ISSN 0002-1679
Regn.No.:840

P. Agri. 21-12-2017
450

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AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110054-2016

# AGRICULTURAL SITUATION IN INDIA

## DECEMBER, 2017

**Publication Division**
Directorate of Economics
and Statistics
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Cooperation & Farmers Welfare
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# *Agricultural Situation in India*

VOL. LXXVI **December, 2017** No. 9

Contents

The Journal brought out by the Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, 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 Shukoh 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.

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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.

STATISTICAL TABLES



**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.

Minus (–) indicates deficit or decrease.

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 Situation 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

**Cabinet's approval for the Centrally Sponsored Scheme (State Plans), namely, Rashtriya Krishi Vikas Yojana (RKVY) as Rashtriya Krishi Vikas Yojana-Remunerative Approaches for Agriculture and Allied sector Rejuvenation (RKVY-RAFTAAR) for three years i.e., from 2017-18 to 2019-20**

The Cabinet Committee on Economic Affairs, chaired by the Prime Minister Shri Narendra Modi, on 1st November, 2017, approved the continuation of Rashtriya Krishi Vikas Yojana (RKVY) as Rashtriya Krishi Vikas Yojana-Remunerative Approaches for Agriculture and Allied sector Rejuvenation (RKVY-RAFTAAR) for three years i.e., from 2017-18 to 2019-20. The financial allocation of the scheme would be Rs. 15,722 crore with the objective of making farming a remunerative economic activity through strengthening the farmer's effort, risk mitigation and promoting agri-business entrepreneurship.

RKVY-RAFTAAR funds would be provided to the States as 60:40 grants between Centre and States (90:10 for North Eastern States and Himalayan States) through the following streams:

(a) Regular RKVY-RAFTAAR (Infrastructure & Assets and Production Growth) with 70% of annual outlay to be allocated to states as grants based for the following activities:

   i. Infrastructure and assets with 50% of regular RKVY-RAFTAAR outlay.

   ii. Value addition linked production projects with 30% of regular RKVY-RAFTAAR outlay.

   iii. Flexi-funds with 20% of regular RKVY-RAFTAAR outlay. States can use this for supporting any projects as per the local needs.

(b) RKVY-RAFTAAR special sub-schemes of National priorities - 20% of annual outlay; and

(C) Innovation and agri-entrepreneur development through creating end-to-end solution, skill development and financial support for setting up the agri-enterprise -10% of annual outlay including 2% of administrative costs.

The scheme would incentivize States in enhancing more allocation to Agriculture and Allied Sectors. This would also strengthen farmer's efforts through creation of agriculture infrastructure that help in supply of quality inputs, market facilities etc. This would further promote agri-entrepreneurship and support business models that maximize returns to farmers.

**Various schemes and programs initiated by the Government to achieve the target of Doubling of Farmers' Income: Shri Radha Mohan Singh**

Union Agriculture and farmers Welfare Minister, Shri Radha Mohan Singh, on 2nd November, 2017, said that the Prime Minister had set a target to double the farmers' income by 2022. The Ministry is working towards achieving the goal. And to achieve this target, the Prime Minister has advocated a seven-point strategy:

i. Special focus on irrigation with sufficient budget, with the aim of "Per Drop More Crop".

ii. Provision of quality seeds and nutrients based on soil health of each field.

iii. Large investments in Warehousing and Cold Chains to prevent post-harvest crop losses.

iv. Promotion of value addition through food processing.

v. Creation of a National Farm Market, removing distortions and e-platform across 585 Stations.

vi. Introduction of a New Crop Insurance Scheme to mitigate risks at an affordable cost.

vii. Promotion of ancillary activities like poultry, beekeeping, and fisheries.

Shri Radha Mohan Singh stated the above mentioned seven-point strategy while chairing the Inter-Session meeting of the Consultative Committee meeting of the Ministry of Agriculture & Farmers Welfare he also specified that the Government had launched a number of schemes and programs to Double Farmers' Income. Pradhan Mantri Krishi Sinchai Yojana, Pradhan Mantri Fasal Bima Yojana, Paramparagat Krishi Vikas Yojana, Soil Health Card, Neem-Coated Urea and e-NAM Schemes are few of our flagship programs that aim to improve the productivity and earnings of our farmers.

*Source:* www.pib.nic.in

Shri Singh stated that the Department of Agriculture, Cooperation, and Farmers Welfare has also constituted a Committee under the Chairmanship of CEO, NRAA with members from all related departments and NITI Aayog to examine issues relating to doubling of farmers' income by the year 2022. As of now, six meetings of the Committee have been held.

The Agriculture Minister said that the RKVY guidelines are being changed to include entrepreneur development. DAC&FW has prepared a roadmap for production of pulses to the tune of 24 million tonnes by 2017-18. A dedicated micro-irrigation fund with an initial corpus of Rs.5000 crore has been set up by NABARD to achieve "Per Dop More Crop".

**Shri Radha Mohan Singh addressed a conference on Fruits & Vegetables, Dairy, Poultry & Fisheries - Leveraging the Diverse India Opportunity at World Food India 2017**

Union Agriculture and Farmers Welfare Minister Shri Radha Mohan Singh said that the unprecedented and multi-faceted development of Indian agriculture post-independence is unparalleled. Shri Singh said the world is eager to study and adapt our growth strategy. The Agriculture and Farmers Welfare Minister said it on 4th November, 2017, while addressing a conference on Fruits & Vegetables, Dairy, Poultry & Fisheries - Leveraging the Diverse India Opportunity at World Food India 2017 in New Delhi.

The Agriculture Minister said that at the time of independence, we were unable to feed 34 crore population, but today, thanks to the hard work and wisdom of our policymakers, farmers, scientists, and food production officers, we have moved ahead among the countries suffering from food shortages and not only providing food to 134 million population but have also become a food exporter.

