12 | 73.09 | 130.95 | 38.39 | 117.93 | 73.78 | 108.19 | 0.45 |
| July | 101.31 | 183.06 | 99.78 | 137.79 | 92.30 | 137.29 | 115.35 | 24.07 |
| August | 90.53 | 182.70 | 90.80 | 195.64 | 84.63 | 205.59 | 91.57 | 170.55 |
| September | 87.58 | 157.17 | 86.46 | 195.161 | 87.88 | 207.09 | 93.84 | 224.42 |
| October | 94.32 | 155.24 | 84.57 | 195.96 | 92.17 | 183.59 | 90.62 | 225.62 |
| November | 90.59 | 153.29 | 81.90 | 152.18 | 92.62 | 118.27 | 92.86 | 201.59 |
| December | 87.43 | 134.83 | 87.12 | 104.17 | 94.27 | 100.73 | 95.15 | 170.05 |

The coefficient of seasonal variation of apple prices and arrival in selected markets is placed in Table 10. The coefficient of variation of price indices was lowest (8.95%) in Delhi market and highest (15.92%) in Bangalore market. The coefficient of average seasonal price varied from 23.66 per cent (Ambala market) to 46.88 per cent (Bangalore market). The variation in arrivals was highest in Delhi and lowest in Chandigarh markets. It may be concluded that Bangalore market is facing highest price fluctuations followed by Chandigarh market, whereas arrival fluctuations were relatively lesser in Bangalore and maximum in Delhi market. From price variability point of view, Delhi market turned out to be more stable, followed by Ambala and Chandigarh markets.

TABLE 10: COEFFICIENT OF SEASONAL VARIATION IN PRICE AND ARRIVALS OF APPLE IN SELECTED MARKETS

| Markets | Prices | | Arrivals | |
|---|---|---|---|---|
| | ASPV (%) | CV (%) | ASAV (%) | CV (%) |
| Ambala | 23.66 | 11.18 | 191.73 | 69.07 |
| Bangalore | 46.08 | 15.92 | 184.42 | 69.81 |
| Chandigarh | 26.54 | 12.00 | 190.14 | 66.30 |
| Delhi | 24.01 | 8.95 | 199.20 | 91.89 |

ASPV/ASAV- Average seasonal price variation/average seasonal arrival variation
CV – Coefficient of variation.

The month wise regression analysis was carried out to see the effects of arrivals on markets prices in the selected markets. The market arrivals did have negative effects on the prices, but its impact was quite significant in Delhi market. The difference in peak and trough of arrival and prices indicated that the inclusion of lag prices could better explain the behaviour of current prices. The inclusion of lag variable not only improved the sign, but also the value of $R^2$.

The results of regression analysis of monthly prices on lag price and arrivals of apple in the selected markets are given in Table -11. The table indicated that lag price of apple had a positive and significant impact on the respective current prices in all the selected markets. It was observed that lagged price gave high response and explains large variation in Ambala market followed by Chandigarh, Bangalore and Delhi market indicating thereby that lagged price is one of important source of information while determining current sale price in these markets. This is sort of imperfection in these markets that the effect of current arrivals in *ceteris paribus* is not fully reflected in current prices.

TABLE 11: RESULTS OF REGRESSION ANALYSIS OF MONTHLY PRICES ON LAG PRICE AND ARRIVALS OF APPLE CROP IN SELECTED MARKETS (1998- 2014)

| Particulars | Ambala | Banglore | Chandigarh | Delhi |
|---|---|---|---|---|
| (i) Constant | 411.169 | 662.48 | 113.395 | 2875.71 |
| (ii) Lag price | 0.967*** | 0.910*** | 0.923*** | 0.785*** |
| | (0.102) | (0.106) | (0.162) | (0.198) |
| (iii) Arrival | - 0.105 | -0.0957 | 0.139 | -0.0426** |
| | (0.222) | (0.115) | (0.097) | (0.021) |
| (iv) $R^2$ | 0.86 | 0.85 | 0.90 | 0.48 |

Note: Figures in parentheses is indicate standard error.
*** Significant at 1 per cent level of significance
** Significant at 5 per cent level of significance

**Inter-market price behaviour**

Market integration implies the extent of transmission of prices and arrival signals and related market information from one market to another. If prices in different markets move in same direction, this would indicate that the markets are efficient in transmitting price signals and they are correlated. It can be observed from the Table-12 that correlation coefficient of 0.70 was found for Delhi-Bangalore, Ambala- Bangalore and Chandigarh-Bangalore market pairs. However, in case of Ambala-Chandigarh, Delhi-Chandigarh, Ambala-Delhi correlation coefficients were 0.76, 0.69, and 0.69, respectively. The results indicated that all markets have some information about apple prices and arrivals in other markets but degree of integration can be further improved by strengthening the market intelligence. The markets situated in close proximity exhibited high correlation. When series of actual prices were correlated, the correlation coefficient turned out to be higher and significant in apple prices between selected markets. When correlation coefficients were worked out for deseasonalised, detrended, decycled monthly apple price between selected markets, the value of correlation coefficients were found to be lower. The results presented in the Table- 12 implied that the selected markets were very well integrated as was evidenced by correlation analysis of price series. The analysis indicate that occurrence of the price fluctuation was due to irregular variation in demand and supply conditions, which resulted into lower value of correlation coefficients in the selected markets, when seasonal, time trends and cyclic influences in the actual price series were eliminated.

TABLE 12: CORRELATION MATRIX OF DESEASONALISED DETRENDED, DECYCLED MONTHLY APPLE PRICE SERIES (1998-2014)

| Market | Ambala | Banglore | Chandigarh | Delhi |
|---|---|---|---|---|
| Ambala | 1 | - | - | - |
| Banglore | 0.701*** | 1 | - | - |
| Chandigarh | 0.761*** | 0.701*** | 1 | - |
| Delhi | 0.691*** | 0.701*** | 0.691*** | 1 |

*** Significant at 1 per cent level of significance

## Conclusion

Apple cultivation is a profitable economic activity in the Kashmir valley compared to other agriculture food crops. It is labour intensive, farm based and commercially attractive economic activity. The income earned from apple crop shall be more profitable than any other horticulture crop, provided it is done in a systematic way. There are numerous problems faced by apple growers in marketing of their apple produce. The high transportation cost, delay in payments at terminal markets like Delhi, Chandigarh Bangalore as well as commission charges are high in these markets. The information on arrival and prices in distant markets is not easily available. Unavailability of processing industries in the producing areas is another problem.

To improve the Existing Marketing system several measures need to be taken:

1. Marketing facilities for sending the produce to different terminal markets of the country, namely, Delhi, Bombay, Banglore Calcutta and other capitals of the bigger states should be made available.

2. Minimizing the number of 'agencies' in the channel of apples reaching from producer-to consumers should be devised.

3. To generate information on wholesale prices, arrivals in various markets of the country for apple produce, and generate Market Intelligence Reports.

4. To establish a nation-wide communication network for speedy collection and dissemination of market information data for its efficient and timely utilization.

5. To prepare farmers' advisory and issue the same for the benefit of producer farmers especially by making use of statistics so generated and collected for optimizing returns to the producers.'

6. The transport cost may be charged on truck load basis instead of per box basis.

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# Evaluation of Post Harvest Losses during Marketing of Oranges

Dr. Nishant V. Shende* and Amol S. Dake

## Introduction

In India, common citrus fruits are Mandarin orange (*Citrus reticulata*), Sweet Orange (*Citrus sinensis*) and Acid lime (*Citrus aurantifolia*).Mandarin is the most important commercial crop. It occupies about 39% of the area under citrus cultivation. The Chief Centers of production are Nagpur, Assam and Coorg. Mandarin occupies about 12 % of the area, Maharashtra, Andhra Pradesh, Punjab and Rajasthan are its principal cultivation states.

In Nagpur, as fruits are cultivated on larger area, the demand for fruits is increasing day by day. The procurement of it involves various activities like purchasing, processing, packing, transportation, loading and unloading, weighing etc. However, during this procurement, quality as well as quantity deteriorates. To overcome this problem, modern procurement system exists nowadays.

In this paper, explicit evaluation of the post-harvest losses at different stages of marketing, farmers' net price, marketing costs, margins and efficiency have been done. It has been found that the existing methods tend to overstate the farmers' net price and marketing margins of intermediaries. In fact, the margin of the retailers' has been found to be negative (loss) after taking into account the physical loss during retailing which otherwise, was positive (profit) in the conventional estimation. Similarly, the producers' net share and wholesalers' margins also decrease substantially. It has been shown that marketing efficiency is inversely proportional to the marketing losses. The co-operative marketing has been found to be a more efficient system in terms of both operations and price. Marketing cost has been identified as the major constraint in the wholesale marketing channel and bringing down the costs, particularly the commission charges as demonstrated in the channel, will help in reducing the price-spread and increasing the producers' margin. The need for specialized transport vehicles for perishable commodities has been highlighted

## Methodology

The schedule was designed for data collection keeping in view the objectives of the study. The selected farmers were personally contacted and data was collected from them in the schedule for the year 2012-13. Survey method was followed for the data collection. Information pertaining to level of utilization of different inputs, expenditure, yields and constraints faced by orange grower's output price and other relevant information were collected through a survey method with the help of pre-tested schedule.

The data on marketing transactions along with the margins was obtained from different market agencies. Similarly, the data on purchase price, expenses and margins obtained in the marketing of orange was collected from village merchants, commission agents, wholesalers, retailers in Katol, Kalmeshwar, Narkhed & Nagpur market. This data was used for estimating post harvest losses, reasons for post harvest losses, market margin, market efficiency, marketed surplus as well as price spread in marketing of oranges in the area under study.

The primary data was collected by multistage random sampling techniques. Four tehsils were selected (Katol, Kalmeshwar, Narkhed & Nagpur), on the basis of potential area of orange in Nagpur district. From each tehsil, 5 villages were selected and from each village 5 farmer were selected. Hence, total 100 farmers, 10 wholesalers and 10 retailers were selected for the study.

## Estimation of post harvest losses in marketing

In the conventional estimation procedures, the losses at different stages of marketing are not considered explicitly as an item of cost. It is considered either as part of net income received by farmer or the margin of the market intermediaries. The modified formulas (Murthy et al. 2007) were used separately for estimating the losses in value terms at different stages of marketing as well as for estimation of producers' share and marketing margin.

*Net Price Received by Farmer*

$$NPF = GPF - (CF + (LF \times GPF))$$

Where,

NPF = Net Price received by the farmer in (Rs./Qtl.)

GPF = Gross Price received by farmer in (Rs./Qtl.)

CF = Cost incurred by farmers during Marketing (Rs./Qtl.)

LF = Physical loss in produce from harvest till it reaches the market (qtl.)

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*Market Margin of Wholesaler*

MMW = GPW – GPF –CW- (LW X .GPW)

Where,

MMW = Market Margin of the wholesaler in (Rs./Qtl.)

GPW = Wholesalers selling price/Purchase price of retailer in (Rs./Qtl.)

GPF = Gross Price received by farmer in (Rs./Qtl.)

CW = Cost incurred by the wholesaler during marketing (Rs./Qtl.)

LW = Physical loss in the produce at the wholesale level in (Rs./Qtl.)

In the marketing chain, when more than one wholesaler is involved, i.e., there are primary wholesalers, secondary wholesalers, etc, then the total marketing margin of wholesaler is,

MMW = MMW1 +…….+ MMWn

*Market Margin of Retailer*

MMR = GPR – GPW – CR- (LR X GPR)

MMR = Market margin of retailer (Rs./Qtl.)

GPR = Retailer's selling price or purchase price of consumers (Rs./Qtl.)

GPW = Retailer purchase price. (Rs./Qtl.)

CR = Cost incurred by retailer during marketing (Rs./Qtl.)

LR = The physical loss in produce at retailer level (Rs./Qtl.)

*Total marketing margin of marketing intermediaries (MM) will be calculated as*

MM = MMw + MMR

Where,

MM = Market margin of intermediaries. (Rs./Qtl.)

MMw = Market margin of Wholesaler (Rs./Qtl.)

MMR = Market margin of Retailer (Rs./Qtl.)

*Total Marketing cost (MC) incurred by producer/ seller and by Intermediaries are*

MC = CF + Cw + CR

Where,

MC = Total Market cost (Rs./Qtl.)

CF = Cost incurred by producer farmer (Rs./Qtl.)

Cw = Cost incurred by wholesaler (Rs./Qtl.)

Cr = Cost incurred by Retailer (Rs./Qtl.)

The total marketing loss (ML) in value of produce due to injury/ damage caused during handling from the point of harvest till it reached to the consumers is

ML = (LF * GPF) + (Lw * GPw) + (LR * GPR)

Where,

ML = Total marketing loss. (Rs./Qtl.)

LF = Physical loss in the produce at the farmer level. (Rs./Qtl.)

GPF = Farmer selling price. (Rs./Qtl.)

LW = Physical loss in the produce at the wholesaler level. (Rs./Qtl.)

GPw = Wholesalers selling price (Rs./Qtl.)

LR = Physical loss in the produce at the retailer level. (Rs./Qtl.)

GPR = Retailer selling price. (Rs./Qtl.) or

Consumer purchase price. (Rs./Qtl.)

*Marketing Efficiency*

To ascertain the impact of marketing loss on marketing margins, marketing efficiency was also estimated by commonly used formula given by Acharya and Agrwal (1999)

Corrected measure

$$\text{Marketing efficiency} = \frac{NPF}{MC+MM+ML}$$

Where,

NPF = Net Price received by farmer

MC = Total marketing cost

MM = Total market margin, and

ML = Total Marketing loss

Commonly used measure

NPF

$$\text{Marketing efficiency} = \frac{NPF}{MC+MM}$$

Where,

NPF = Net Price received by farmer

MC = Total marketing cost

MM = Total market margin.

*Socio-economical factor influencing post harvest losses*

Post harvest losses at farm level are influenced by different socio -Economic factors of farmers. To study the influence

of different social economic variables on the post harvest loss, a linear multiple regression model [Kishor Kumar et.al. (2008) was used].

The specified model is:

$$Y = \alpha_0 + \beta_1X_1 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

Where,

| | | |
|---|---|---|
| $Y$ | = | Post harvest loss at farm level (Kg./qtls.) |
| $\alpha_0$ | = | Intercept. |
| $\beta_i$ | = | Coefficient. |
| $\beta_1$ | = | Education of the head of Family. (In number of year.) |
| $\beta_2$ | = | Type of family. (0 for joint and 1 for Nuclear) |
| $\beta_3$ | = | Size of land holding (ha.) |
| $\beta_4$ | = | Experience of farmer (In number of years) |
| $\beta_5$ | = | Production of orange (qtls./ha.) |
| $\beta_6$ | = | Price received by farmer (Rs./kg.) |
| $\beta_7$ | = | Transport dummy (0 for inadequate and 1 for adequate) |
| $\beta_8$ | = | Labour availability dummy (0 for inadequate and 1 for adequate) |

**Factor affecting marketed surplus**

For determining the factors affecting the marketed surplus of orange; exponential type of function and Multiple linear of the following structural form was fitted;

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$$

Where,

| | | |
|---|---|---|
| $Y$ | = | Marketed surplus of orange. (qtls./ha.) |
| $X_1$ | = | Orange production. (qtls/ha.) |
| $X_2$ | = | Total consumption of orange. (qtls./ha.) |
| $X_3$ | = | Spoilage at farm. (Qtls./ha.) |
| $X_4$ | = | Off-farm income. (Rs./farm/annum.) |
| $X_5$ | = | Net price received by the producer. (Rs./qtls.) |
| $X_6$ | = | Education of family head (In number of years.) |
| $b_0$ | = | Intercept. |
| $b_i$ | = | Coefficient. |
| $i$ | = | 1, 2,3…….n |

**Result and Discussion**

*(1) Socio-economic characteristic of selected Orange growers in Nagpur district*

The socio-economic parameters of the Orange growers influence the production income and marketing activities of the agro produce of farm. The type of family, educational status, land use pattern, cropping pattern are the major socio-economic factors that are needed to be studied. These factors are explained below.

A total of twenty (20) villages spread across four Tehsil of Nagpur district of Vidarbha region were surveyed for the study. The General characteristics of the sample farmers are profiled in table 1.