Shri Singh further said that with just two percent of the world's land we are not just feeding 17 percent of the global population, 11.3 percent livestock and vast genetic inheritance, but also exporting food. He said that today we are the world's largest milk producer, second largest fruits and vegetable producer, third in the production of fish and holds fifth place in egg production.

Shri Singh informed that at the time of Independence, per capita milk supply was 130 gram per day to the 34 million populations and today per capita milk supply has increased to 337-gram milk per day to 134 million people. This is an incomparable achievement in milk production. The Minister further said that we export a lot of agricultural commodities which is about 10 percent of the country's total exports. The World Food India, which was being organized in the national capital, was a unique platform where delegates from 60 countries of the world participated.

The Agriculture Minister said that special emphasis had been given to the overall agricultural growth. The Government has taken various steps to increase the agricultural sector's growth rate. Pradhan Mantri Fasal Bima Yojana, Paramparagat Krishi Vikas Yojana, e-NAM, Pradhan Mantri Krishi Sinchai Yojana, Soil Health Card are some of our key schemes. The Government has allowed 100% FDI in food processing.

Shri Singh added that the Government is implementing Horticulture Development for Integrated Development of Horticulture (MIDH) scheme for the Integrated Horticulture Development Mission & Integrated Horticulture Development Mission, which includes various cold chain such as Pack Houses/ Central Sorting, Pr-Cooling, Reefer Vehicle, Primary processing units and Ripening chambers. It also includes processing units in the North-Eastern and Himalayan states.

Under MIDH, 4392 cold storages/ CA Stores of 19.47 million MT capacity, 20710 Farm Pack Houses, 411 Referral Transport, 408 Ripening Chambers, 4414 Primary Processing Units, and 101 Precooling Units have been set up till March 31, 2017.

The Agriculture Minister said that under the MIDH, the State is promoting the Horticulture Mission, Horticulture crops / Farm level programs to develop the collective area of fruits and vegetables including processing varieties in the field of Mega Food Parks and Export Promotion Areas. In 2016-17, export of horticultural product was 5.03 million MT (Fresh fruits and vegetables - 4.16 million MT, processed fruit, and vegetable - 0.88 million MT, flower farming - 33725 MT) and there has been a 12 percent growth in terms of value.

**India is one of the oldest organic agricultural nations of the world: Shri Radha Mohan Singh**

Union Minister for Agriculture and Farmers Welfare, Shri Radha Mohan Singh said India is one of the oldest organic agricultural nations of the world and a large part of the country still practices traditional organic farming. Shri Singh said it on 9th November, 2017, at the inauguration of Organic World Congress 2017 at India Expo Centre in Greater Noida. The event, organized by International Federation of Organic Farming Movements (IFOAM) and OAFI, had seen the participation of 1,400 representatives from 110 countries, and 2000 Indian delegates.

Shri Radha Mohan Singh said currently, 22.5 lakh hectares have been brought under organic farming and 3,60,400 farmers have been benefited by Paramparagat Krishi Vikas Yojana. Now, the aim is to bring 50,000-hectare area under organic farming in the northeast region. So far 45,863 hectares have been brought under organic farming, 2,406 Farmers Interest Group (FIG) have been created and 44,064 farmers have been linked to the scheme against the target of 2,500 FIG.

Shri Singh said that in Uttar Pradesh, Paramparagat Krishi Vikas Yojana was launched in 2015-16 and so far 28,750 farmers have been benefited from 28750 acres of land. For the marketing of organic products, the government is allocating Rs.5 lakh per district for the setting up of sales outlet.

Union Agriculture Minister said some international scientists call such farming "default organic", however, it is important to understand that often farmers, who continue with these methods, are organic farmers by choice. Using their wisdom, they have been treading this path for centuries. They are not happy with chemicals and pesticides and choose not to use them. Therefore, their farming practices cannot be called "default" in any way.

Shri Radha Mohan Singh said that the Government acknowledges that indiscriminate and excessive use of chemicals during last several decades has posed a question - how long can we continue to do farming like this? The environment and social and economic issues are linked to chemical fertilizer based farming and it needs our attention. Shri Singh said that Food Security is not an issue anymore in the country, but we still have the challenge of providing healthy and nutritious food to the growing population.

We have become dependent on chemical farming and the use of fertilizers, pesticides, and other chemicals have increased the production but at the same time excessive use of chemicals has led to the production of unhealthy crops. Shri Singh said that if we analyze the adverse effects of indiscriminate use of these chemicals on the environment, we realize a large part of chemical is absorbed by the soil, air, and plants. Spraying of chemicals pollutes far away plants. Also, these chemicals seep into the ground and pollute water sources.

Union Agriculture Minister said the use of chemicals has led to climate change and created ecological imbalance and it is affecting human beings too. For the sake of soil health, sustainable production, and healthy and nutritious food for people, organic farming has become a national and global requirement.

**Crop Residue Management**

Burning of crop residue in the states like Punjab, Haryana, Uttar Pradesh and Rajasthan also contributes in increasing environmental pollution levels. National Green Tribunal directed the Delhi government and these four northern states to take strict measures to deal with this serious biennial threat.

- In this regard, Agriculture and farmers Welfare Ministry, on 10th November, 2017, issued an advisory to the state governments to create awareness among the farmers about the harmful effect of straw burning.
- Facilitate farmers residue management machines and equipment such as Zero Till Seed Drill, Happy Seeder, Straw Baler, Rotavator, Paddy Straw Chopper/ Mulcher, Gyro Rake, Straw Reaper, Shredder, etc., to through Custom Hiring Centres or village level Farm Machinery Banks.
- The State Governments have also been directed that Rs. 4000/ Hectare should be used from the funds available for demonstration of machines under Sub-Mission on Agricultural Mechanization for demonstration of straw management machinery at farmers' fields.

**Cabinet approved MoU between India and Philippines on agriculture and related fields**

The Union Cabinet chaired by Prime Minister Shri Narendra Modi gave its approval on 10th November, 2017, for signing a Memorandum of Understanding (MoU) between India and Philippines in the field of agriculture and related fields.

The MoU would improve bilateral cooperation in the field of agriculture and would be mutually beneficial to both countries.

It would promote understanding of best agricultural practices in the two countries and would help in better productivity as well as improved global market access. This MoU provides for cooperation in the fields of rice production and processing, multi cropping system, dryland farming systems, bio-organic farming, solid and water conservation and management, soil fertility, sericulture, agro forestry, livestock improvement etc.

The MoU provides for constitution of Joint Working Group composed of equal number of representatives. The Joint Working Group would meet once every two years alternatively in the Philippines and India.

**Overall fish production registered an increase of approximately 18.86% in comparison to the last three years & inland fisheries sector registers a growth of 26%: Union Agriculture and Farmers Welfare Minister**

Union Agriculture and Farmer Welfare Minister, Shri Radha Mohan Singh, on 21st November, 2017, said that the previously implemented "Letter of Permit" or "L.O.P." system in the E.E.E. has been stopped since January, 2017. Besides, specific decisions have been taken to safeguard the interests of traditional fishermen in the area of EEZ beyond 12 nautical miles, which is regulated by the Government of India, such as the traditional fishers have been exempted from the fishing ban implemented during monsoon period in the EEZ; use of LED lights/other artificial lights for fishing as well as practice of bull-trailing or pair-trailing have been completely banned, recently on

10th November, 2017. The duration of fishing ban had also been increased from 47 days to 61 days, with the consent of all coastal State Governments.

Shri Singh said that the scheme 'Blue Revolution' has been launched with the outlay of Rs. 300 crore for the integrated development of the Fisheries sector in the country. As a result, overall fish production has registered an increase of about 18.86% in comparison to the last three years, whereas inland fish production has registered a growth of more than 26%. Combining the production of all types of fisheries (capture and culture), the total fish production in the country has reached at about 11.41 million tonnes in 2016-17. Shri Singh further said that about 1.5 crore people in the country are employed in the fisheries sector for their livelihood. The Union Agriculture Minister stated this in a function organized on "World Fisheries Day" in the National Agricultural Science Center (NASC) complex, Pusa Road, New Delhi.

It is worth mentioning that 21st November is celebrated as a World of Fisheries Day worldwide every year. In India, which is the second largest fish producing country, the World Fisheries Day is being celebrated from 21st November, 2014 and it is being celebrated for the fourth consecutive year. The theme of this year is *"2022 ka hai sapnaa….. kisaan ki aay ho duguna – Sankalp se siddhi"*. Shri Radha Mohan Singh also inaugurated the World Festivals Day celebrations. Smt. Krishna Raj, Minister of State for Agriculture and Farmers Welfare was also present on the occasion.

Shri Singh emphasized that the vast aquatic resources present in the country provide more opportunities and potential for further development in fisheries sector. He said that main aim of Blue Revolution Scheme is to increase the fish production and productivity to up to 8% annual growth rate and to produce 15 million tonnes of fish by 2020. This scheme would contribute significantly to achieving the targets of doubling the income of farmers and fishermen by 2022.

Shri Singh further said that in line with Blue Revolution Scheme and with active participation of all the States / Union Territories, Government of India has taken effective steps and proposed a long-term plan "Blue Revolution Mission-2016" for the period from 2015-16 to 2019-20. Under this scheme, it is proposed to achieve full production capacity and increase the fish productivity from the aquatic resources and aquaculture in both inland and marine sectors.

Smt. Krishna Raj, Minister of State for Agriculture and Farmers Welfare, said that India has a fleet of 2.48 lakh fishing vessels, and the country has exported fish products amounting to US$ 5.78 billion (Rs. 37,871 crore) during 2016-17, which is the highest export from the country so far. Globally, the value of export of annual fish products ranges from 85 to 90 billion dollars. Smt. Raj also informed that in the last decade, where the average annual growth rate of fish and fish products was recorded at 7.5%, India remained at the first place with an average annual growth rate of 14.8%. She also informed that more than 25% of the world's protein diet is obtained by fish, and that the human population consumes more than 100 million metric tonnes of fish per year in the form of food.

**Shri Radha Mohan Singh addressed the 82nd General Council meeting of National Cooperative Development Corporation**

Union Minister for Agriculture and Farmer Welfare, Shri Radha Mohan Singh, on 21st November, 2017, said that during the current financial year 2017-18 NCDC not only continued its excellent performance, but also registered a record by surpassing its annual target in first 6 months.

Shri Radha Mohan Singh informed the members that during 2016-17, NCDC sanctioned Rs. 25270 crore and disbursed at all high time assistance Rs.15915 crores. Shri Singh further said that in the last three years, the Corporation also registered a significant growth of 254% in releasing its financial assistance to the cooperatives. This was stated by Union Agriculture Minister in 82nd meeting of General Council of NCDC held on 21st November, 2017 at Krishi Bhavan, New Delhi.

Union Agriculture Minister said that Net NPA of Corporation was maintained at zero level and its loan recovery rate is more than 99.66%. The Corporation during the current financial year, 2017-18 not only continued excellent performance, but also registered a record by surpassing its annual target in first 6th months. Shri Singh appreciated the performance of NCDC and expressed hope that NCDC would continue to post commendable results and achieve greater heights and standard in the years to come.