TABLE 1: TEHSIL WISE AVERAGE AGE, EXPERIENCE IN ORANGE FARMING, CLASSIFICATION OF LAND AND INCOME OF SELECTED ORANGE GROWERS

| Sr. No. | Particular | Tahasils | | | | Total / |
|---|---|---|---|---|---|---|
| | | Katol | Kalmeshwar | Nagpur | Narkhed | Overall |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **A Age groups** | | | | | | |
| 1 | Young (<30) | 4 (16.00) | 5 (20.00) | 8 (32.00) | 6 (24.00) | 23 (23.00) |
| 2 | Middle age (30 - 50) | 16 (64.00) | 14 (56.00) | 10 (40.00) | 12 (48.00) | 52 (52.00) |
| 3 | Old (>50) | 5 (20.00) | 6 (24.00) | 7 (28.00) | 7 (28.00) | 25 (25.00) |
| | Total | 25 (100.00) | 25 (100.00) | 25 (100.00) | 25 (100.00) | 100 (100.00) |
| **B Experience in orange farming** | | | | | | |
| 1 | 6 to10years | 6 (24.00) | 8 (32.00) | 6 (24.00) | 5 (20.00) | 25 (25.00) |
| 2 | 11 to15years | 15 (60.00) | 9 (36.00) | 11 (44.00) | 10 (40.00) | 45 (45.00) |
| 3 | Above 16 year | 4 (16.00) | 8 (32.00) | 8 (32.00) | 10 (40.00) | 30 (30.00) |
| | Total | 25 (100.00) | 25 (100.00) | 25 (100.00) | 25 (100.00) | 100 (100.00) |

Table 1: Tehsil wise Average Age, Experience in Orange Farming, Classification of Land and Income of Selected Orange Growers—*Contd.*

| | | | | | | |
|---|---|---|---|---|---|---|
| **C Average size of Holding** | | | | | | |
| 1 | Small (0.01 - 2. 0 ha.) | 7 (28.00) | 8 (32.00) | 12 (48.00) | 12 (48.00) | 39 (39.00) |
| 2 | Medium (2.01- 4. 00 ha.) | 10 (40.00) | 13 (52.00) | 8 (32.00) | 9 (36.00) | 40 (40.00)) |
| 3 | Large (Above 4.00 ha.) | 8 (32.00) | 4 (16.00) | 5 (20.00) | 4 (16.00) | 21 (21.00) |
| | Total | 25 (100.00) | 25 (100.00) | 25 (100.00) | 25 (100.00) | 100 (100.00) |
| **D Average Family income** | | | | | | |
| 1 | Low income (less than 50,000 Rs. Per annum) | 0 (0.0) | 1 (4.00) | 1 (4.00) | 0 (0.00) | 2 (2.00) |
| 2 | Medium income (50,000 to 2,00,000 Rs. Per annum) | 8 (32.00) | 5 (20.00) | 8 (32.00) | 6 (24.00) | 27 (27.00) |
| 3 | High income (more than 2.00.000) | 17 (68.00) | 19 (76.00) | 16 (64.00) | 19 (76.00) | 71 (71.00) |
| | Total | 25 (100.00) | 25 (100.00) | 25 (100.00) | 25 (100.00) | 100 (100.00) |

Note: Figures in parentheses indicate the per cents to total.
**Source:** primary survey.

Age and experience in orange farming play vital role in farmer's disposition towards technology and their comprehension and adoption. Hence, it is observed from table 1 that, only (25.00) per cent of the respondents fell under old age category while (52.00) per cent belonged to middle age category and rest 23 per cent to young category. The Experience profile showed that 45 per cent farmers had experienced between 11 to 15 year, followed by 30 per cent above 16 years and between 6 to 10 years, there was 25 per cent farmer.

Family income is a major factor in determining the economic well being of the farmers. The farmer income distribution showed that (71.00) and (27.00) per cent had high and medium income group, respectively. Whereas on an average, 39.00 per cent farmers had small size of holding and 40.00 per cent farmers had medium size of holding and 21.00 per cent of farmers had large size of holding.

*(2) Average type of family of selected Orange growers*

The type of family size of selected Orange growers in Nagpur district is given in Table 2.

Table 2: Tehsil wise Type of Family of Selected Orange Growers in Nagpur District

| Sr. No. | Tahasils | Joint Family | Nuclear Family | Total |
|---|---|---|---|---|
| 1 | Katol | 15 (60) | 10 (40) | 25 (100) |
| 2 | Kalmeshwar | 17 (68) | 8 (32) | 25 (100) |
| 3 | Nagpur | 19 (76) | 6 (24) | 25 (100) |
| 4 | Narkhed | 15 (60) | 10 (40) | 25 (100) |
| 5 | Overall / Total | 66 (66.00) | 34 (34.00) | 100 (100) |

Note: Figures in parentheses indicate the per cents to total.

Table 2 revealed that in Katol tehsil, on an average, there were 60 per cent Joint Families, and 40 per cent Nuclear Families. In Kalmeshwar tehsil, 68 per cent were Joint Families, and 32 per cent Nuclear Families. Whereas in Nagpur tehsil, there were 76 percent Joint Families, and 24 per cent Nuclear Families. In Narkhed tehsil, there were 60 per cent Joint Families, and 40 per cent Nuclear Families out of 25 families in each tehsil. On an overall basis, there was 66 per cent Joint Families, and 34 per cent Nuclear Families out of total 100 Families.

*(3) Educational Status of selected Orange growers*

The educational status of selected Orange growers in Nagpur district is presented in Table 3.

TABLE 3: TEHSIL WISE EDUCATIONAL STATUS OF SELECTED ORANGE GROWERS

| Sr. No. | Particulars | Tahasils | | | | |
|---|---|---|---|---|---|---|
| | | Katol | Kalameshwar | Nagpur | Narkhed | Total / Overall |
| 01 | Illiterate | 5 (20.00) | 3 (12.00) | 11 (44.0) | 12 (48.00) | 31 (31.00) |
| 02 | Primary School | 7 (28.00) | 2 (8.00) | 8 (32.0) | 3 (12.00) | 20 (20.00) |
| 03 | Middle School | 7 (28.00) | 3 (12.00) | 4 (16) | 5 (20.00) | 19 (19.00) |
| 04 | High School | 3 (12.00) | 13 (52.00) | 2 (8.00) | 1 (4.00) | 19 (19.00) |
| 05 | Higher Secondary | 2 (8.00) | 3 (12.00) | 0 (000) | 2 (8.00) | 4 (7.00) |
| 06 | Graduate and above | 1 (4.00) | 1 (4.00) | 0 (000) | 2 (8.00) | 4 (4.00) |
| | Total | 25 (100.00) | 25 (100.00) | 25 (100.00) | 25 (100.00) | 100 (100.00) |

Note: Figures in parentheses indicate the percents to total.

It is observed that 31.00 per cent of the farmers were illiterate in four tehsils. This was followed by those who had education up to primary school (20.00 per cent) at overall level. In the four tehsils, illiteracy rate was 48.00, 44.00, 20.00 and 12.00 per cent for Narkhed, Nagpur, Katol and Kalameshwar tehsils, respectively. The no. of farmers having primary level education level above graduation was highest in Nagpur tehsil (32.00 per cent). It was followed by Katol tehsil (28.00 per cent). The no. of farmers having education level above graduation was highest in Narkhed tehsil (8.00 per cent) .The higher literacy level of farmers was observed in Narkhed tehsil.

*(4) Market margin of Intermediaries*

An effort was made to study marketing aspects of orange, such as to identify the marketing channels, marketing cost, price spread, margins, post harvest loses, factors affecting post-harvest losses, Factors affecting marketed surplus and marketing efficiency.

(a) Marketing channels

Marketing channels through which orange in the study area was marketed from the producers to the ultimate consumers are presented in Table 4 The two channels identified in the marketing of orange were:

Channel (I): – Producer → pre harvest contractor → wholesaler → retailer in local market Consumer.

Channel (II): – Producer → wholesaler → retailer in local market → Consumer.

In the channel – I, Wholesaler himself brought the produce to distant market and sold through Retailer-cum-commission agents. For the service rendered by the wholesaler cum commission agent, he charged 6 per cent commission on total value of produce marketed. As per the information collected from the respondents, 72.00 per cent of producers sold their produce through this channel.

In the channel – II, retailer himself brought the produce to the market and sold directly to consumer at local market. There is only 18.00 per cent of produce sold through this channel.

TABLE 4: DIFFERENT MARKETING CHANNELS OF ORANGE

| Sr. No. | Channel | No. of farmer | Quantity sold (tonne) |
|---|---|---|---|
| 1. | Producer→pre-harvest contractor→ wholesaler retailer in local→ market Consumer→ | 72 (72.00) | 1692.8 (67.24) |
| 2. | Producer→wholesaler→ retailer in local market Consumer→ | 28 (28.00) | 824.75 (32.76) |
| | Total | 100 (100.0) | 2517.6 (100.0) |

(b) Marketing cost and marketing margin incurred by the growers and market intermediaries in marketing of orange (Rs./qtl.)

The cost of marketing of orange is estimated and presented in Table 5.

It is seen from Table 5 that out of two marketing channels, in channel I, the marketing cost incurred by pre-harvest Contractors' was Rs. 1137.74 while selling price was Rs. 3228.0. The Wholesaler incurred marketing cost of Rs. 969.90 while the margin of Wholesaler was Rs. 241.10. The selling price of Wholesalers was Rs. 4439.00.The marketing Cost incurred by Retailer was Rs. 333.20 while marketing margin of retailer was Rs. 327.80. The selling price or Net price received by

producer was Rs. 1938.0 without any marketing cost. The total marketing cost of channel I was Rs. 2440.84 and total margin received by different intermediaries was Rs. 721.16

In channel II, the marketing cost incurred by producer was Rs.1099.73. The net price received by producer was Rs.1879.27. The margin of wholesaler was Rs. 256.04, while marketing cost was Rs. 986.96. The retailer incurred the marketing cost of Rs. 385.03 and received margin was Rs. 332.97. The total marketing cost of channel II was Rs. 2471.72and total margin received by different intermediaries was Rs. 589.01.

From above discussion, it can be concluded that highest marketing cost was observed in channel II i.e., Rs. 2471.72 and highest total margin was observed in channel I i.e., Rs. 721.16.

TABLE 5: MARKETING COST AND MARKET MARGIN OF THE ORANGE

*(Rs. /qtl.)*

| Sr.No. | Particular | Channel-I | Channel-II |
|---|---|---|---|
| A. | Producer - | | |
| 1 | Harvesting and Picking Charges | - | 428.45 (38.95) |
| 1 | Loading | - | 97.06 (8.82) |
| 2 | Transportation | - | 172.55 (15.70) |
| 3 | Unloading | - | 96.08 (8.73) |
| 4 | Commission @ 6 % | - | 178.74 (16.25) |
| 5 | Miscellaneous Charges | - | 60.78 (5.52) |
| 6 | Market charges | - | 66.67 (6.06) |
| 7 | Total marketing cost | - | 1099.73 (100.00) |
| 8 | Selling Price of producer | 1938.0 | 2979.0 |
| 10 | Net price | 1938.0 | 1879.27 |
| B. | Pre-harvest Contractor | | |
| 1 | Purchase price of Pre-harvest Contractor | 1938.0 | |
| 1 | Harvesting and Picking charges | 346.80 (30.48) | - |
| 2 | Loading | 114.65 (10.07) | - |
| 3 | Transportation | 320.03 (28.14) | - |
| 4 | Unloading | 114.67 (10.07) | - |
| 5 | Paddy straw | 33.19 (2.91) | - |
| 6 | Commission | 193.68 (17.02) | - |
| 7 | Weighing Charges | 14.42 (1.26) | - |
| 8 | Total | 1137.74 (100.00) | - |
| 9 | Total marketing loss | 342.16 (10.60) | - |
| 10 | Selling Price of Pre-Harvest Contractor | 3228.0 | - |
| 11 | Market margin of Pre-Harvest Contractor | 152.26 | - |
| C. | Wholesaler | | |
| 1 | Charges of Packing Materials | 40.40 (4.16) | 47.92 (4.85) |
| 2 | Paddy Straw | 8.55 (0.88) | 10.06 (1.01) |
| 3 | Paper | 8.71 (0.89) | 8.66 (0.87) |
| 4 | Sutali | 18.60 (1.91) | 16.93 (1.71) |
| 5 | Nails | 5.65 (0.58) | 6.40 (0.64) |
| 6 | Packaging | 31.40 (3.23) | 32.00 (3.24) |
| 7 | Nail Fitting | 25.77 (2.65) | 29.03 (2.94) |
| 8 | Tying Roap | 36.42 (3.75) | 36.99 (3.74) |
| 9 | Marketing and labeling | 40.82 (4.22) | 40.58 (4.11) |
| 10 | Loading | 108.68 (11.20) | 110.05 (11.15) |
| 11 | Transportation | 260.85 (26.90) | 275.06 (27.86) |
| 12 | Unloading | 84.62 (8.72) | 82.58 (8.36) |
| 13 | Commission Charges@6% | 263.40 (27.10) | 253.32 (25.66) |
| 14 | Marketing charges | 36.03 (3.82) | 37.38 (3.78) |
| 15 | Total | 969.90 (100.00) | 986.96 (100.00) |
| 16 | Selling Price of Wholesaler | 4439.0 | 4222.0 |
| 17 | Market margin of Wholesaler | 241.10 | 256.04 |

TABLE 5: MARKETING COST AND MARKET MARGIN OF THE ORANGE

*(Rs. /qtl.)*

| Sr.No. | Particular | Channel-I | Channel-II |
|---|---|---|---|
| D. | Marketing Cost incurred by Retailer | | |
| 1 | Shop Rent | 75.96<br>(22.80) | 89.32<br>(23.20) |
| 2 | Loading | 95.76<br>(28.74) | 110.89<br>(28.80) |
| 3 | Transportation | 34.65<br>(10.40) | 41.69<br>(10.83) |
| 4 | Unloading | 89.29<br>(26.80) | 100.76<br>(26.17) |
| 5 | Other | 37.51<br>(11.26) | 45.81<br>(11.90) |
| 6 | Total | 333.20<br>(100.00) | 385.03<br>(100.00) |
| 7 | Selling price of Retailers | 5100.00 | 4940.00 |
| 8 | Market margin of Retailer | 327.80 | 332.97 |

Note: Figure in parenthesis indicate the percent to total.

(c) Producer share in consumers' rupees

The producer share in consumers' rupees is estimated and presented in Table 6:

TABLE 6: PRODUCER SHARE IN CONSUMER'S RUPEE

*(Rs. /Qtl.)*

| Sr. No. | Particular | Channel-I | Channel-II |
|---|---|---|---|
| 1 | Net Price received by Producer | 1938.00<br>(38.00) | 1879.27<br>(38.04) |
| 2 | Total Marketing cost incurred by producer, Pre-harvest contractors wholesaler and retailer | 2440.84<br>(47.85) | 2471.72<br>(50.03) |
| 3 | Total market margin of wholesaler & retailer | 721.16<br>(14.14) | 589.01<br>(11.92) |
| 4 | Selling price of retailer/Purchase price of consumer | 5100.00<br>(100.00) | 4940.00<br>(100.00) |

Note: Figures in parentheses indicate the percentage to consumer price.

It is seen from Table 6 that the net price received by producer in channel-I, and channel-II were Rs. 1938.00, and Rs. 1879.27 per tonne, respectively. The producer's share in consumer's rupee was highest in channel-II *i.e.*, 38.04 per cent followed by channel-I *i.e.*, 38.00 per cent. The total market cost was highest in channel-I as compared to channels-II. The total market margin was higher in channel-II which is Rs. 589.01. Though the producer's share in consumer's rupee was highest in channel-II as compared to channels-I, but the net price received by producer is highest in channel-II *i.e.*, Rs. 1879.27/tone. Hence selling of orange through channel-II by orange grower was found more remunerative than other channels in study area.

(5) Post Harvest Losses

*(a) Post harvest losses in difference stages of marketing (Rs. /qtl.)*

Table 7 presents the scenario of postharvest losses at different stages of orange marketing.