Shri Singh emphasized the role of cooperatives in ensuring remunerative income for farmers and invited people to invest for creation of direct supply chain and develop post harvest infrastructure to ensure better income for farmers in line with the resolve of Government of India to double the income of farmer by 2022. In this regard he said that NCDC would continue to play a pivotal role in development of cooperatives in the larger interest of the farmer and rural population.

Shri Radha Mohan Singh solicited wholehearted support from members of GC to accelerate the progress of cooperative movement and said that NCDC would continue its efforts to make its assistance more attractive and affordable for cooperatives in agriculture and allied sectors. Shri Singh also informed that it has been decided to upgrade NCDC Training Institute situated at Gurugram (Haryana) as a national level institute and rename it as Laxmanrao Inamdar Academy for Cooperative Studies and Human Resource Management.

**India's dairy sector offers numerous possibilities for entrepreneurs globally: Shri Radha Mohan Singh**

Union Agriculture & Farmers' Welfare Minister, Shri Radha Mohan Singh, on 26th November, 2017, on the occasion of National Milk Day said that India is the 'Oyster' of the global dairy industry with opportunities galore for the entrepreneurs globally. Since last 15 years, India continues to be the largest producer of milk in the world. This phenomenal increase is contributed to the several measures initiated by the Government of India to increase the productivity of livestock.

Shri Singh said that increasing the milk production had increased significantly from 137.7 million tonnes in 2013-14 to 164 million tonnes in 2016-17. Milk production increased by 18.81% in 2016-17 compared to 2013-14. Similarly, the per capita availability of milk increased from 307 gram in 2013-14 to 351 gram in 2016-17. Annual growth rate of Milk Production during the period 2011-14 was 4%, which has increased to 6% during 2014-17. The annual growth rate of world milk production has increased by 2% during 2014-17.

On this occasion the Minister said that Livestock sector contributes significantly towards livelihoods and security net for the landless and marginal farmers. About 70 million rural households are engaged in dairying in India with 80% of total cow population. The strength of women in Dairy has reached to the 70% of the total work force (about 44 lakh) of which 3,60,000 women are in leadership roles in village dairy cooperatives and 380 women on the boards of Union and State Federations.

Union Agriculture & Farmers' Welfare Minister said that the consumption of milk is rising, commensurate with increase in the purchasing power of people, increasing urbanization, changing food habits & life styles and demographic growth. Milk with its varied benefits is the only source of animal protein for the largely vegetarian population of the country. Further, factors such as increased consumer interest in high protein diets and increasing awareness & availability of value-added dairy products through organised retail chains are also driving its demand. During last 15 years, Milk Cooperatives have converted about 20% of milk procured into traditional and value added products that offers about 20% higher revenue. This share of value-added products is estimated to increase to 30% by 2021-22.

Shri Singh informed that the Government has initiated a number of dairy development schemes so that the enhanced demand due to variety of factors is met through domestic sources by laying special focus on raising milk production through improved productivity of our dairy animals. A new scheme *"Rashtriya Gokul Mission"* has been initiated for the first time in the country under which 18 Gokul Grams in 12 different States are being set up. Also two awards 'Gopal Ratna Award' for upkeep of the best dairy animals of indigenous breeds and 'Kamdhenu Award' for institutions maintaining best herd of indigenous breeds. This year on World Milk Day 10 Gopal Ratna and 12 Kamdhenu awards have been awarded. Two *"National Kamdhenu Breeding Centres"* one each in Andhra Pradesh and Madhya Pradesh are being setup for conservation of indigenous breeds. In these centres 41 cattle and 13 buffalo breeds would be conserved. In order to make dairy business more profitable *"National Bovine Productivity Mission"* has been in initiated with creation of e Pashuhaat portal. This is playing an important role in linking milk producers and breeders for indigenous breeds.

Union Agriculture & Farmers' Welfare Minister further said that a scheme titled *Dairy Processing & Infrastructure Development Fund (DIDF)* for dairy cooperative sector has been initiated with an outlay of Rs.10881 crore. This scheme would focus on creation of additional milk processing infrastructure and chilling infrastructure through setting up of Bulk Milk Coolers. Also provisions have been made for providing Electronic milk adulteration testing equipment and facilities for manufacturing of value added products.

**Indian agriculture has made rapid growth in food, fruits, vegetables, dairy and fishery production: Shri Radha Mohan Singh**

Union Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh, on 29th November, 2017, said that Indian agriculture has made rapid growth in food, fruits, vegetables, dairy and fishery production. The Minister was speaking at the inauguration of two-day national level workshop on Peri-Urban Agriculture, organized by Haryana Agriculture Department. He further said that the unprecedented development in agricultural production is setting an example for the world and they are trying to learn our techniques and adopt them. He said, in the last three years, the Ministry has developed innovative schemes, provided necessary funds and made policy-making decisions which had a far-reaching effect on the agriculture sector.

Shri Singh said to achieve the target of doubling farmers' income by 2022, set by Hon'ble Prime Minister Shri Narendra Modi, the Ministry is not only working towards increasing the production but also focusing on proper processing techniques, traffic, and market expansion to make agriculture profitable. He said under Peri-Urban Agriculture small and large-scale agricultural production would be done in and around the cities.

The Agriculture Minister further said that Peri-Urban Agriculture can help in climate change adaptation through diversification of food resources for the urban population. Shri Singh said due to rapid urbanization in the past years,

demand for vegetables, fruits and flowers is constantly increasing in these areas. Peri-Urban Agriculture can contribute to price stabilization through the development of important local food production centres of the diversified food system. This would reduce the burden on transport, and help in reducing greenhouse gas emissions from cold storages.

Shri Singh said that, we are developing a system that would supply food to cities from 100 to 200 km. This would help in creating attractive employment option and prevent the conversion of agricultural land near urban areas into cities and towns. The government is promoting quality in agriculture through food processing and in this regard Pradhan Mantri Kisan SAMPADA Yojana has been launched with an allocation of Rs.6,000 crore rupees.