TABLE 7: POST HARVEST LOSSES IN DIFFERENT STAGES OF MARKETING

*(Rs./qtl.)*

| Sr. No. | Stages of losses | Post harvest losses Channel-I | Channel-II |
|---|---|---|---|
| A. | At farm level | | |
| 1 | During harvesting | 96.15<br>(28.30) | 100.45<br>(28.10) |
| 2 | Picking and Grading | 53.72<br>(15.70) | 55.05<br>(15.40) |
| 3 | Packing | 34.22<br>(10.00) | 36.82<br>(10.30) |
| 4 | Loading and unloading | 41.40<br>(12.80) | 43.26<br>(12.10) |
| 5 | Transportation | 116.68<br>(34.20) | 122.26<br>(34.20) |
| | Total | 342.16<br>(100.00) | 357.48<br>(100.00) |
| B. | At wholesale level | | |
| 1 | Grading | 52.30<br>(19.90) | 47.94<br>(19.50) |
| 2 | Packing | 31.80<br>(12.10) | 30.24<br>(12.30) |
| 3 | Loading and unloading | 38.63<br>(14.70) | 34.67<br>(14.10) |
| 4 | Transportation | 140.60<br>(53.50) | 133.01<br>(54.10) |
| | Total | 262.8<br>(100.00) | 245.86<br>(100.00) |
| C. | At Retailer level | | |
| 1 | Loading and unloading | 48.58<br>(18.21) | 51.05<br>(16.66) |
| 2 | Transportation | 75.95<br>(31.02) | 96.34<br>(31.45) |
| 3 | Selling | 124.27<br>(50.76) | 158.88<br>(51.87) |
| | Total | 244.80<br>(100.00) | 306.28<br>(100.00) |

Note: Figures in parentheses indicate the percentage to total.

The total post-harvest loss at farm level was highest in channel II *i.e.*, Rs. 357.48 per qtls; whereas that of in the first channel was Rs. 342.16 Rs. per qtls. In the first channel, highest losses during transportation was Rs. 116.38/qtl. followed by harvesting Rs. 96.15/qtl. In

second channel also a similar pattern had been observed. Overall, in the both channel, losses at farm level were highest during transportation followed by harvesting.

**Post-harvest Losses in orange at Wholesaler Level**

In this section, the post-harvest losses at the wholesale have been discussed. The wholesale transactions in orange were being performed from early morning till around 11 am every day. The total post- harvest loss at Wholesaler level was highest in channel II that is Rs. 262.8 per qtl; whereas in the first channel, it was Rs. 245.86 per qtl. In the first channel, highest losses during transportation were 140.60 Rs. /qtl. followed by grading *i.e.*, 52.30 Rs./qtl. In second channel also the highest losses during Transportation followed by grading. Overall, in the both channel losses at wholesale level was highest during transportation followed by Grading.

The losses at retail level were also worked out and have been presented in Table 7. The highest loss at Retail level observed in channel II was Rs. 306.28 per qtl; as compared to channel I, *i.e.*, Rs. 244.80 Per qtl. It was found that loss was registered maximum in selling that is Rs. 158.88 per qtl, followed by transportation Rs. 96.34 Per qtl. As far as losses at different stages were concerned at retailer level, the maximum losses were estimated during the selling stage. The maximum loss during selling stage was registered in second channel.

*(b) Total post Harvest losses in marketing of Orange*

Table 8 represents the total post harvest losses at different stages of Orange marketing of sample farms.

TABLE 8: TOTAL POST HARVEST LOSSES IN MARKETING OF ORANGES

| Sr. No. | Stages of losses | Post harvest losses | | | |
|---|---|---|---|---|---|
| | | Channel-I | | Channel-II | |
| | | Quantity (kg /qtl) | Values (Rs. /qtl) | Quantity (kg /qtl) | Values (Rs. /qtl) |
| A | At farm level | 10.69 (49.27) | 342.16 (40.26) | 12.00 (49.96) | 357.48 (39.29) |
| B | At wholesaler level | 6.20 (28.59) | 262.8 (30.92) | 5.82 (24.23) | 245.86 (26.71) |
| C | At Retailer level | 4.80 (22.73)) | 244.80 (28.80) | 6.20 (25.81) | 317.13 (33.67) |
| | Total | 21.69 (100.00) | 853.49 (100.00) | 24.02 (100.00) | 909.62 (100.00) |

Note: Figures in parentheses indicate the percentage to total.

The aggregate post-harvest losses in sample Orange farms were calculated by taking together the losses at producer level, wholesaler level and at retail level. Table 8 reveals that post-harvest losses were maximum in channel II *i.e.*, Rs. 909.62 per qtl; and minimum in Channel I *i.e.*, Rs. 849.76 per qtl. Table 8 also revealed that post-harvest losses in the first channel were maximum farm level, that is Rs. 342.16 Per qtl; followed by Wholesale level *i.e.*, Rs. 262.80 Per qtl; whereas in channel II, maximum loss in farm level was Rs. 357.48 per qtl; followed by Retailer level which was Rs. 317.13 per qtls.

Across different levels, it was found that the losses were maximum at farm level in both channels. And thus, first hypothesis *i.e.*, Very high post harvest losses during the marketing of oranges at different stages of handling are proved here.

*(6) Influences of socio-economic factors in post harvest losses of Oranges*

To study the influence of different socio-economic features of farmers on post harvest losses at farm level, a multiple regression analysis was carried out. The results of estimated regression coefficient are presented in Table 9

TABLE 9: INFLUENCES SOCIO-ECONOMIC FACTORS IN POST HARVEST LOSSES OF ORANGES

| Sr. No. | Explanatory variables | Coefficient ($\beta$) | Standard error |
|---|---|---|---|
| 1. | Intercept | 102.401 | 10.13 |
| 2. | Education (x1) | -0.250 | 0.225 |
| 3. | Type of family (x2) | -2.467* | 1.563 |
| 4. | Size of land holding(x3) | -0.141 | 0.400 |
| 5. | Experience in Orange cultivation (x4) | -1.530** | 0.353 |
| 6. | Production of orange (x5) | 0.503** | 0.071 |
| 7. | Price of Orange(x6) | -0.008* | 0.004 |
| 8. | Transport dummy(x7) | 1.081 | 2.083 |
| 9. | Labour availability(x8) | -5.878* | 2.014 |
| $R^2$ | | — | 0.893 |
| F value | | 95.37 | — |
| Adjusted $R^2$ | | 0.884 | — |

* 5 % level of significance
** 1 % level of significance

The variation in eight independent variables included in regression model explained nearly 89 per cent variation in post harvest losses of oranges. The F ratio was significant, indicating there by the good fit of regression models, except for the variables *viz*. education, size of land holding, and transport dummy of the farmers. The regression coefficient of the variables, such as, type of family, experience in orange cultivation, price of orange and labour availability dummy were negative, as postulated in the model for orange. The negative influence of type of family, experience in orange cultivation, price of orange and labour availability dummy on the dependant variable was noticed. Thus, the coefficient of 3 variables out of 8 variable included in models were in conformity with postulated hypotheses. The post harvest losses was positively and significantly influenced by production of

orange of the farmers. These post-harvest losses increased with a decrease in the experience of the farmers, in orange cultivation. Inadequate labour availability and transport facilities increased post harvest losses as the coefficient of these were negatively and positively non significant, significant respectively.

From above analysis, second hypothesis *i.e.*, various socio-economic factors are responsible for post-harvest losses of oranges *Viz.*, education of the head of Family. size of land holding, experience of farmer, etc. is proved here.

*(7) Factor affecting marketed surplus of orange at farm level*

To study the factors affecting marketed surplus of oranges at farm level, both multiple linear regression analysis and multiple non-linear regression analysis were carried out. The results of regression analysis are presented in Table 10.

The literacy level was found as an important determinant of marketed surplus of orange due to fact that educated farmers are more innovative and can adopt orange cultivation on scientific lines. However, the literacy level was found to have a negative impact on marketed surplus, although relation was statistically significant in the linear regression but in the non linear regression, this is found to be statistically in significant. The analysis further revealed that price of orange had positive impact on market supplies Returns to farmer improve their economic status and encourage them to adopt the various input innovation that ultimately improve production.

TABLE 10: FACTORS AFFECTING MARKETED SURPLUS OF ORANGE AT FARM LEVEL

| Sr. No. | Explanatory variables | Non-linear regressions analysis | | Linear regressions analysis | |
|---|---|---|---|---|---|
| | | Coefficient (β) | Standard error | Coefficient (β) | Standard error |
| 1. | Intercept | -1.079 | 1.403 | -5.204 | 11.18 |
| 2. | Production of orange (x1) | 0.583** | 0.108 | 0.339** | 0.100 |
| 3. | Consumption (x2) | 0.095** | 0.024 | 4.676** | 0.723 |
| 4. | Spoilage (x3) | -0.059** | 0.018 | 0.006** | 0.002 |
| 5. | Off-farm income (x4) | 0.004 | 0.004 | 6.907 | 1.198 |
| 6. | Price of Orange (x5) | 0.510* | 0.391 | 0.006* | 0.004 |
| 7. | Education (x6) | -0.001 | 0.012 | -0.621* | 0.304 |
| 8. | R2 | 0.394 | | 0.518** | |
| | F value | 10.08 | | 16.68 | |
| | Adjusted R2 | 0.355 | | 0.487 | |

* 5 % level of significant and
** 1 % level of significant

However, the coefficient of spoilage at the farm level clearly indicated that there was dire need to prevent these losses to improve marketed surplus of orange. The major cause of loss at farm level was incidence drops of fruits at the time harvesting, also physical injury to fruits at the time of harvesting. Loss during transport was mainly due to the overloading. The total orange consumption was found to have a positive impact on marketed surplus, and found to be statistically significant in both analyses.

From table 10, third hypothesis *i.e.*, Various factor affecting the marketed surplus of oranges *Viz.*, size of holding production, price, consumption, etc. is proved here.

*(8) Marketing efficiency of different channels for Orange*

Table 11 depicts the Marketing efficiency of different channels of orange, marketing efficiency and margin in both the channels with accounting loss at each level.

TABLE 11: MARKETING EFFICIENCY OF DIFFERENT CHANNELS FOR ORANGE

| Sr. No. | Particulars Channel | Channel-I | Channel-II |
|---|---|---|---|
| 1 | Net price received by farmer (Rs./qtl.) | 1938.00 | 1879.7 |
| 2 | Marketing margin (Rs./qtl.) | 721.16 | 589.01 |
| 3 | Marketing cost (Rs./qtl.) | 2440.84 | 2471.72 |
| 4 | Marketing loss (Rs./qtl.) | 853.29 | 909.62 |
| 5 | Marketing efficiency | 0.48 | 0.47 |

The marketing efficiency (Table 11) was found minimum (0.47) when farmer sold his produce directly to Wholesaler in market. (*i.e.*, Channel-II). When the fruit was sold through Pre-harvest contractors, the marketing efficiency was highest (0.48) in channel-I. Further, marketing loss was lower in channel-1 because orchardists sold fruits to pre-harvest contractors immediately before ripening and pre harvest contractors harvesting and that too in the nearby market, so loss due to perishability, handling and transportation was almost lower. The producer got Rs.1879.27/qtl. as maximum benefits in channel-II, therefore, this channel should be followed to make producer highest beneficiary; although this channel has its own limitations.

**Conclusions**

The highest marketing cost observed in channel II was Rs.2471.72/qtl. and lowest in channel-I (Rs.2440.24/qtl.). The total market margin was highest in Channel I (Rs. 721.16/qtl.) as compared to channel II (Rs. 589.01/qtl.). From this study, we can conclude that channel II was more profitable than channel I. The total post harvest losses were highest in channel II Rs. 24.02 kg./qtl. that in rupees was Rs. 909.62 per qtl. The production of orange positively influenced the post harvest losses in orange. The estimated regression model for marketable surplus revealed that production of orange, consumption and net price received by producer were significant and positive determinant of

marketed surplus in nonlinear regression analysis. Marketing efficiency was found maximum (0.47) in second channel while it was 0.48 in channel first.

The study has estimated post-harvest losses in Oranges grown in Nagpur district. At producer level, the post-harvest losses have been found maximum and minimum at wholesalers level. Across different stages, the losses have been found maximum at the grower level. The spoilage/loss of Oranges at the grower level resulted was drawn lack of his knowledge about proper post-harvest management.

Improper grading, packing, lack of storage and inadequate transportation facilities contribute more to the problem. One of the most important causes of post harvest losses is harvest at inappropriate maturity, resulting in erratic ripening and poor quality. Therefore, there is an urgent need of training to the Orange growers on scientific post-harvest techniques, if the Orange production is to be sustained on a profitable basis in the region. The study has suggested that one possible solution to tackle these problems could be the establishment of producer co-operatives to handle various activities relating to marketing of Orange. This will not only help to reduce the post-harvest losses but also increase the bargaining power of Orange growers in marketing. It will help them in adopting consumer-oriented approach to Orange marketing.

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# Farm Size and Economic Viability of Sugarcane Cultivation in Maharashtra: Some Evidence from Plot Level Cost of Cultivation Data

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**Abstract**

Long term economic viability of sugarcane cultivation in India came in for serious academic discussion, especially in Maharashtra. Here an attempt is made with as the major objective of understanding this issue. The specific objective is to study the relationship between farm size and economic viability of sugarcane cultivation in Maharashtra with the help of plot level data (2000-01 to 2012-13) collected from cost of cultivation survey, Directorate of Economics and Statistics, (GoI). The plot level data analysis results suggest that the sugarcane cultivation by marginal and small farmers is economically less viable compared to medium and large farmers. The marginal and small farmers have slightly lower risk in yield, but it is much higher in relation to net returns. Therefore, it is recommended that, as the sugarcane cultivation is under critical situation, any hike in operational cost due to high duration of sugarcane crop needs to be solved technologically. In order to economize operational cost of sugarcane cultivation, proper management of sugarcane harvesting in particular time period is necessary and there is a need for using better varieties of sugarcane.

Keywords: sugarcane cultivation, operational cost, farm size, economic viability, Maharashtra.

## Introduction and Motivation

Economic viability is one of major dimensions of sustainability. It depends on efficiency of the production system and supports the sources of income of the farming production system. It is also a function of market forces, price of sugarcane, efficiency and productivity. Sustainability of sugarcane and its viability is essential for the aggregate welfare of sugarcane growers. Therefore, economic viability has to ensure minimum risk (market risk) and cost of cultivation should be less. Despite the increase in area, production and productivity of sugarcane, recently there are some growing concerns regarding farm profitability, sustainable use of resources and increasing input prices which have direct/indirect influence on cost of cultivation for sugarcane. This leads to higher risk in farm income and makes sugarcane cultivation further vulnerable to market forces. It not only impacts the household economy of the farmers but also the aggregate agricultural development.

Despite many innovation and adoption of technologies in sugarcane cultivation, especially in Maharashtra, the farm profitability is still subject to large fluctuations which adversely affecting farmers' decisions to invest in sugarcane cultivation. This, in turn, impacts their livelihoods. Therefore, it is always desirable to economize on cost of cultivation of sugarcane with low risk in order to achieve sustainable growth of sugarcane crop. Sugarcane production system would be unsustainable with existence of higher risk and high input costs. This growing concern about the lower profit margin in sugarcane cultivation is connected with sustainability of small and marginal sugarcane farmers. In fact, the area under sugarcane cultivation increased from 2.30 million hectares in 1966-67 to 4.99 million hectare in 2012-13 in India (DES, MoA, 2015). Despite rise in the area under sugarcane, the small and marginal land holdings still continue to be hindrance in promoting sugarcane cultivation. It is important to understand the major constraints that the small and marginal cultivators face and how sugarcane cultivation could be sustained over time.

Against this background, this paper attempts to examine the changes in economic viability of sugarcane cultivation. The purpose of this study is to check the level and the structure of economic viability and, understand how input use pattern has been changing over a period of time, especially from land holding perspective. We also look at the sugarcane cultivation in Maharashtra from sustainability point of view using some sustainability indicators based on the plot level cost of cultivation data.

## A Brief Review of Literature

### Theoretical Literature

One of the main objectives of any production system or farm is profit maximization. Therefore, Schultz (1964) described the 'peasant production mode' as profit maximization behavior. The theories of production economics mainly deals with the factor-factor relationship, product-product relationship and factor-product relationship. To attain profit maximization objective, the agricultural production theories support farmers through efficient farm allocation of resources. There are two ways to achieve profit maximization, one is to maximize output from a given resources, and the other is to minimize the resources required for a given output.

During the decades of seventies and eighties, there was a continuing debate on relationship between farm size and productivity which has three different views. This debate was started by Sen (1962) with the argument that an inverse relationship existed between farm size and productivity. Others' studies also found negative relationship between farm size and productivity (Reddy Ratna, 1993; Chand et al, 2011;

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Sial et al, 2012; Pillai, 2012). Contrary to this, Usha Rani (1971) found that the productivity per acre remains constant over different size groups of farms, whereas Saini (1979) found that a positive relationship between farm size and productivity. On the basis of these three different views, it can be said that the relationship between farm size and productivity may differ from region to region and crop to crop. Due to variations in soil structure, use of fertilizers, manure, irrigation, high yielding verities and climatic conditions, no unique relationship between farm size and productivity has been found.

With regard to labour use in agriculture, the *theory of household behavior* (1979) by Barnum and Lyn Sauire suggests that commercial profit oriented farm employs only hired labour and marketing all output, whereas a pure subsistence farm uses only family labour instead of hired labour and does not produce any marketed surplus. In case of sugarcane, it is only grown for commercial purpose by using both hired and family labour. However, the proportion of labour use depends on farm size. Sen (1962) stated that agriculture seems unaffordable when only family labour is employed. Generally, the agriculture is not profitable, but it is considered profitable as family labour income. If we exclude family labour income from total income, then nothing will remain as profit. Farm size also matters when we come to profitability.

**Empirical Literature**

Several research studies indicate that economic constraints affect the decision of sugarcane cultivation. Due to the high cost of production and longer growing period, the poor farmers cannot cultivate sugarcane. Using CACP data from 1975 to 2007, Narayanamoorthy (2013) pointed out that the share of profit over Cost C2 and Cost C3 from the sugarcane cultivation had declined substantially over the years and farmers were unable to get any profit. The farmers have not gained any margin from the cultivation of sugarcane during the early post economic reform period. The increasing cost of sugarcane cultivation is found to be crucial factor that influenced farmers to abandon sugarcane cultivation. Sugarcane is being more and more pushed to be cultivated in poor marginal land category. Also, many sugarcane farmers devoted their poor marginal land with low soil fertility for sugarcane cultivation (Karma 1999, Kweyu 2013). Nazir et al. (2013) conducted a study to identify the factors affecting sugarcane production, with the production function analysis to find out an input- output relationship. The study revealed that the input costs of sugarcane cultivation were the major factor which influenced the returns of sugarcane farmers. Apart from this, lack of scientific knowledge and low output prices were the major factors which influenced the cost of sugarcane production. In addition to these constraints, failure to plough out old sugarcane, lack of equipments, low output prices, high transport cost and unavailability of inputs are economic constraints in sugarcane cultivation (Chidako et al. 2011; Sulaiman et al. 2015).

Cultivation of various crops in combination with sugarcane may have affected the economics of sugarcane cultivation. An attempt had been made by Lavania and Pandey (1969) to compare the rising cost of sugarcane with that of growing various crops combinations. Usually, Sugarcane cultivation requires more human and bullock labour as compared to any other crops combinations. The cost of inputs like seeds, manure and fertilizers was high for sugarcane as compared to paddy and gram crops combinations. Sen and Bhatia (2004) and Tripathi (2013) analysed major state-wise profitability of sugarcane cultivation. Due to the increasing input prices, the total cost of sugarcane cultivation was observed higher than gross value of output in Maharashtra during 2000-02. Uttar Pradesh recorded unsatisfactory performance in the sugarcane cultivation as compared to Maharashtra, Karnataka and Tamil Nadu. The relative share of inputs like human labour, animal labour, seeds, fertilizers, irrigation and machine labour were found to be varied from state to state and from year to year depending upon the proportion of the ratooning. Animal and machine labour were not important items of cost of cultivation of sugarcane as their share in the total cost was in the range of 2-4 per cent in all the states. Hussain et al (2011) also identified that land rent, labour cost, seed, manure, irrigation, fertilizers and land preparation costs were the major determinants of cost of cultivation of sugarcane in Pakistan.

According to the size of sugarcane farms, even though the per hectare net returns from sugarcane cultivation was more by the small land holding sugarcane growers, the returns per rupee spent on sugarcane cultivation was more on large farms in Rahuri region of Ahmednagar district of Maharashtra. Therefore, the large land holding sugarcane growers enjoyed the benefits from low cost of production per tonne of sugarcane as compared to small and medium sugarcane growers (Patil et al., 1979). However, Kannan et al., (2013) argued that farm business income from sugarcane has declined, and that despite value of sugarcane output having risen more proportionately compared to cost of inputs it still had led to decline in income in Maharashtra. Furthermore, they identified two major influencing factors on crop income, *i.e.*, stagnation in crop yield and government intervention in market through price policy.

These studies on sugarcane sustainability and economic viability mentioned above are inadequate on a few counts. First of all, the assessment of costs and returns from sugarcane has been examined only in a limited way – in terms of production condition and labour absorption based on fragmented and aggregate level data analysis. Since Indian farming is mainly dominated by small and marginal farmers, not many studies have mainly emphasized on small and marginal farmers. Secondly, none of the analysts however, engaged themselves with the issue of sustainability of the crop in the face of growing costs and shrinking profits. Finally, there is no single study found on plot level data analysis from sustainability point of view in India, especially

in Maharashtra where sugarcane cultivation is dominant. As such, this study tries to assess economic viability of sugarcane cultivation in Maharashtra state.

**Objective**

- To study the relationship between farm size and economic viability of sugarcane cultivation and the variations in cost of cultivation structure in Maharashtra.

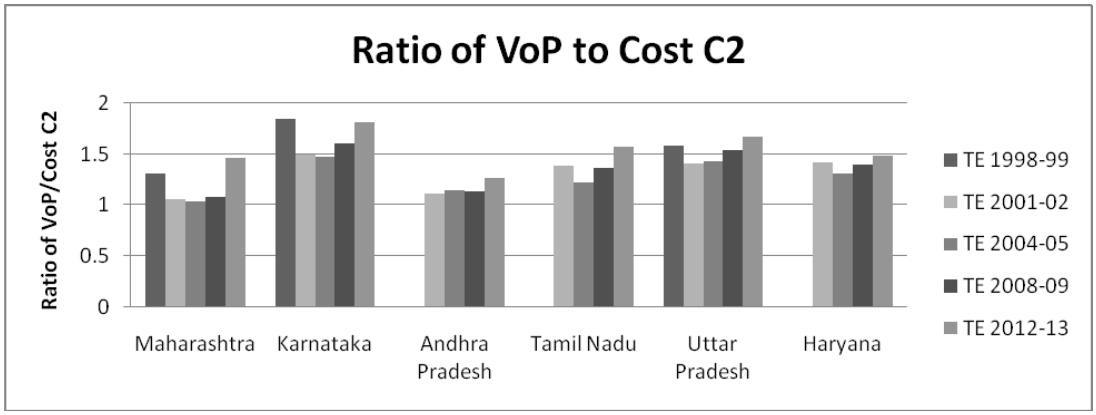
**Data and Methods**

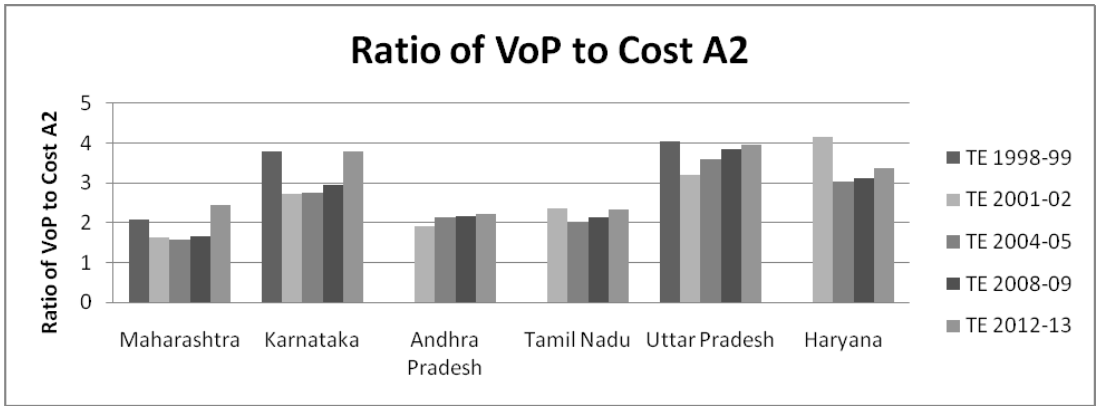
The estimation of farm level income is the most appropriate measure of farmers' well-being. This analysis is based on secondary data. For the estimation of profitability, plot level cost of cultivation survey data (2000-01 to 2012-13) was compiled from the Directorate of Economics and Statistics (DES), Ministry of Agriculture (GOI), for the period 2000-01 to 2012-13 for Maharashtra state and it's divided into two periods.

To calculate per hectare farm income, both output and input data was deflated by relevant price deflators. A weighted state level income series was constructed by using area share of sugarcane crop in total cropped area as weight. For the calculation of profitability in order to examine the economic viability of sugarcane cultivation, this analysis has examined the net income [value of output (main + by-product) – total cost (Cost C2)], farm business income [value of output (main + by- product) – paid out cost (Cost A2)] concepts which were given in Sen and Bhatia (2004) and family labour income [value of output (main + by- product) – Cost B2] which was given in Singh and Dhillon (2015). Cost concepts were used as per the guidelines of CACP.

**Economic Viability: Where does Maharashtra Stand?**

In order to examine the economic sustainability of sugarcane cultivation in Maharashtra it is important to look into the costs and returns to the sugarcane farmers. Agro-climatic and soil conditions, natural resources endowments, acceptance of modern technologies along with marketing opportunities play an important role in determining returns from sugarcane cultivation. The macro data on cost of cultivation reveals that the sugarcane cultivators in Maharashtra were able to make profits during Triennium Ending (TE) 1998-99, 2001-02, 2004-05, 2008-09 and 2012-13. Sugarcane growers got better profit from sugarcane cultivation after the introduction of Fair and Remunerative Price (FRP) in 2009. However, the sugarcane farmers had received almost negligible profit in relation to Cost C2 in TE 2001-02, 2004-05, 2008-09 in Maharashtra. This profit would not be sufficient to meet minimum requirements of a family. Despite the less profit, the sugarcane growers received profit as a family labour income. In relation to Cost A2, the profit has been recorded positive. The profit in relation to Cost A2 has increased from Rs. 30.74 thousand per hectare in TE 1998-99 to Rs. 77.44 thousand per hectare in TE 2012-13, whereas in relation of Cost C2, it has also increased from Rs. 13.94 thousand per hectare to Rs. 41.64 thousand per hectare during the same periods. Despite the higher value of product in Maharashtra, the profit from sugarcane recorded less due to higher A2 and C2 Costs. However, it showed that a positive profit had been obtained from sugarcane cultivation in Maharashtra state.



From the point of economic sustainability, Maharashtra's sugarcane cultivation is relatively less sustainable as compared to other states. It can be said that Maharashtra's sugarcane cultivation is economically less viable than other sugarcane growing states like Uttar Pradesh, Karnataka, Tamil Nadu, Andhra Pradesh and Haryana. The net income figures for Maharashtra state clearly show that the cultivation of sugarcane involves more risk in terms of net income.

**Sugarcane Sustainability: Small and Marginal Farmers Perspective**

**Farm Size and Productivity Relationship**

Despite the ongoing debate on farm size and its relation to productivity, the productivity of crops mainly depends on various factors such as weather condition, soil fertility, use of manure and fertilizers and high yielding varieties, irrigation and other associate factors. The state-wise differences in productivity among marginal, small, semi-medium, medium and large sugarcane growers in Maharashtra are presented in Table 1.

TABLE 1: FARM SIZE GROUPS AND RETURNS FROM SUGARCANE CULTIVATION IN MAHARASHTRA AT 2004-05 PRICES (IN PER HECTARE)

| Items | Period | Marginal | Small | Semi-medium | Medium | Large |
|---|---|---|---|---|---|---|
| Yield (Main Product) (Qtl) | 2000-01 to 2006-07 | 899.66 | 808.79 | 847.15 | 821.14 | 811.21 |
| | 2007-08 to 2012-13 | 912.52 | 929.49 | 917.78 | 871.51 | 904.09 |
| Gross Return (Rs) | 2000-01 to 2006-07 | 79652.86 | 71171.22 | 73327.57 | 71541.22 | 68117.85 |
| | 2007-08 to 2012-13 | 96664.41 | 96897.81 | 99124.97 | 91913.03 | 95560.2 |
| Operational Cost (Rs) | 2000-01 to 2006-07 | 52042.71 | 47243.27 | 45341.03 | 40983.47 | 40441.53 |
| | 2007-08 to 2012-13 | 50748.01 | 49507.39 | 49311.74 | 44930.2 | 45949.98 |
| Gross Margin (Rs) | 2000-01 to 2006-07 | 27610.15 | 23927.96 | 27986.54 | 30557.76 | 27676.33 |
| | 2007-08 to 2012-13 | 45916.4 | 47390.42 | 49813.23 | 46982.83 | 49610.22 |
| Net Return (Rs) | 2000-01 to 2006-07 | 11896.25 | 9650.75 | 13632.49 | 16687.19 | 14374.28 |
| | 2007-08 to 2012-13 | 39357.00 | 39208.67 | 41468.61 | 38715.32 | 41934.82 |
| Attached and Casual Labour Income (Rs) | 2000-01 to 2006-07 | 13740.8 | 13200.09 | 12804.02 | 12488.58 | 12865.44 |
| | 2007-08 to 2012-13 | 13427.77 | 14183.49 | 14142.25 | 14382.98 | 15572.07 |

**Source:** Computed from Cost of Cultivation Survey Data, Directorate of Economics and Statistics (DES), MoA, GoI. (2000-01 to 2012-13).

The productivity rates of all farm size groups were satisfactory and in case of marginal farmers, the average yield was much higher as compared to medium and large farmers. It was mainly because of the efficient input use due to easy management of marginal land size by the marginal farmers. While the large farms in Maharashtra have several limitations of infrastructure, lack of resources and poor management due to large farm size. The marginal and small farmers have significanly higher yields than medium and large sugarcane farmers in Maharashtra, marginal (91.2 tonnes / hect), small (92.9 tonnes / hect), semi- medium (91.7 tonnes / hect), medium (87.1 tonnes / hect), and large (90.4tonnes / hect) during 2007-13. There is no significant difference among marginal, small and semi-medium sugarcane farmers as far as the yield is concerned. It is found that yield level in the small farm size is higher than large farm size, but the high level yield of sugarcane aiso requires higher costs input which, resulte in a higher cost of cultivation.

**Cost of Living and Income from Sugarcane Cultivation**

The output of an agricultural sector may be measured in physical units and monetary term. The measurement of physical units is theoretically sound but it is not always feasible because agriculture includes many heterogeneous activities. A more frequent approach is to measure the agriculture output by monetary unit (Macheck and Spicka, 2014). Therefore, profitability measurement in monetary term is important along with physical units. Farmers often claim of a decline in profitability in sugarcane farming. But, the results presented in Table 1 show that the returns from sugarcane cultivation did not decline during the study period. However, incomes disparities exist across various farm size groups. Despite high yield among small and marginal farmers, the average gross margin per hectare was Rs 45.9 and Rs 47.3 thousand, with medium and large sugarcane farmers getting Rs. 46.9 and Rs. 49.6 thousand per hectare during 2000-07, respectively. With regard to net return, same result is discernible since small and marginal farmers are getting less average net return (Rs. 39.3 and Rs. 39.2 thousand per hectare respectively) as compared to the large sugarcane farmers who are getting average net return of around Rs. 42 thousand per hectare. This evidence clearly shows a positive relationship between farm size and returns from sugarcane cultivation. It can be said that with higher gross and net returns and less operational costs, the large sugarcane farmers are getting higher profit compared to small and marginal farmers in Maharashtra. Considering costs and benefits, one can conclude that growing sugarcane for small and marginal farmers are not economically viable compared to large farmers, but it is environmentally sustainable for small and

marginal farmers when yield trends are considered. To sum up, the per hectare net returns on sugarcane cultivation by large farmers was more as the returns per rupee spent was more. The large sugarcane farmers enjoyed the benefits of low cost of cultivation.