The Minister said that Mission for Integrated Development of Horticulture (MIDH) has helped in production and productivity, post-harvest management and marketing by providing assistance in the production of quality seeds, protected agriculture, vegetable and organic farming.

Shri Singh said that, cow and buffalo rearing around the cities for milk is an ancient practice. Ministry of Agriculture has implemented important schemes to promote milk production. The Minister added said that Rashtriya Gokul Mission was launched in December 2014 to conserve and develop indigenous breeds in a focused and scientific manner. The projects have been sanctioned in 27 states of the country with the funds of Rs.1,077 crore under the Mission to double the productivity of domestic bovines. Through this process, the species of 41 domestic bovines and 13 mahish bovines is being promoted and developed. A sum of Rs. 173 crore has been sanctioned for 18 Gokul Grams in 12 states under Gokul Gram Scheme. For the first time, two National Kamdhenu Breeding Centres in Chintaldevi district Nellore, Andhra Pradesh, and Itarsi, district Hoshangabad, MP, with the funds of Rs.50 crore are being established for the preservation and promotion of domestic bovines in scientific way. With Rs.10 crore, 2 Gokul villages are being set up in Haryana – one in Hisar and one in Ladwa Gaushala. An announcement has been made for implementation of DIDF (Dairy Processing and Infrastructure Development Fund) with an outlay of Rs 10,881 crore under the ambitious White Revolution Mission.

**Shri Radha Mohan Singh chaired the 22nd meeting of Board of Mangement (BOM) of Small Farmers' Agri-Business Consortium (SFAC)**

Union Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh chaired the 22nd meeting of Board of Mangement (BOM) of Small Farmers' Agri-Business Consortium (SFAC) in, New Delhi, on 30th November, 2017. Shri Singh was briefed about the activities under SFAC, an exclusive society that focuses on increasing incomes of small and marginal farmers through aggregation and development of agribusiness.

Shri Singh said that SFAC's VCA Scheme is getting good response from the agripreneurs and many cases are in pipeline for sanction. Shri Singh was also informed that all the agri-business units' proposals have been recommended to SFAC by notified financial institutions under VCA Scheme and it is also the result of publicity and awareness camps which have been organized by SFAC to publicize the VCA scheme all over India.

The Union Agriculture Minister further said that SFAC organised nationwide publicity and awareness programme to publicise VCA scheme and to provide better clarity of the EGCGF scheme amongst FPOs, Bankers/ NABARD, Line Departments, FPOs Members and RIs. FPO is being introduced in the fisheries sector and a pilot project involving formation of 21 Fish Farmers Producer Organizations (FFPOs) in the major fish producing States has been submitted. For northeast region, Small Farmers Agribusiness Consortium (SFAC's) and Spice Board are working with North Eastern Council (NEC) to form spice based FPCs in Sikkim and Arunachal Pradesh.

Shri Singh also informed that SFAC has taken several new initiatives such as Advance Training Programme for Board of Directors and CEOs of FPC; Professional Handholding of FPCs; Strengthening of Infrastructure through Dovetailing with Central/ State Government Programmes; Promotion of Fish Farmers Producer Organizations; Fertilizer Dealership for the FPCs.

SFAC has provided a virtual platform in Delhi in the form of a Delhi Kisan Mandi. It has been operational since September 2014 and as on October 2017, 32347.419 MT of fresh produce has been sold through Delhi Kisan Mandi with the sale value of Rs. 3482.549 lakh.

**Cabinet approved MoU between India and Italy for cooperation in Agriculture and Phytosanitary issues**

The Union Cabinet, chaired by Prime Minister Shri Narendra Modi, approved signing of a Memorandum of Understanding (MoU) between India and Italy on 30th November, 2017 for cooperation in Agriculture and Phytosanitary issues. It replaces the earlier MoU signed in January, 2008 which is going to expire in January, 2018.

The MoU provides for cooperation in the fields of Phytosanitary issues, agricultural production and a wide range of other sectors including animal husbandry, agricultural research, food processing and other additional fields as may be mutually decided by both the sides.

The MoU has provision for exchange of information on the situation of agriculture and rural development, strengthening of technical exchange and production cooperation in respect of agricultural mechanization/farm machinery and agro-industrial infrastructures, removal of technical barriers and exchange experiences in animal husbandry sector including modern scientific researches and technologies etc.

The MoU provides for setting up of a Joint Working Group in order to promote bilateral exchanges in the field of agriculture, consider long-term initiatives for agricultural cooperation, and promote cooperation in order to reduce phytosanitary risks in exported goods also through the definition of specific joint procedures.

It would encourage and facilitate contacts between governmental agencies, scientific and academic institutions and business communities of both countries and promote further cooperation between the respective research institutes of the two countries.

# General Survey of Agriculture

**Trends in Foodgrain Prices**

During the month of October, 2017, the All India Index Number of Wholesale Price (2011-12=100) of food grains decreased by 0.63 percent from 144.0 in September, 2017 to 143.1 in October, 2017.

The Wholesale Price Index (WPI) Number of cereals increased by 0.07 percent from 142.5 to 142.7 while WPI of pulses decreased by 3.52 percent from 150.5 to 145.2 during the same period.

The Wholesale Price Index Number of wheat increased by 0.29 percent from 137.7 to 138.0 while WPI of paddy increased by 0.54 percent from 148.8 to 149.6 during the same period.

**Weather, Rainfall and Reservoir Situation**

**Rainfall Situation**

Cumulative Post-Monsoon Season rainfall for the country as a whole during the period 01st October to 29th November, 2017 has been 13% 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 19% in East & North East India but lower than LPA by 90% in North-West India, 12% in South Peninsula and by 6% in Central India.