Economic viability of any farming system can be defined as "the farm which could provide an income required for the minimum maintenance of the family (Shrivastava, 1994; Dave, 1994)". Therefore, there is a need to compare income from sugarcane cultivation with the poverty line income. The gross value of output from sugarcane was in range around Rs. 76 thousand to Rs. 137 thousand per hectare, while the total value of inputs was in range around Rs. 38 thousand to Rs. 58 thousand per hectare. After deducting the gross value of inputs, per hectare per month income of marginal, small, semi-medium, medium and large farms from sugarcane cultivation came to Rs. 3.18, 3.82, 5.25, 4.96 and 6.58 thousand, respectively. Taking into account the size of farm family, per person per month income of marginal, small, semi-medium, medium and large farms from sugarcane cultivation came to Rs. 636, 765, 1050, 992 and 1317, respectively. This income was compared against the C. Rangarajan norm of poverty line for rural households which revealed that the marginal and small sugarcane farmers are under poverty. Some of the consumption items may not be taken into consideration while fixing poverty line. Moreover, some extra amount is required for future expenditure, if any unforeseen event occurs. Therefore, the extra 10 per cent of poverty line income was included. After including extra 10 per cent amount with estimated poverty line income, only the large sugarcane growers are getting income above poverty line. Obviously, the semi-medium, medium and large sugarcane growers could get income more than poverty line income, because they can grow sugarcane more than one hectare. The small and marginal farmers can be continuing below poverty line, if sugarcane growers keep their dependence only on sugarcane cultivation income. To keep farm family above poverty line, they have to find out an opportunity to earn more income from outside sugarcane cultivation. It is concluded that with present level of income and productivity, marginal and small sugarcane growers cannot meet their minimum needs from sugarcane cultivation income alone.

Table 2: Divergence Between Farm Income from Sugarcane Cultivation and Rural Poverty Line Income

| | Marginal | Small | Semi-medium | Medium | Large |
|---|---|---|---|---|---|
| **Average of 2011-12 and 2012-13** | | | | | |
| Gross Value of Output / Hect | 76245 | 86711 | 115482 | 111830 | 137534 |
| Gross Value of Inputs / Hect | 38076 | 40835 | 52460 | 52311 | 58502 |
| Farm Family Income/ Hect / Annum | 38169 | 45876 | 63022 | 59519 | 79032 |
| Farm Family Income / Hect / Month | 3181 | 3823 | 5252 | 4960 | 6586 |
| Per Person Farm Income / Hect / Month | 636 | 765 | 1050 | 992 | 1317 |
| **Poverty Line Income for Rural Population (C. Rangarajan)** | | | | | |
| Per Household / Month | 4860<br>(5346) | 4860<br>(5346) | 4860<br>(5346) | 4860<br>(5346) | 4860<br>(5346) |
| Per Person / Month | 972<br>(1069) | 972<br>(1069) | 972<br>(1069) | 972<br>(1069) | 972<br>(1069) |
| **Gap between Farm Income and Rural Poverty line Income (C. Rangarajan)** | | | | | |
| Farm Family Income / Hect / Month | **-1679** | **-1037** | 392 | 100 | 1726 |
| Per Person Farm Income / Hect / Month | **-336** | **-207** | 78 | 20 | 345 |
| **Gap between Farm Income and Rural Poverty line Income (C. Rangarajan + extra 10 % of poverty line Income)** | | | | | |
| Farm Family Income / Hect / Month | **-2165** | **-1523** | **-94** | **-386** | 1240 |
| Per Person Farm Income / Hect / Month | **-433** | **-305** | **-19** | **-77** | 248 |

Note: 1. The size of farm family assuming 5 persons.
2. The figures in parentheses show poverty line income for rural population (C. Rangarajan + extra 10 % of poverty line income).
3. For analysis, we have taken average of 2011-12 and 2012-13 because the poverty line estimated by C. Rangarajan is based on July 2012.

### Income Disparities between Sugarcane Cultivators and Labour

From point of equity, it is important to examine the status of a sugarcane farmer in relation to the income of labour who engaged in sugarcane cultivation. It is clear that income disparity between sugarcane cultivator and labour is rising. As discussed earlier, labour in sugarcane cultivation is becoming more costly. This is one of the prime reasons considered for rising distress among farmers in India (Chand et al, 2015). Between 2007-08 and 2012-13, a cultivator earned three times what a labourer earned sugarcane cultivation. It is found that the income of a sugarcane cultivator increased at a higher rate compared to the income earned by an agricultural labourer. An interesting fact is noted that small farmers get net average income from sugarcane of Rs. 39.3 thousand per hectare by spending Rs. 13 thousand on hired labour, and on the contrary, large farmers get an average income Rs. 41.9 thousand per hectare by spending Rs. 15 thousand on hired labour. There was a small hike in the income of a labourer. Sugarcane farmers continued to earn more than doubled income than a labourer in sugarcane cultivation from 2000-01 to 2012-13. Despite the slight increment in income of both farmers and labourers, the proportion of this increment is not moving in same direction (income increment of farmers is high).

### Risk Involved in Sugarcane Cultivation

TABLE 3: COEFFICENT OF VARIATION OF YIELD, COSTS AND RETURNS IN SUGARCANE CULTIVATION (2000-01 TO 2012-13)

(per cent)

| Size Group | Yield | Operational Cost | Gross Margin | Net Return |
|---|---|---|---|---|
| Marginal | 28.81 | 17.78 | 61.73 | 95.73 |
| Small | 27.06 | 14.97 | 55.32 | 104.98 |
| Semi-medium | 29.30 | 14.93 | 50.95 | 87.08 |
| Medium | 24.79 | 19.19 | 77.39 | 73.73 |
| Large | 29.20 | 16.68 | 57.12 | 84.07 |

**Source:** Same as in Table 1.

Agricultural sustainability depends on extent of risk involved in the production of any crop. Generally, the risk involved in any crop cultivation system is considered as a measure of instability in productivity and returns. Risk involved in sugarcane cultivation measured in terms of coefficient of variation in per cent. Although the marginal and small farmers have slightly lower risk in yield, it is much higher in relation to net return among marginal and small sugarcane farmers. The high risk involved in small and marginal farms may be due to low rainfall, high labour costs, hired irrigation and machine use. The high risk in sugarcane cultivation is one of the major causes of distress for small and marginal sugarcane farmers in Maharashtra where small and marginal farmers have dominance.

### Input Self Sufficiency and Labour Absorption

Input self sufficiency and labour absorption are two main indicators of sugarcane sustainability. As we know, Indian agriculture is dominated by small and marginal land holdings with some degree of mechanization. A significant amount of employment generation occurred due to cultivation of sugarcane. This employment generation is due to labour intensive feature of sugarcane cultivation. However, the rationality of labour use in agriculture is very important for increase in agricultural production and productivity and farm income (Basu and Nandi, 2014). Of the total cost of sugarcane cultivation, due to rising farm wages, human labour still accounts for a significant portion, though it can vary from state to state, crop to crop and farm size to size. Family labour is one of the important inputs influencing the cost structure of sugarcane cultivation. Every farm operation requires labour for its successful completion.

The per hectare quantity of major inputs required according to farm size group is presented in Table 4. To accomplish farm operation, the marginal, small, semi-medium, medium and large sugarcane farmers employed family labour 819, 623, 610, 464 and 395 hours per hectare during 2007-08 to 2012-13 respectively. As expected, the large farmers used less family labour compared to small and marginal farmers. In case of marginal and small sugarcane farmers most of the operations were done with family labour with very less mechanization. All farm size group farmers depends on attached and casual labour, but extent of hired labour dependency is more by medium and large farmers. The dependency on animal labour is high by small and marginal farmers compared to medium and large farmers. In terms of per hectare use of hired machine labours, it is higher is case of small and marginal farmers were high. It means the small and marginal farmers are more dependent on hired machine labour. One thing noticed is that the use of attached labour by medium and large farmers has declined, whereas it is increased for the small farmers. As stated, the marginal and small farmers have high yields with less mechanization. As such, it can be said that the sugarcane production structure is dominated by small and marginal farmers with less use of mechanization; the large farmers who used more mechanization did not have comparative advantage in sugarcane yield.

Table 4: Quantity of Major Inputs used per hectare according to Farm Size in Sugarcane Cultivation in Maharashtra

| Items | Marginal | | Small | | Semi-medium | | Medium | | Large | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000-07 | 2007-13 | 2000-07 | 2007-13 | 2000-07 | 2007-13 | 2000-07 | 2007-13 | 2000-07 | 2007-13 |
| Family Labour (Hrs.) | 880.5 | 819.2 | 700.8 | 623.4 | 565.3 | 610.9 | 436.8 | 464.4 | 383.1 | 395.3 |
| Attached Labour (Hrs.) | 35.3 | 26.2 | 64.0 | 86.1 | 155.4 | 92.6 | 182.0 | 167.0 | 244.8 | 232.8 |
| Casual Labour (Hrs.) | 1593.8 | 1163.6 | 1543.8 | 1190.8 | 1408.6 | 1158.2 | 1392.3 | 1089.3 | 1327.5 | 1153.8 |
| Hired Animal Labour (Hrs.) | 90.1 | 52.9 | 86.7 | 47.9 | 74.2 | 43.4 | 50.8 | 35.2 | 49.0 | 37.0 |
| Owned Animal Labour (Hrs.) | 15.0 | 12.1 | 29.5 | 19.9 | 26.6 | 26.0 | 32.8 | 26.2 | 33.9 | 26.9 |
| Hired Machine (Hrs.) | 35.4 | 28.4 | 32.9 | 25.3 | 30.2 | 26.5 | 22.8 | 24.9 | 27.2 | 25.0 |
| Own Machine (Hrs.) | 0.3 | 1.3 | 0.2 | 1.9 | 0.5 | 3.7 | 5.1 | 5.1 | 4.5 | 6.2 |
| Seed (Qtl) | 33.9 | 23.3 | 31.0 | 25.2 | 34.1 | 29.2 | 32.9 | 24.1 | 36.0 | 27.0 |
| Total Fertilizers (Kg.) | 604.7 | 675.7 | 529.2 | 630.4 | 528.4 | 623.1 | 459.9 | 591.2 | 490.1 | 595.7 |
| Manure (Qtl.) | 34.8 | 21.6 | 26.5 | 38.1 | 21.3 | 20.4 | 25.3 | 14.8 | 17.9 | 19.9 |
| Canal and Other Irrigation Charges (Rs.) | 3226.7 | 1982.7 | 2016.7 | 1197.6 | 1341.9 | 1759.0 | 1658.7 | 1357.3 | 1456.8 | 791.4 |

**Source:** Same as in Table 1.

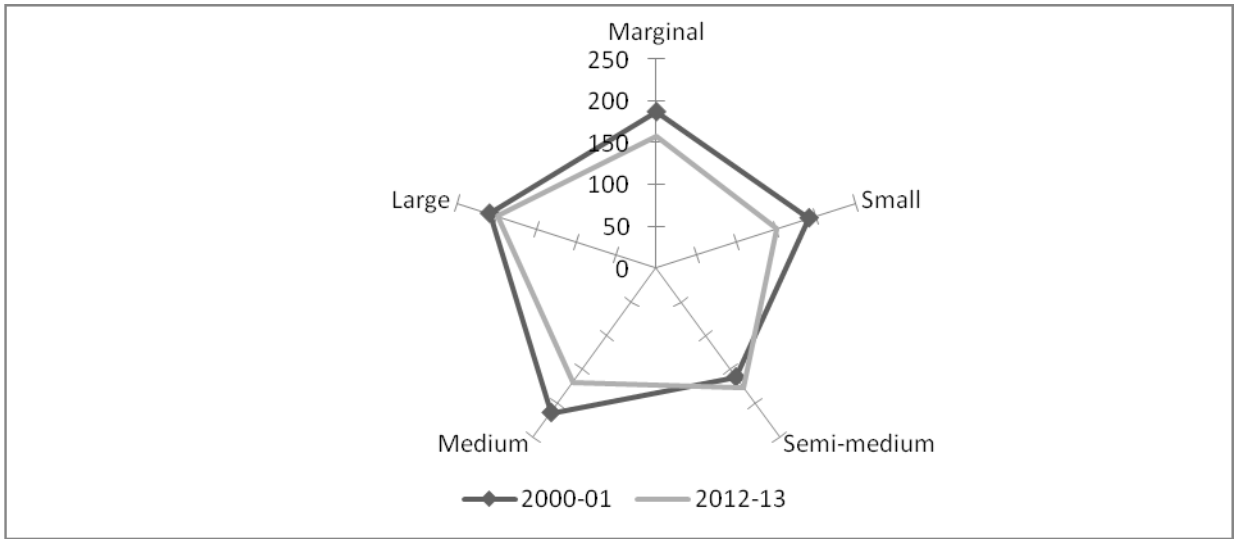
## Cost of Soil Degradation

As observed, the rate of fertilizers use is higher than recommended doses in Maharashtra. There is no doubt that the use of fertilizers is associated with high productivity, but the excess use of fertilizers may lead to soil degradation. Therefore, the cost of fertilizers is considered as cost of soil degradation in context of Maharashtra state. Application of manures and fertilizers is essential to realize maximum yield. The per hectare fertilizer use was high among small and marginal farmer. Similarly, the manure use was also high. This led to large quantity of water requirement for sugarcane cultivation. The higher cost of marginal and small sugarcane farmers was mainly due to higher family, machine and animal labour, fertilizers costs and irrigation. Small and marginal sugarcane farmers also more dependent in terms of hired irrigation in Maharashtra. The large sugarcane growers were found less dependent on hired irrigation. Irrigation cost was also much higher among small and marginal farmers. Whereas the manure applications by the marginal and small farmers were around 21 and 38 quintals per hectare, for large farmers, it is 19 quintals and for medium farmer around 14 quintals per hectare. This indicates that small and marginal sugarcane growers were still dependant on conventional inputs to a large extent to reduce dependency on purchased inputs, but this resulted in less returns, despite high yield level.

The fertilizers response ratio indicates how sugarcane respond to the fertilizers applied per hectare,. During period 2000-01 to 2012-13, the fertilizer response ratios have been declined for all size groups, except for semi-medium farmers (see chart 1). Decline in fertilizer ratio may occur due to use of manure and it could be good sign for long term sustainability of sugarcane. Use of excess doses of

Chart 1: Fertilizers Response Ratio in Maharashtra

(kg sugarcane / kg applied nutrient fertilizers per hectare)




**Source:** Author's construction, by using CACP data.

fertilizers along with water by semi- medium farmers could be one of the main reasons for comparatively better yield. However, it will not be sustainable for long time without use of manure and other micronutrients.

**Summary and Policy Implications**

The highlights from the above discussion show that despite receiving less income from sugarcane cultivation, the area under sugarcane has increased over the years in Maharashtra. The plot level data analysis indicates income disparity between farm size groups and a positive relationship between farm size and net returns in Maharashtra. Although the marginal and small farmers have slightly lower risk in yield, it was much higher in relation to net returns. The dependency on inputs was higher among marginal and small farmers. With present level of income and productivity, the marginal and small sugarcane growers could not meet minimum needs of their families from sugarcane cultivation income alone. In short, sugarcane cultivation by the marginal and small farmers is extremely unviable compared to medium and large sugarcane farmers.

Sugarcane cultivation is facing a major concern which is hike in operational cost due to longer duration of sugarcane crop that need to be technically solved. In order to reduce the operational cost of sugarcane cultivation, the small farmers need to be adopted mechanization and proper record and management of sugarcane harvesting within particular time period is necessary. This may be beneficial to both farmers and sugar mills through higher recovery and cutting of cultivation cost. Moreover, the better selection of sugarcane variety also has influence on the cost of cultivation. Therefore, there is a need for adoption of better varieties of sugarcane.