Out of total 36 meteorological Sub-divisions, 06 met subdivisions received large excess/excess rainfall, 13 subdivisions received normal rainfall and 17 Sub-divisions received deficient/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 23rd November, 2017) was 101.08 BCM as against 105.34 BCM on 23.11.2016 (last year) and 106.52 BCM of normal storage (average storage of last 10 years). Current year's storage is 96% of last year's storage and 95% of the normal storage.

**Sowing Position during Rabi 2017**

As per latest information available on sowing of crops, around 51% of the normal area under rabi crops has been sown upto 24.11.2017. Total area sown under rabi crops in the country has been reported to be 315.86 lakh hectares as compared to 320.55 lakh hectares during the same period of last year. This year's area coverage so far is lower by 4.69 lakh ha. than the area coverage during the corresponding period of last year.

As compared to normal area as on date, total area coverage this year is higher by 10.2 lakh ha., under gram, 2.2 lakh ha. under lentil; 1.1 lakh ha. under rice, 1.3 lakh ha. under maize and lower by 33.9 lakh ha. under wheat, 4.1 lakh ha. under jowar and 4.5 lakh ha. under rapeseed & mustard.

**Economic Growth**

The growth rate of GDP at constant market prices in first quarter (April-June) (Q1) of 2017-18 was 5.7 per cent as compared to 7.9 per cent in the corresponding period of previous year.

The growth rate of GVA at constant basic prices for Q1 of 2017-18 was 5.6 per cent as compared to 7.6 per cent in the corresponding period of previous year. At the sectoral level, GVA of agriculture, industry and services sectors grew at 2.3 per cent, 1.6 per cent and 8.7 per cent respectively in Q1 of 2017-18.

As per the provisional estimates of national income for the year 2016-17, the growth of GDP at constant (2011-12) prices was 7.1 per cent in 2016-17 and the growth rate of GVA at constant basic prices for 2016-17 was 6.6 per cent (Table 1).

The share of total final consumption in GDP at current prices in Q1 of 2017-18 is estimated at 70.7 per cent, as compared to 69.6 per cent in Q1 of 2016-17. The fixed investment rate (ratio of gross fixed capital formation to GDP) declined from 29.2 per cent in Q1 of 2016-17 to 27.5 per cent in 2017-18.

The saving rate (ratio of gross saving to GDP) for the year 2015-16 was 32.3 per cent, as compared to 33.1 per cent in 2014-15. The investment rate (rate of gross capital formation to GDP) in 2015-16 was 33.3 per cent, as compared to 34.4 per cent in 2014-15.

**Agriculture and Food Management**

**Rainfall:** The cumulative South West Monsoon rainfall received for the country as a whole, during the period 1st October - 15th November, 2017, has been 9 per cent below normal. The actual rainfall received during this period has been 89.4 mm as against the normal at 98.5 mm. Out of

the total 36 meteorological subdivisions, 8 subdivisions received excess rainfall, 12 subdivisions received normal rainfall, 5 subdivisions received deficient rainfall, 10 subdivisions received large deficient rainfall and 1 received no rain.

**Production of food grains:** As per the 1st Advance Estimates released by Ministry of Agriculture, Cooperation & Farmers Welfare on 22nd September 2017, production of kharif foodgrains during 2017-18 is estimated at 134.7 million tonnes, as compared to 138.5 million tonnes (4th Advance estimates) and 135 million tones (1st Advance estimates) in 2016-17 (Table 3).

**Procurement:** Procurement of rice as on 1st November, 2017 was 12.8 million tonnes during Kharif Marketing Season 2017-18 whereas procurement of wheat was 30.8 million tonnes during Rabi Marketing Season 2017-18 (Table 4).

**Off-take:** Offtake of rice during the month of September, 2017 was 27.6 lakh tonnes. This comprises 23.8 lakh tonnes under TPDS/NFSA and 3.8 lakh tonnes under other schemes. In respect of wheat, the total offtake was 20.1 lakh tonnes comprising 18.0 lakh tonnes under TPDS/ NFSA and 2.1 lakh tonnes under other schemes. The cumulative offtake of foodgrains during 2017-18 is 34.3 million tonnes (Table 5).

**Stocks:** Stocks of foodgrains (rice and wheat) held by FCI as on 1st October, 2017 was 43.3 million tones.

TABLE 1: Growth of GVA at Basic Prices by Economic Activity at Constant (2011-12) Prices (in per cent)

| Sectors | Growth Rate (%) | | | Share in GVA or GDP (%) | | |
|---|---|---|---|---|---|---|
| | 2014-15 | 2015-16 | 2016-17 PE | 2014-15 | 2015-16 | 2016-17 PE |
| Agriculture, forestry & fishing | -0.2 | 0.7 | 4.9 | 16.5 | 15.4 | 15.2 |
| Industry | 7.5 | 8.8 | 5.6 | 31.2 | 31.5 | 31.2 |
| Mining & quarrying | 11.7 | 10.5 | 1.8 | 3.0 | 3.1 | 3.0 |
| Manufacturing | 8.3 | 10.8 | 7.9 | 17.4 | 17.8 | 18.1 |
| Electricity, gas, water supply & other utility services Construction Services | 7.1 | 5.0 | 7.2 | 2.2 | 2.1 | 2.2 |
| Construction | 4.7 | 5.0 | 1.7 | 8.6 | 8.4 | 8.0 |
| Services | 9.7 | 9.7 | 7.7 | 52.2 | 53.1 | 53.7 |
| Trade, Hotel, Transport Storage | 9.0 | 10.5 | 7.8 | 18.5 | 19.0 | 19.2 |
| Financial, real estate & prof services | 11.1 | 10.8 | 5.7 | 21.4 | 21.9 | 21.7 |
| Public Administration, defence and other services | 8.1 | 6.9 | 11.3 | 12.4 | 12.2 | 12.8 |
| GVA at basic prices | 7.2 | 7.9 | 6.6 | 100.0 | 100.0 | 100.0 |
| GDP at market prices | 7.5 | 8.0 | 7.1 | — | —- | —- |

*Source*: Central Statistics Office (CS0). PE: as per Provisional estimates of GDP released on 31st May 2017.