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# AGRO-ECONOMIC RESEARCH

## Pilot Project to Ascertain the Use of Diesel for Irrigation*

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The current study estimates the diesel usage by farmers for the purpose of irrigation using unit-level data from the Commission for Agricultural Costs and Prices (CACP) for the years 2003 to 2010.

The study also estimates the increase in production costs due to the removal of diesel subsidy. It then estimates the increase in production costs due to the removal of the fertiliser subsidy.

The analysis is performed for seven principal crops across 19 major states of India. Some of the analysis is described only for paddy, wheat, and sugarcane, which are the major crops irrigated using groundwater extracted from diesel pumps.

### Background on Irrigation in India

The net sown area has remained constant for over the last 40 years in India (approximately 140 million hectares). Spread of irrigation has been largely responsible for increasing the total cropped area from 166 million hectares in 1970–71 to 195 million hectares in 2011–12.

This increase has had a tremendous impact on productivity as well. As area irrigated for food grains increased from 18 per cent in 1950–51 to 48 per cent in 2011–12, productivity has increased from 0.88 t/ha to 2.13 t/ha. This implies that India has increased foodgrain production by 2.5 times in the last 40 years without increasing the area under cultivation. This has also paved the way for more diversification into other crops like oilseeds, fibres, sugarcane, and horticulture.

However, the spread of irrigation and resultant productivity has not applied to all crops or states. The irrigated area for pulses has remained more or less stagnant, which indicates a slow rise in productivity. For cotton, increase in irrigated area did not immediately result in increase in productivity, until the arrival of new-technology based seeds.

Along with an increase in irrigated area, India has also seen a shift in irrigation sources since the last 40 years or so. Groundwater, which contributed only to 38 per cent of total irrigation in 1970–71, contributed to 61 per cent in 2008–09. Tubewells alone were contributing to 41 per cent of total irrigated area in 2008–09.

Many commentators see this development as positive, but it has also raised some serious environmental concerns recently. The spread of irrigation has been quite unequal among regions. While some states have over-exploited their groundwater availability (where drafting has exceeded availability from replenishment and rain), some states have not used even a small portion of the abundant groundwater available.

A key reason for the difference is the differential availability of electricity or diesel power to extract groundwater. The availability and cost of these energy sources have to some extent defined the contours of groundwater usage by many states

In terms of electricity, there was a surge in the green revolution period, when states provided abundant subsidies, and the share of electricity used by agriculture had peaked at 32 per cent in 1997–98. As governments reduced subsidies gradually, the share of electricity used by agriculture has reduced too.

Diesel, which is another source for extraction of groundwater, is used largely in the plains of eastern India. There has been very little understanding of the usage of diesel by farmers in India, and this study contributes to that by using the unit-level cost-of-cultivation data provided by the CACP.

### Findings related to Sample and Diesel usage in the Sample

The average farm size in the sample is 3.1 acres, comparable with 2.83 acres based on the agricultural census. But there are variations between land sizes in the agricultural census data and in the sample in various states; so, the findings are largely restricted to the sample and do not necessarily apply to the Indian farm population as a whole.

The net irrigated area in 2010 was 50 per cent, which is comparable with the figures from production data. In 2010, all the area in Punjab was irrigated, but only 90 per cent in Haryana and 80 per cent in Gujarat and Tamil Nadu.

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At the all-India level, there seems to be one diesel pump in every five farms. This figure ranges from 20.51 pumps per 100 farms in 2003 to 21.36 pumps per 100 farms in 2010.The figures are quite high (more than or near 1 in 2 farms) for Uttar Pradesh, Madhya Pradesh, and Tamil Nadu, but very low (almost 1 diesel pump per 50 farms) in Andhra Pradesh, Jharkhand, Maharashtra, and Odisha. In the study period, most states had seen a rise in the number of diesel pumps; only Bihar and Haryana saw a decline.

The diesel pump density (number of pumps in every 1,000 ha) shows that, in 2010, there was a diesel pump in, roughly, every 13 hectares of cultivated area in the country (or 78 in every 1,000 hectares). There was more than 1 pump in every 10 hectares in Uttar Pradesh (about1 in 4 ha), West Bengal (about 1 in every 5 ha), Tamil Nadu (about 1 in 6 ha), Madhya Pradesh, and Bihar (about 1 in 8 ha). There was less than 1 diesel pump in every 100 hectares in Chhattisgarh (about 1 in 200 hectares), Odisha and Jharkhand (about 1 in 160 hectares), Maharashtra (about 1 in 125 hectares), and Andhra Pradesh (about 1 in 111 hectares).

With regard to diesel pump capacity, the percentage of diesel pumps with a capacity greater than 10 horse power (HP) increased from 2.3 per cent in 2003 to 5.3 per cent in 2010 and those in the range of 5–10 HP declined from 68.1 per cent in 2003 to 61.1 per cent in 2010.

Of the irrigated area of all crops in the sample, 30 per cent was irrigated by diesel pumps. In 2010, this dependency was very high for the eastern states of Jharkhand (98 per cent), Assam (92 per cent), Bihar (89 per cent), and West Bengal (71 per cent), but very low for Uttarakhand (0.7 per cent), Maharashtra (1.8 per cent), Chhattisgarh (2.3 per cent), Kerala (2.7 per cent), and Haryana (3.6 per cent). Between 2003 and 2010, there was a significant decline in the dependency of irrigation on diesel in states like Bihar (5 per cent), Odisha (10 per cent), Punjab (18 per cent), Madhya Pradesh (12 per cent), and Rajasthan (11 per cent).

For the irrigation of paddy, the area irrigated by diesel at the all-India level in 2010 was less than for all crops (19 per cent). In 2010, there was high dependency of paddy irrigation on diesel in Assam (93.4 per cent), Bihar (80.4 per cent), West Bengal (64.7 per cent), and Uttar Pradesh (51.7 per cent). For wheat irrigation, 34.6 per cent of area was irrigated across the country in 2010 by using diesel pumps. Dependency on diesel for wheat irrigation was high, particular, by in Bihar (89.8 per cent), Madhya Pradesh (54.6 per cent), and Uttar Pradesh (57.5 per cent in 2010). With regards to sugarcane, 52.1 per cent of the area was irrigated in 2010 by using diesel pumps; the figures for Tamil Nadu and Uttar Pradesh were 47.8 per cent and 56.3 per cent, respectively.

In terms of intensity of diesel pump usage, the average number of hours of diesel pump usage per hectare for all crops at the all-India level was 115 hours in 2003, which went up to 121 hours in 2010. In 2010, this was highest in Tamil Nadu (379.5 hours), followed by Karnataka (265 hours), Maharashtra (146 hours), and Gujarat (117.5 hours). This is an indicator of the deeper water levels in South and West India, where more hours of diesel pump operation might be required to extract groundwater.

From the capacity and hours of utilisation, we estimate the amount of diesel needed to operate these pumps. This indirect method is used in our study to estimate the amount of diesel used per hectare by different farmers across states and to cultivate different crops.

On average, 89 litres of diesel was used per hectare at the all-India level in 2003, which increased slightly in 2010 to 92 litres. The biggest users of diesel in 2010 were Rajasthan (241 litres), followed by Karnataka (220 litres), and Tamil Nadu (213 litres).

At the all-India level, the average diesel consumption per hectare for paddy, wheat, and sugarcane was, respectively, 118 litres, 68 litres, and 245 litres. On average, diesel consumption was 279 litres per hectare for paddy cultivation in Tamil Nadu and 116 litres per hectare for wheat cultivation in Rajasthan. The diesel consumption per hectare was highest for sugarcane cultivation in Tamil Nadu at 403 litres.

Average expenditure on irrigation by diesel increased from Rs. 1,941 per hectare in 2003 to Rs. 3,454 per hectare in 2010, largely because of the increase in the price of diesel, as consumption had not changed much.

**Findings related to Diesel Subsidy and Implications of the Removal of the Diesel Subsidy**

In 2010–11, the diesel subsidy was Rs. 34,706 crores, which was about 0.42 per cent of India's GDP and 1.76 per cent of total government expenditure. The subsidy on diesel varied from Rs. 1.4 per litre in 2009–10 to Rs. 8.46 per litre in 2008–09. As a percentage of diesel prices, the subsidy per litre was 15 per cent on average from 2005–06 to 2010-11; in 2008-09, it was as high as 27.41 per cent.

The consumption of diesel for agriculture was only a small share of the total diesel consumption—less than 10 per cent in 2010–11. If the subsidy in diesel is distributed according to the proportion to diesel consumption for irrigation, then the diesel subsidy for irrigation would be as low as Rs. 1,006 crores in 2010–11. In the same year, the subsidy for kerosene was Rs. 19,484 crores.

Diesel cost as a share of the total cost of paddy cultivation was 4.38 per cent in Assam and 20.8 per cent in Tamil Nadu. The same for wheat cultivation was 5.22 per cent in Punjab and 13.8 per cent in Rajasthan. For cotton, the figure was 5.22 per cent in Punjab and

6.62 per cent in Gujarat. In the case of sugarcane, it was 4.92 per cent in Uttar Pradesh and 13.46 per cent in Tamil Nadu. For groundnuts, it was as high as 16.2 per cent and 18.4 per cent in Gujarat and Tamil Nadu. For gram cultivation, the share was 5.22 per cent for Uttar Pradesh and 11.3 per cent for Rajasthan.

Removal of the subsidy would increase the production cost per hectare for paddy by approximately Rs. 174 in Assam and Rs. 1,616 in Tamil Nadu. For wheat, the production cost would increase by Rs. 237 in Bihar and Rs. 670 in Rajasthan. For cotton, the change would be Rs. 475 in Punjab and Rs. 556 in Gujarat. For sugarcane, the change would be a low Rs. 503 in Uttar Pradesh but a very high Rs. 2,334 in Tamil Nadu. In the case of groundnuts, the same would be Rs. 842 for Gujarat and Rs. 1,082 for Tamil Nadu. For mustard, it would be Rs. 166 for Bihar and Rs. 326 for Rajasthan. Finally, for gram, it would vary from Rs. 182 in Madhya Pradesh to Rs. 253 in Uttar Pradesh.

We compare this impact with the impact of removing the fertiliser subsidy and reach the following conclusions. Removal of fertiliser subsidy will have a higher impact than removing the diesel subsidy on the production cost of wheat, cotton, sugarcane, and mustard, but the converse is true for groundnut and gram, as diesel cost is more important than fertiliser cost. The results are mixed for paddy cultivation. Removal of fertiliser subsidy will have a higher impact on cost of production than removal of diesel subsidy for the states of Andhra Pradesh, Punjab, and Uttar Pradesh while it is the reverse for the states of Assam, Tamil Nadu, and West Bengal.

The fertiliser subsidy is largely targeted at agriculture only, and it is almost double that of the total diesel subsidy. But, because fertiliser is used more evenly by farmers belonging to different states and different land class sizes, the impact of removing the subsidy would be felt by farmers across the country. This may not be the case with the removal of the diesel subsidy.

The removal of diesel subsidy might enhance the usage of efficient sources of energy if these are made available. If solar power is made available and the diesel subsidy is reduced, it could have a positive impact; On the other hand, if an inefficient sources like kerosene were subsidised heavily and diesel subsidies were removed, the outcomes might not have been great.

There have been various issues in some states in making solar power available to farmers. Farmers often say that diesel pumps, unlike solar panels, can be locked, and therefore cannot be stolen. Farmers do not have basic knowhow or enough information on solar power subsidies. These have to be improved along with the reduction of the diesel subsidy to obtain better outcomes.

- Until these sources are made available, a more directed subsidy for diesel could be provided only to farmers. We hope the estimates from this report will provide a rough indicator for the calculation of such subsidies to farmers. This subsidy could be given in the form of a conditional cash transfer or any other efficient method.
- Subsidy on electricity could be used for multiple purposes, like expansion of non-farm enterprises as well. So, these concerns also need to be considered while looking at whether to expand diesel usage by subsidy or expand electricity connection. Electric motors have also been found to be more efficient than diesel motors.

# COMMODITY REVIEWS

## Foodgrains

During the month of April, 2017 the Wholesale Price Index (Base 2004-05=100) of pulses increased by 1.17%, cereals decreased by 0.48% & foodgrains decreased by 0.14% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

*(Base: 2004-2005=100)*

| Commodity | Weight (%) | WPI for the month of September, 2016 | WPI for the month of August, 2016 | WPI A year ago | Percentage Change during | |
|---|---|---|---|---|---|---|
| | | | | | A month | A year |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Rice | 1.793 | 147.6 | 147.7 | 136.3 | -0.07 | 8.29 |
| Wheat | 1.116 | 141.0 | 142.9 | 132.9 | -1.33 | 6.09 |
| Jowar | 0.096 | 131.6 | 132.1 | 115.5 | -0.38 | 13.94 |
| Bajra | 0.115 | 153.8 | 152.6 | 155.8 | 0.79 | -1.28 |
| Maize | 0.217 | 135.5 | 135.2 | 135.2 | 0.22 | 0.22 |
| Barley | 0.017 | 144.5 | 156.9 | 143.4 | -7.90 | 0.77 |
| Ragi | 0.019 | 252.8 | 258.0 | 174.1 | -2.02 | 45.20 |
| Cereals | 3.373 | 144.5 | 145.2 | 135.2 | -0.48 | 6.88 |
| Pulses | 0.717 | 155.8 | 154.0 | 180.4 | 1.17 | -13.64 |
| Foodgrains | 4.09 | 146.6 | 146.8 | 143.5 | -0.14 | 2.16 |

**Source:** Office of the Economic Adviser, M/O Commerce and Industry.

### Procurement of Rice

2.02 million tonnes of rice (including paddy converted into rice) was procured during April 2017 as against 1.73 million tonnes of rice (including paddy converted into rice)procured during April 2016.The total procurement of Rice in the current marketing season *i.e.* 2016-2017, up to 28.04.2017 stood at 34.57 million tonnes, as against 32.26 million tonnes of rice procured, during the corresponding period of last year. The details are set out in the following table:

PROCUREMENT OF RICE

*(In Thousand Tonnes)*

| State | Marketing Season 2016-17 (upto 28.04.2017) | | Corresponding Period of last Year 2015-16 | | Marketing Year (October-September) 2015-16 | | 2014-15 | |
|---|---|---|---|---|---|---|---|---|
| | Procurement | Percentage to Total | Procurement | Percentage to Total | Procurement | Percentage to Total | Procurement | Percentage to Total |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Andhra Pradesh | 3017 | 8.73 | 3549 | 11.00 | 4326 | 12.65 | 3591 | 11.17 |
| Chhatisgarh | 4662 | 13.48 | 3972 | 12.31 | 3442 | 10.06 | 3423 | 10.64 |
| Haryana | 3570 | 10.33 | 2861 | 8.87 | 2861 | 8.36 | 2015 | 6.27 |
| Maharashtra | 246 | 0.71 | 160 | 0.50 | 230 | 0.67 | 199 | 0.62 |
| Punjab | 11047 | 31.95 | 9350 | 28.99 | 9350 | 27.33 | 7786 | 24.21 |
| Tamil Nadu | 141 | 0.41 | 983 | 3.05 | 1191 | 3.48 | 1049 | 3.26 |
| Uttar Pradesh | 2354 | 6.81 | 2910 | 9.02 | 2910 | 8.50 | 1698 | 5.28 |
| Uttarakhand | 706 | 2.04 | 597 | 1.85 | 598 | 1.75 | 465 | 1.45 |
| Others | 8830 | 25.54 | 7876 | 24.42 | 9301 | 27.19 | 11936 | 37.11 |
| Total | 34573 | 100.00 | 32258 | 100.00 | 34209 | 100.00 | 32162 | 100.00 |

**Source:** Department of Food & Public Distribution.

## Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2017-2018 up to April, 2017 is 23.01 million tonnes against a total of 19.78 million tonnes of wheat procured during last year. The details are set out in the following table.

PROCUREMENT OF WHEAT

*(In Thousand Tonnes)*

| State | Marketing Season 2017-18 (upto 28.04.2017) | | Corresponding Period of last Year 2016-17 | | Marketing Year (April-March) 2016-17 | | 2015-16 | |
|---|---|---|---|---|---|---|---|---|
| | Procurement | Percentage to Total | Procurement | Percentage to Total | Procurement | Percentage to Total | Procurement | Percentage to Total |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Haryana | 6783 | 29.48 | 6270 | 31.70 | 6722 | 29.32 | 6778 | 24.13 |
| Madhya Pradesh | 4688 | 20.37 | 3521 | 17.80 | 3990 | 17.40 | 7309 | 26.02 |
| Punjab | 10207 | 44.36 | 9326 | 47.15 | 10645 | 46.42 | 10344 | 36.83 |
| Rajasthan | 643 | 2.79 | 392 | 1.98 | 762 | 3.32 | 1300 | 4.63 |
| Uttar Pradesh | 680 | 2.95 | 264 | 1.33 | 802 | 3.50 | 2267 | 8.07 |
| Others | 11 | 0.05 | 7 | 0.04 | 9 | 0.04 | 90 | 0.32 |
| Total | 23012 | 100.00 | 19780 | 100.00 | 22930 | 100.00 | 28088 | 100.00 |

**Source:** Department of Food & Public Distribution.

## Commercial Crops

**Oil Seeds, Manufacture of Vegetable and Animal Oils and Fats :** The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 129.9 in april, 2017 showing an increase of 0.9% over the previous month and a decrease of 8.5% over the year. The WPI of copra (coconut) increased by 4.9, groundnut seed by 1.5%, soyabean by 1.5%, safflower (kardi seed) by 1.0% and gingelly seed by 0.7% over the previous month. wpi of rape & mustard seed decreased by 3.5%, sunflower by 2.4%, cotton seed by 1.3% and niger seed by 0.3% over the previous month.

The WPI of manufacture of vegetable and animal oils and fats as a group stood at 107.2 in April, 2017 showing a decrease of 1.1% over the previous month and an increase of 4.0% over the year. The WPI of groundnut oil increased by 0.3% and mustard & rapeseed oil by 0.4% over the previous month. The WPI of soybean oil decreased by 2.3%, cotton seed oil by 2.1%, sunflower oil by 1.3% and copra oil by 0.6% over the previous month.

**Fruits & Vegetable:** The WPI of fruits & vegetable as a group stood at 130.8 in April, 2017 showing an increase of 2.2% over the previous month and a decrease of 4.2% over the year.

**Potato:** The WPI of potato stood at 99.5 in April, 2017 showing an increase of 9.2% over the previous month and a decrease of 40.7% over the year.

**Onion**: The WPI of onion stood at 107.9 in April, 2017 showing a decrease of 2.4% and 12.6% over the previous month and year respectively.

**Condiments & Spices:** The WPI of condiments & spices (group) stood at 126.6 in april, 2017 showing a decrease of 1.3% and 9.6% over the previous month and year respectively. the WPI of chillies (dry) decreased by 4.3%, black pepper by 2.6% and turmeric by 1.3% over the previous month.

**Raw Cotton:** The WPI of raw cotton stood at 111.5 in April, 2017 showing a decrease of 2.4% over the previous month and an increase of 24% over the year.

**Raw Jute:** The WPI of raw jute stood at 168.9 in April, 2017 a decrease of 10.3% and 26.4% over the previous month and year respectively.

## Wholesale Price Index of Commercial Crops

*( Base: 2011-12=100)*

| Commodity | Latest | Month | Year | % Variation Over | |
|---|---|---|---|---|---|
| | April, 2017 | March, 2017 | April, 2016 | Month | Year |
| *OIL SEEDS* | 129.9 | 128.7 | 142.0 | 0.9 | -8.5 |
| Groundnut Seed | 139.8 | 137.7 | 139.1 | 1.5 | 0.5 |
| Rape & Mustard Seed | 130.6 | 135.3 | 144.2 | -3.5 | -9.4 |
| Cotton Seed | 154.5 | 156.5 | 157.2 | -1.3 | -1.7 |
| Copra (Coconut) | 134.6 | 128.3 | 103.9 | 4.9 | 29.5 |
| Gingelly Seed (Sesamum) | 116.4 | 115.6 | 119.2 | 0.7 | -2.3 |
| Niger Seed | 201.6 | 202.3 | 221.2 | -0.3 | -8.9 |
| Safflower (Kardi Seed) | 126.0 | 124.8 | 108.9 | 1.0 | 15.7 |
| Sunflower | 104.2 | 106.8 | 115.5 | -2.4 | -9.8 |
| Soyabean | 126.8 | 124.9 | 167.5 | 1.5 | -24.3 |
| *MANUFACTURE of VEG AND ANIMAL OILS & FATS* | 107.2 | 108.4 | 103.1 | -1.1 | 4.0 |
| Groundnut Oil | 119.0 | 118.7 | 118.7 | 0.3 | 0.3 |
| Cotton Seed Oil | 98.3 | 100.4 | 94.9 | -2.1 | 3.6 |
| Mustard & Rapeseed Oil | 118.1 | 117.6 | 120.4 | 0.4 | -1.9 |
| Soyabean Oil | 103.0 | 105.4 | 101.4 | -2.3 | 1.6 |
| Copra Oil | 142.6 | 143.4 | 123.1 | -0.6 | 15.8 |
| Sunflower Oil | 102.5 | 103.9 | 105.4 | -1.3 | -2.8 |
| *FRUITS & VEGETABLES* | 130.8 | 128.0 | 136.6 | 2.2 | -4.2 |
| Potato | 99.5 | 91.1 | 167.7 | 9.2 | -40.7 |
| Onion | 107.9 | 110.6 | 123.5 | -2.4 | -12.6 |
| *CONDIMENTS & SPICES* | 126.6 | 128.3 | 140.1 | -1.3 | -9.6 |
| Black Pepper | 171.2 | 175.7 | 193.8 | -2.6 | -11.7 |
| Chillies(Dry) | 108.6 | 113.5 | 147.1 | -4.3 | -26.2 |
| Turmeric | 110.1 | 111.5 | 124.5 | -1.3 | -11.6 |
| Raw Cotton | 111.5 | 114.3 | 89.9 | -2.4 | 24.0 |
| Raw Jute | 168.9 | 188.3 | 229.4 | -10.3 | -26.4 |

# STATISTICAL TABLES

## WAGES

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

*(In Rs.)*

| State | District | Centre | Month & Year | Daily Normal Working Hours | Field Labour | | Other Agri. Labour | | Herdsman | | Skilled Labour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Car-penter | Black Smith | Cobbler |
| | | | | | M | W | M | W | M | W | M | M | M |
| Andhra | Krishna | Ghantasala | Nov,16 | 8 | 300 | 200 | 500 | NA | 250 | NA | NA | NA | NA |
| Pradesh | Guntur | Tadikonda | Nov,16 | 8 | 290 | 231 | 350 | NA | 300 | NA | NA | NA | NA |
| Telangana | Ranga Reddy | Arutala | Feb, 16 | 8 | 800 | 217 | 300 | 190 | NA | NA | 400 | 300 | NA |
| Karnataka | Bangalore | Harisandra | Nov, 16 | 8 | 360 | 340 | 400 | 350 | 400 | 300 | 600 | 450 | NA |
| | Tumkur | Gidlahali | Nov, 16 | 8 | 250 | 200 | 250 | 200 | 250 | NA | 300 | 280 | NA |
| Maharashtra | Nagpur | Mauda | Sep, 14 | 8 | 100 | 80 | NA | NA | NA | NA | NA | NA | NA |
| | Ahmednagar | Akole | Sep, 14 | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Jharkhand | Ranchi | Gaitalsood | June, 16 | 8 | 179 | 179 | 179 | 179 | 179 | 179 | 227 | 227 | 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 | Harvest-ing | Other Agri Labour | Herds-man | Skilled Labour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| Assam | Barpeta | Laharapara | Sep, 16 | M | 8 | 300 | 250 | 250 | 250 | 250 | 200 | 350 | 300 | 250 |
| | | | | W | 8 | NA | 200 | 200 | 200 | 200 | NA | NA | NA | NA |
| Bihar | Muzaffar-pur | Bhalui Rasul | June,16 | M | 8 | 300 | 300 | 300 | 300 | 300 | 300 | 400 | 400 | NA |
| | | | | W | 8 | NA | 300 | NA | NA | 300 | NA | NA | NA | NA |
| | Shekhpura | Kutaut | June,16 | M | 8 | 250 | NA | 225 | 100 | NA | NA | 500 | NA | NA |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chhattisgarh | Dhamtari | Sihava | Jan, 17 | M | 8 | 150 | 140 | NA | NA | 150 | 175 | 250 | 150 | 200 |
| | | | | W | 8 | NA | NA | NA | NA | 110 | 120 | NA | 100 | NA |
| Gujarat* | Rajkot | Rajkot | Oct, 16 | M | 8 | 248 | 254 | 235 | 223 | 203 | 197 | 488 | 475 | 463 |
| | | | | W | 8 | NA | 200 | 229 | 216 | 197 | 178 | NA | NA | NA |
| | Dahod | Dahod | Oct, 16 | M | 8 | 279 | 279 | 164 | 164 | 150 | NA | 371 | 321 | 286 |
| | | | | W | 8 | NA | 243 | 164 | 164 | 150 | NA | NA | NA | NA |
| Haryana | Panipat | Ugarakheri | Nov, 16 | M | 8 | 400 | 400 | 400 | 400 | 400 | NA | NA | NA | NA |
| | | | | W | 8 | NA | 300 | 300 | 300 | 300 | NA | NA | NA | NA |
| Himachal | Mandi | Mandi | June,16 | M | 8 | NA | 182 | 182 | 182 | 182 | 182 | 300 | 300 | NA |
| Pradesh | | | | W | 8 | NA | 182 | 182 | 182 | 182 | 182 | NA | NA | NA |
| Kerala | Kozhikode | Koduvally | Aug,16 | M | 4-8 | 845 | 685 | NA | 685 | 915 | NA | 885 | NA | NA |
| | | | | W | 4-8 | NA | NA | 485 | 585 | 485 | NA | NA | NA | NA |
| | Palakkad | Elappally | July,16 | M | 4-8 | NA | 500 | NA | 500 | 466 | NA | 600 | NA | NA |
| | | | | W | 4-8 | NA | NA | 300 | 300 | 300 | NA | NA | NA | NA |
| Madhya Pradesh | Hoshan-gabad | Sangarkhera | Sep, 16 | M | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Satna | Kotar | Sep,16 | M | 8 | 200 | 200 | 200 | 200 | 200 | 200 | 300 | 300 | 300 |
| | | | | W | 8 | NA | 200 | 200 | 200 | 200 | 200 | NA | NA | NA |
| | Shyopurkala | Vijaypur | Sep,16 | M | 8 | NA | 300 | 300 | 300 | 300 | NA | 300 | 300 | NA |
| | | | | W | 8 | NA | 300 | 300 | 300 | NA | NA | NA | NA | NA |

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

*(In Rs.)*

| State | District | Centre | Month & Year | Type of Labour | Normal Daily working Hours | Ploughing | Sowing | Weeding | Harvest-ing | Other Agri Labour | Herds-man | Skilled Labour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| Odisha | Bhadrak | Chandbali | Jan, 17 | M | 8 | 350 | 250 | 250 | 350 | 300 | 300 | 350 | 350 | 300 |
| | | | | W | 8 | NA | 250 | 200 | 200 | 200 | 200 | NA | NA | NA |
| | Ganjam | Aska | Jan, 17 | M | 8 | NA | NA | NA | NA | 200 | 200 | NA | NA | NA |
| | | | | W | 8 | NA | NA | NA | NA | 100 | 100 | NA | NA | NA |
| Punjab | Ludhiyana | Pakhowal | Nov, 15 | M | 8 | 395 | NA | 395 | 395 | 380 | 100 | 400 | 400 | 200 |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Rajasthan | Barmer | Kuseep | Jan, 17 | M | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Jalore | Sarnau | Jan, 17 | M | 8 | NA | NA | 300 | 400 | NA | NA | 500 | 200 | NA |
| | | | | W | 8 | NA | NA | 300 | 300 | NA | NA | NA | 100 | NA |
| Tamil Nadu* | Thanjavur | Pulvarnatham | June, 16 | M | 8 | NA | 343 | NA | 355 | 344 | NA | NA | NA | NA |
| | | | | W | 8 | NA | NA | 110 | 133 | 128 | NA | NA | NA | NA |
| | Tirunelveli | Malayakulam | June, 16 | M | 8 | NA | 350 | 375 | 400 | 491 | NA | NA | NA | NA |
| | | | | W | 8 | NA | NA | 171 | 180 | 329 | NA | NA | NA | NA |
| Tripura | State Average | | July, 16 | M | 8 | 290 | 255 | 267 | 270 | 268 | 290 | 307 | 283 | 283 |
| | | | | W | 8 | NA | 203 | 198 | 199 | 203 | 220 | NA | NA | NA |
| Uttar Pradesh* | Meerut | Ganeshpur | Jan, 17 | M | 8 | 266 | 265 | 264 | 280 | 264 | NA | 398 | NA | NA |
| | | | | W | 8 | NA | 205 | 211 | 210 | 211 | NA | NA | NA | NA |
| | Aurraiya | Aurraiya | Jan,17 | M | 8 | 170 | 175 | 150 | 235 | 171 | NA | 350 | NA | .NA |
| | | | | W | 8 | NA | NA | 150 | 235 | 171 | NA | NA | NA | NA |
| | Chandauli | Chandauli | Jan,17 | M | 8 | 200 | 200 | 200 | NA | 200 | NA | 400 | NA | NA |
| | | | | W | 8 | NA | 200 | 200 | NA | 200 | NA | NA | NA | NA |

M-Man
W-Woman
NA- Not Available
* States reported district average daily wages.