TABLE 2: Quarter-wise Growth of GVA at Constant (2011-12) Basic Prices (per cent)

| Sectors | 2015-16 | | | | 2016-17 | | | | 2017-18 |
|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q 1 |
| Agriculture, forestry & fishing | 2.4 | 2.3 | -2.1 | 1.5 | 2.5 | 4.1 | 6.9 | 5.2 | 2.3 |
| Industry | 7.3 | 7.1 | 10.3 | 10.3 | 7.4 | 5.9 | 6.2 | 3.1 | 1.6 |
| Mining & quarrying | 8.3 | 12.2 | 11.7 | 10.5 | -0.9 | -1.3 | 1.9 | 6.4 | -0.7 |
| Manufacturing | 8.2 | 9.3 | 13.2 | 12.7 | 10.7 | 7.7 | 8.2 | 5.3 | 1.2 |
| Electricity, gas, water supply & other utility services | 2.8 | 5.7 | 4.0 | 7.6 | 10.3 | 5.1 | 7.4 | 6.1 | 7.0 |
| Construction | 6.2 | 1.6 | 6.0 | 6.0 | 3.1 | 4.3 | 3.4 | -3.7 | 2.0 |
| Services | 9.3 | 10.1 | 9.6 | 10.0 | 9.0 | 7.8 | 6.9 | 7.2 | 8.7 |
| Trade, hotels, transport, communication and services related to broadcasting | 10.3 | 8.3 | 10.1 | 12.8 | 8.9 | 7.7 | 8.3 | 6.5 | 11.1 |
| Financial, real estate & professional services | 10.1 | 13.0 | 10.5 | 9.0 | 9.4 | 7.0 | 3.3 | 2.2 | 6.4 |
| Public administration, defence and Other Services | 6.2 | 7.2 | 7.5 | 6.7 | 8.6 | 9.5 | 10.3 | 17.0 | 9.5 |
| GVA at Basic Price | 7.6 | 8.2 | 7.3 | 8.7 | 7.6 | 6.8 | 6.7 | 5.6 | 5.6 |
| GDP at market prices | 7.6 | 8.0 | 7.2 | 9.1 | 7.9 | 7.5 | 7.0 | 6.1 | 5.7 |

*Source:* Central Statistics Office (CS0).

TABLE 3: PRODUCTION OF MAJOR AGRICULTURAL CROPS (1ST ADV. EST.)

| Crops | Production (in Million Tonnes) | | | | | |
|---|---|---|---|---|---|---|
| | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 (4th AE) | 2017-18 (1st AE)* |
| Total Foudgrains | 257.1 | 265.0 | 252.0 | 251.6 | 275.7 | 134.7 |
| Rice | 105.2 | 106.7 | 105.5 | 104.4 | 110.2 | 94.5 |
| Wheat | 93.5 | 95.9 | 86.5 | 92.3 | 98.4 | ... |
| Total Coarse Cereals | 40.0 | 43.3 | 42.9 | 38.5 | 44.2 | 31.5 |
| Toral Pulses | 18.3 | 19.3 | 17.2 | 16.4 | 23.0 | 8.7 |
| Total Oilseeds | 30.9 | 32.8 | 27.5 | 25.3 | 32.1 | 20.7 |
| Sugarcane | 341.2 | 352.1 | 362.3 | 348.4 | 306.0 | 337.7 |
| Cottor# | 34.2 | 35.9 | 34.8 | 30.0 | 33.1 | 32.3 |

*Source:* DES, DAC&FW, M/o Agriculture & Farmers Welfare, 3rd advance Estimates, # Million bales of 170 kgs. each. *only Kharif Crops.

TABLE 4: PROCUREMENT OF CROPS (IN MILLION TONNES)

| Crops | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|---|---|
| Rice# | 35.0 | 34.0 | 31.8 | 32.0 | 34.2 | 38.1* | 12.8* |
| Wheat@ | 28.3 | 38.2 | 25.1 | 28.0 | 28.1 | 23.0 | 14.1 |
| Total | 63.3 | 72.2 | 56.9 | 60.2 | 62.3 | 61.1 | 43.6 |

# Kharif Marketing Season (October-September), @ Rabi Marketing Season (April-March,), * As on 01.11.2017
Source: FCI and DFPD, M/o Consumer Affairs and Public Distribution.

TABLE 5: OFF-TAKE OF FOODGRAINS (MILLION TONNES)

| Crops | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18* |
|---|---|---|---|---|---|---|
| Rice | 32.6 | 29.2 | 30.7 | 31.8 | 32.8 | 20.2 |
| Wheat | 33.2 | 30.6 | 25.2 | 31.8 | 29.1 | 14.1 |
| Total (Rice & Wheat) | 65.8 | 59.8 | 55.9 | 63.6 | 61.9 | 34.3 |

Source: DFPD, M/o Consumer Affairs, Food and Public Distribution. P: Provisional, *up to September, 2017

TABLE 6: STOCKS OF FOODGRAINS (MILLION TONNES)

| Crops | October 1, 2016 | October 1, 2017 |
|---|---|---|
| 1. Rice | 14.5 | 16.3 |
| 2. Unmilled Paddy # | 2.1 | 1.7 |
| 3. Converted Unmiled Paddy in terms of Rice | 1.4 | 1.1 |
| 4. Wheat | 21.3 | 25.9 |
| Total (Rice & Wheat) (1+3+4) | 37.2 | 43.3 |