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

| Commodity | Variety | Unit | State | Centre | Apr-17 | Mar-17 | Apr-16 |
|---|---|---|---|---|---|---|---|
| Wheat | PBW 343 | Quintal | Punjab | Amritsar | 1625 | 1800 | 1600 |
| Wheat | Dara | Quintal | Uttar Pradesh | Chandausi | 1625 | 1650 | 1525 |
| Wheat | Lokvan | Quintal | Madhya Pradesh | Bhopal | 1621 | 1610 | 1590 |
| Jowar | - | Quintal | Maharashtra | Mumbai | 2200 | 2200 | 2200 |
| Gram | No III | Quintal | Madhya Pradesh | Sehore | 5371 | NA | 5225 |
| Maize | Yellow | Quintal | Uttar Pradesh | Kanpur | 1350 | 1350 | 1510 |
| Gram Split | - | Quintal | Bihar | Patna | 7000 | 7800 | 5760 |
| Gram Split | - | Quintal | Maharashtra | Mumbai | 7600 | 6950 | 7200 |
| Arhar Split | - | Quintal | Bihar | Patna | 7500 | 7700 | 13050 |
| Arhar Split | - | Quintal | Maharashtra | Mumbai | 6200 | 6000 | 12200 |
| Arhar Split | - | Quintal | NCT of Delhi | Delhi | 6100 | 6300 | 12350 |
| Arhar Split | Sort II | Quintal | Tamil Nadu | Chennai | 6400 | 6500 | 12800 |
| Gur | - | Quintal | Maharashtra | Mumbai | 4000 | 4000 | 3500 |
| Gur | Sort II | Quintal | Tamil Nadu | Coimbatore | 4200 | 4200 | 3800 |
| Gur | Balti | Quintal | Uttar Pradesh | Hapur | 2850 | 2920 | 2910 |
| Mustard Seed | Black (S) | Quintal | Uttar Pradesh | Kanpur | 3400 | 3450 | 4000 |
| Mustard Seed | Black | Quintal | West Bengal | Raniganj | 4300 | 4450 | 4500 |
| Mustard Seed | - | Quintal | West Bengal | Kolkata | 4200 | 4000 | 4600 |
| Linseed | Bada Dana | Quintal | Uttar Pradesh | Kanpur | 5250 | 5000 | 4400 |
| Linseed | Small | Quintal | Uttar Pradesh | Varanasi | 4620 | 4600 | 4260 |
| Cotton Seed | Mixed | Quintal | Tamil Nadu | Virudhunagar | 2100 | 2100 | 2100 |
| Cotton Seed | MCU 5 | Quintal | Tamil Nadu | Coimbatore | 2750 | 2750 | 2500 |
| Castor Seed | - | Quintal | Telangana | Hyderabad | 4200 | 4200 | 3400 |
| Sesamum Seed | White | Quintal | Uttar Pradesh | Varanasi | 6500 | 6850 | 10710 |
| Copra | FAQ | Quintal | Kerala | Alleppey | 8750 | 8600 | 5900 |
| Groundnut | Pods | Quintal | Tamil Nadu | Coimbatore | 5000 | 5000 | 4500 |
| Groundnut | - | Quintal | Maharashtra | Mumbai | 6600 | 6500 | 6600 |
| Mustard Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1335 | 1330 | 1425 |
| Mustard Oil | Ordinary | 15 Kg. | West Bengal | Kolkata | 1430 | 1425 | 1500 |
| Groundnut Oil | - | 15 Kg. | Maharashtra | Mumbai | 1550 | 1540 | 1500 |
| Groundnut Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 1875 | 1875 | 1950 |
| Linseed Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1335 | 1300 | 1492 |
| Castor Oil | - | 15 Kg. | Telangana | Hyderabad | 1455 | 1455 | 1095 |
| Sesamum Oil | - | 15 Kg. | NCT of Delhi | Delhi | 1525 | 1520 | 1440 |
| Sesamum Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 2550 | 2325 | 1980 |
| Coconut Oil | - | 15 Kg. | Kerala | Cochin | 1905 | 1920 | 1290 |
| Mustard Cake | - | Quintal | Uttar Pradesh | Kanpur | 1775 | 1870 | 2200 |

2. Month End Wholesale Prices of Certain Agricultural Commodities and Animal Husbandry Products at Selected Centres in India—*Contd.*

| Commodity | Variety | Unit | State | Centre | Apr-17 | Mar-17 | Apr-16 |
|---|---|---|---|---|---|---|---|
| Groundnut Cake | - | Quintal | Telangana | Hyderabad | 2929 | 2714 | 3358 |
| Cotton/Kapas | NH 44 | Quintal | Andhra Pradesh | Nandyal | 5400 | 5750 | 4400 |
| Cotton/Kapas | LRA | Quintal | Tamil Nadu | Virudhunagar | 4300 | 4700 | 4300 |
| Jute Raw | TD 5 | Quintal | West Bengal | Kolkata | 3600 | 3735 | 5770 |
| Jute Raw | W 5 | Quintal | West Bengal | Kolkata | 3650 | 3785 | 5710 |
| Oranges | - | 100 No | NCT of Delhi | Delhi | 583 | 583 | 600 |
| Oranges | Big | 100 No | Tamil Nadu | Chennai | 500 | 450 | 580 |
| Banana | - | 100 No. | NCT of Delhi | Delhi | 350 | 400 | 333 |
| Banana | Medium | 100 No. | Tamil Nadu | Kodaikkanal | 605 | 596 | 499 |
| Cashewnuts | Raw | Quintal | Maharashtra | Mumbai | 80000 | 80000 | 75000 |
| Almonds | - | Quintal | Maharashtra | Mumbai | 70000 | 70000 | 68000 |
| Walnuts | - | Quintal | Maharashtra | Mumbai | 95000 | 95000 | 65000 |
| Kishmish | - | Quintal | Maharashtra | Mumbai | 11000 | 11000 | 13500 |
| Peas Green | - | Quintal | Maharashtra | Mumbai | 3400 | 3500 | 6300 |
| Tomato | Ripe | Quintal | Uttar Pradesh | Kanpur | 600 | 700 | 850 |
| Ladyfinger | - | Quintal | Tamil Nadu | Chennai | 2000 | 2000 | 2000 |
| Cauliflower | - | 100 No. | Tamil Nadu | Chennai | 2000 | 2000 | 1500 |
| Potato | Red | Quintal | Bihar | Patna | 800 | 1100 | 1000 |
| Potato | Desi | Quintal | West Bengal | Kolkata | 650 | 460 | 1600 |
| Potato | Sort I | Quintal | Tamil Nadu | Mettuppalayam | 2100 | 1450 | 2197 |
| Onion | Pole | Quintal | Maharashtra | Nashik | 400 | 600 | 600 |
| Turmeric | Nadan | Quintal | Kerala | Cochin | 15000 | 15000 | 15500 |
| Turmeric | Salam | Quintal | Tamil Nadu | Chennai | 8800 | 8800 | 9400 |
| Chillies | - | Quintal | Bihar | Patna | 11500 | 11500 | 10000 |
| Black Pepper | Nadan | Quintal | Kerala | Kozhikode | 48000 | 56000 | 67000 |
| Ginger | Dry | Quintal | Kerala | Cochin | 12000 | 12500 | 16500 |
| Cardamom | Major | Quintal | NCT of Delhi | Delhi | 127500 | 127000 | 130500 |
| Cardamom | Small | Quintal | West Bengal | Kolkata | 120000 | 130000 | 100000 |
| Milk | Buffalo | 100 Liters | West Bengal | Kolkata | 3800 | 3800 | 3600 |
| Ghee Deshi | Deshi No 1 | Quintal | NCT of Delhi | Delhi | 37019 | 37019 | 35685 |
| Ghee Deshi | - | Quintal | Maharashtra | Mumbai | 50000 | 47500 | 46000 |
| Ghee Deshi | Desi | Quintal | Uttar Pradesh | Kanpur | 37750 | 37500 | 36000 |
| Fish | Rohu | Quintal | NCT of Delhi | Delhi | 14500 | 15000 | 8500 |
| Fish | Pomphrets | Quintal | Tamil Nadu | Chennai | 34000 | 32500 | 35000 |
| Eggs | Madras | 1000 No. | West Bengal | Kolkata | 3330 | 3600 | 3500 |
| Tea | - | Quintal | Bihar | Patna | 21250 | 21250 | 21150 |
| Tea | Atti Kunna | Quintal | Tamil Nadu | Coimbatore | 36000 | 36000 | 33000 |
| Coffee | Plant-A | Quintal | Tamil Nadu | Coimbatore | 35000 | 32500 | 26500 |
| Coffee | Rubusta | Quintal | Tamil Nadu | Coimbatore | 29000 | 25000 | 13500 |
| Tobacco | Kampila | Quintal | Uttar Pradesh | Farukhabad | NA | NA | 4650 |
| Tobacco | Raisa | Quintal | Uttar Pradesh | Farukhabad | NA | NA | 3400 |
| Tobacco | Bidi Tobacco | Quintal | West Bengal | Kolkata | 13300 | 13200 | 11000 |
| Rubber | - | Quintal | Kerala | Kottayam | 12500 | 12800 | 13000 |
| Arecanut | Pheton | Quintal | Tamil Nadu | Chennai | 32700 | 32700 | 32400 |

## 3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year 2017

| Commodity | Variety | Country | Centre | Unit | JAN | FEB | MAR | APR |
|---|---|---|---|---|---|---|---|---|
| CARDAMOM | Guatmala Bold Green | U.K. | - | Dollar/MT | 9000.00 | 9000.00 | 17500.00 | 17500.00 |
| | | | | Rs./Qtl | 61335.00 | 60219.00 | 113382.50 | 112105.00 |
| CASHEW KERNELS | Spot U.K. 320s | U.K. | - | Dollar/MT | 10612.51 | 10691.56 | 11205.67 | 11662.24 |
| | | | | Rs./Qtl | 72324.26 | 71537.23 | 72601.54 | 74708.31 |
| CASTOR OIL | Any Origin ex tank | Netherlands | - | Dollar/MT | 1453.70 | 1498.40 | 1883.90 | 1859.00 |
| | Rotterdam | | | Rs./Qtl | 9906.97 | 10025.79 | 12205.79 | 11908.75 |
| CHILLIES | Birds eye 2005 crop | Africa | - | Dollar/MT | 4100.00 | 4100.00 | 7500.00 | 7500.00 |
| | | | | Rs./Qtl | 27941.50 | 27433.10 | 48592.50 | 48045.00 |
| CLOVES | Singapore | Madagascar | - | Dollar/MT | 7500.00 | 8400.00 | 8800.00 | 8800.00 |
| | | | | Rs./Qtl | 51112.50 | 56204.40 | 57015.20 | 56372.80 |
| COCONUT OIL | Crude Phillipine/Indonesia, cif Rotterdam | Netherlands | - | Dollar/MT | 1840.00 | 1590.00 | 1610.00 | 1600.00 |
| | | | | Rs./Qtl | 12539.60 | 10638.69 | 10431.19 | 10249.60 |
| COPRA | Phillipines cif | Phillipine | - | Dollar/MT | 905.00 | 838.00 | 800.00 | 831.50 |
| | Rotterdam | | | Rs./Qtl | 6167.58 | 5607.06 | 5183.20 | 5326.59 |
| CORRIANDER | | India | - | Dollar/MT | 1650.00 | 1650.00 | 1650.00 | 1650.00 |
| | | | | Rs./Qtl | 11244.75 | 11040.15 | 10690.35 | 10569.90 |
| CUMMIN SEED | | India | - | Dollar/MT | 2500.00 | 2500.00 | 2900.00 | 3500.00 |
| | | | | Rs./Qtl | 17037.50 | 16727.50 | 18789.10 | 22421.00 |
| MAIZE | | U.S.A. | Chicago | C/56 lbs | 366.25 | 371.00 | 358.50 | 359.00 |
| | | | | Rs./Qtl | 980.93 | 975.57 | 912.83 | 903.80 |
| OATS | | CANADA | Winnipeg | Dollar/MT | 336.74 | 332.74 | 311.98 | 304.24 |
| | | | | Rs./Qtl | 2294.88 | 2226.36 | 2021.32 | 1948.96 |
| PALM KERNAL OIL | Crude Malaysia/ Indonesia, cif Rotterdam | Netherlands | - | Dollar/MT | 1820.00 | 1330.00 | 1190.00 | 1080.00 |
| | | | | Rs./Qtl | 12403.30 | 8899.03 | 7710.01 | 6918.48 |
| PALM OIL | Crude Malaysian/Sumatra, cif Rotterdam | Netherlands | - | Dollar/MT | 822.50 | 760.00 | 705.00 | 710.00 |
| | | | | Rs./Qtl | 5605.34 | 5085.16 | 4567.70 | 4548.26 |
| PEPPER (Black) | Sarawak Black lable | Malaysia | - | Dollar/MT | 7900.00 | 7700.00 | 7700.00 | 7700.00 |
| | | | | Rs./Qtl | 53838.50 | 51520.70 | 49888.30 | 49326.20 |
| RAPESEED | Canola | CANADA | Winnipeg | Can Dollar/MT | 522.40 | 518.30 | 493.80 | 530.40 |
| | | | | Rs./Qtl | 2719.61 | 2634.52 | 2399.87 | 2493.41 |
| | UK delivered rapeseed, | U.K. | - | Pound/MT | 330.00 | 334.00 | 336.00 | 328.00 |
| | delivered Erith(buyer) | | | Rs./Qtl | 2832.72 | 2783.22 | 2716.56 | 2709.28 |
| RAPESEED OIL | Refined bleached and deodorised ex-tanks, broker price | U.K. | - | Pound/MT | 827.00 | 765.00 | 763.00 | 738.00 |
| | | | | Rs./Qtl | 7098.97 | 6374.75 | 6168.86 | 6095.88 |
| SOYABEAN MEAL | UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk | U.K. | - | Pound/MT | 325.00 | 329.00 | 310.00 | 310.00 |
| | | | | Rs./Qtl | 2789.80 | 2741.56 | 2506.35 | 2560.60 |
| | | U.S.A. | - | C/lbs | 34.87 | 32.72 | 32.21 | 31.91 |
| | | | | Rs./Qtl | 5237.56 | 4825.21 | 4599.50 | 4505.32 |
| SOYABEAN OIL | Refined bleached and deodorised ex-tanks, broker price | U.K. | - | Pound/MT | 807.00 | 709.00 | 750.00 | 682.00 |
| | | | | Rs./Qtl | 6927.29 | 5908.10 | 6063.75 | 5633.32 |

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year 2017—*Contd.*

| Commodity | Variety | Country | Centre | Unit | JAN | FEB | MAR | APR |
|---|---|---|---|---|---|---|---|---|
| SOYABEANS | | U.S.A. | - | C/60 lbs | 1055.25 | 1022.75 | 969.00 | 945.75 |
| | | | | Rs./Qtl | 2639.29 | 2511.46 | 2304.08 | 2223.46 |
| | US NO.2 yellow | Netherlands | Chicago | Dollar/MT | 425.60 | 425.60 | - | 386.20 |
| | | | | Rs./Qtl | 2900.46 | 2840.88 | - | 2474.00 |
| SUNFLOWER SEED OIL | Refined bleached and deodorised ex-tanks, broker price | U.K. | - | Pound/MT | 796.00 | 786.00 | 791.00 | 766.00 |
| | | | | Rs./Qtl | 6832.86 | 6549.74 | 6395.24 | 6327.16 |
| Wheat | | U.S.A. | Chicago | C/60 lbs | 424.50 | 441.25 | 425.50 | 407.75 |
| | | | | Rs./Qtl | 1061.72 | 1083.53 | 1011.75 | 958.62 |

**Source:** Public Ledger

## Foreign Exchange Rates

| Currency | JAN | FEB | MAR | APR |
|---|---|---|---|---|
| CanDollar | 52.06 | 50.83 | 48.60 | 47.01 |
| UKPound | 85.84 | 83.33 | 80.85 | 82.60 |
| USDollar | 68.15 | 66.91 | 64.79 | 64.06 |

# Crop Production

4. Sowing and Harvesting Operations Normally in Progress during July, 2017

| State | Sowing | Harvesting |
|---|---|---|
| (1) | (2) | (3) |
| Andhra Pradesh | Winter Rice, Jowar (K), Bajra, Maize (K), Ragi (K), Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Chillies (Dry), Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca. | Autumn rice. |
| Assam | Winter Rice, Castorseed. | Autumn Rice, Jute. |
| Bihar | Autumn Rice, Winter Rice, Jowar (K) Bajra, Maize,Ragi, Small Millets (K) Tur (K), Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta. | Jute. |
| Gujarat | Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Sannhemp. | — |
| Himachal Pradesh | Summer Rice, Jowar (K), Bajra, Ragi, Small Millets (K) Urad (K), Mung (K), Other Kharif Pulses, Chillies (Dry), Sesamum, Sennhemp, Sumer Potato (Plains). | Winter Potato (Hills). |
| Jammu & Kashmir | Autumn Rice, Jowar (K) Bajra, Small Millets (K), Urad (K), Mung (K), Winter Potato, Ginger, Tobacco, sesamum, Jute, Onion. | Tobacco, Sesamum, Onion. |
| Karnataka | Autumn Rice, Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Winter Potato (Plains), Summer Potato (Plains) Black Pepper, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed, Onion, Tapioca. | — |
| Kerala | Ragi, Sweet Potato, Tapicoa. | Sesamum, Tapioca. |
| Madhya Pradesh | Autumn Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Tur (K), Mung (K), Other Kharif Pulses, Summer Potato, Ginger, Chillies (Dry), Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sweet Potato, Turmeric, Sannhemp, Nigerseed. | — |
| Maharashtra | Winter Rice, Jowar (K), Bajra, Maize, Ragi Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Summer Potato (Plains), Chillies (Dry) Tobacco, Groundnut, Castorseed, Sesamum, Cotton, Jute, Mesta, Sannhemp, Nigerseed. | — |
| Manipur | Winter Rice, Tur (K), Sesamum (K), Sweet Potato, Maize. | — |
| Orissa | Winter Rice, Jowar (K), Bajra, Maize, Ragi, Small Millets (K), Summer Potato (Plains), Chillies (Dry), Groundnut, Castorseed, Cotton, Mesta | Chillies (Dry.) |

4. Sowing and Harvesting Operations Normally in Progress during July, 2017—*Contd.*

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

(K)—Kharif. (R)— Rabi



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