## Articles

# Coconut Cultivation: A Dynamic Analysis

Dr. N. Karunakaran*

**Abstract**

Coconut is a popular palm grown in 90 countries, occupying about 10 million hectares of land and producing nearly 42 billion nuts per year in the world. In India, there are 1.514 million hectares of land under coconut cultivation from where 9.7 billion nuts are produced annually. Among the important commercial crops in Kerala, coconut is a dominant one. Kerala accounts for 38 percentage of the area under coconut in India contributing to 27 percentage of national production. During the past five decades and more, coconut cultivation underwent expansion in area under cultivation associated with increase in production. A comparison of the compound growth rates of coconut productivity during the five decades reveals a decrease in the growth of productivity and a slight decrease in recent years. During the period since the middle of 1980, it was observed with regard to area and production that the coefficient of variation was higher as compared to 1960's and 1970's. During this period, significant increase in production had occurred consequent to increase in area and the productivity remains almost stagnant. During the period since 1985, change in production was mainly due to yield effect. The decomposition of growth of output of coconut crop in Kerala revealed that the growth is mainly monetary in nature rather than real growth.

**Key words:** Coconut; dynamism; Kerala; Trend; variability.

**Introduction**

Coconut plays a significant role in the agrarian economy of India in general and Kerala in particular. Apart from the importance of copra and coconut oil which is widely used in the manufacture of industrial products, its husk is a source of fibre which supports a sizable coir industry. The tender-nut supplies coconut water, a popular thirst quencher of health and hygienic value and coconut oil is abundant in vitamins, minerals and anti-oxidants, thus making it the mother of all oils.

Coconut is a crop of small and marginal farmers and about 98 percent of the land holdings are less than two hectares in size. In the western coast, the palm is mainly homestead system of farming. While there is a concentration of coconut plantations in the coastal regions, it is also grown in the midlands and highlands and is found to grow under varying agro-climatic conditions.

In Kerala, it is cultivated in all districts. In terms of income, it occupies an important place in the economy of the state and is mainly a small farmer's crop. Any change in its cultivation either in terms of area, production or productivity would seriously affect the weaker sections of the agricultural population. In spite of its importance, to raise efficiency necessitates investigations into the various aspects of economics of coconut cultivation. The present study is an attempt to analyze the trend, variability and dynamism of coconut cultivation against the background of the agricultural sector of Kerala.

**Materials and Methods**

The study is based on secondary data. The major source of secondary data are various published reports of the Department of economics and statistics, Thiruvananthapuram, State planning board, Thiruvananthapuram, Coconut development board and Directorate of economics and statistics, Government of India.

For studying the area, production and productivity, the compound growth rates were calculated using exponential function fitted to the time series data.

$$Y = ab^t$$

The growth rate (GR) has been computed using the formula:

$$GR = (\text{Antilog } b-1)*100$$

The F test has been applied to test the significance of b. An analysis was also carried to estimate the amount of variability for each of the three variables by computing the coefficient of variation for all the units.

**Results, Analysis and Discussion**

Coconut is grown in more than 90 countries of the world producing around 55 million tonnes annually. Indonesia and Philippines are the major producers of coconut. India is third in coconut cultivation in the world and its production is around 22680 million nuts per year. The world cultivation of coconut is presented in Table 1.

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TABLE 1: WORLD AREA UNDER COCONUT

| Sl. No. | Country | Area (in '000 hectare) |
|---|---|---|
| 1 | Indonesia | 3808 |
| 2 | Philippines | 3562 |
| 3 | India | 2136 |
| 4 | Sri Lanka | 395 |
| 5 | Papua New Guinea | 221 |
| 6 | Thailand | 216 |
| 7 | Vietnam | 155 |
| 8 | Malaysia | 109 |
| 9 | Samoa | 99 |
| 10 | Vanuatu | 96 |
| 11 | Total | 12264 |

*Source*: Govt. of India (2015), "Views of Coconut Development Board on the fixation of Minimum Support Price (MSP) Milling and Ball Copra for the Season 2015", Coconut Development Board, Ministry of Agriculture, Kochi, India.

In India the traditional coconut producing areas are in the states of Kerala, Tamilnadu, Karnataka, Goa, Andrapradesh, Orissa, West Bengal, Pondicherry, Maharashtra and Islands of Lakshadweep and Andaman and Nicobar. State-wise area, production and productivity of coconut are presented in Table 2.

TABLE 2: AREA, PRODUCTION AND PRODUCTIVITY OF COCONUT IN INDIA

| Sl. No. | States/Union territories | Area (in '000ha.) | Production (in Million Nuts) | Productivity (in Nuts/ha.) |
|---|---|---|---|---|
| 1 | Kerala | 809.16 | 5921.04 | 7322 |
| 2 | Karnataka | 513.10 | 6058.86 | 11808 |
| 3 | Tamil Nadu | 465.11 | 6917.25 | 14872 |
| 4 | Andhra Pradesh | 128.90 | 1933.07 | 14997 |
| 5 | Orissa | 54.29 | 380.93 | 7017 |
| 6 | West Bengal | 29.20 | 369.31 | 12648 |
| 7 | Goa | 25.71 | 122.71 | 4773 |
| 8 | Andaman Nicobar Islands | 21.88 | 129.97 | 5940 |
| 9 | Maharashtra | 28.88 | 187.47 | 6676 |
| 10 | Gujarat | 21.12 | 322.39 | 15265 |
| 11 | Assam | 22.15 | 160.21 | 7233 |
| 12 | Bihar | 15.25 | 141.14 | 9255 |
| 13 | Tripura | 6.47 | 27.45 | 4243 |
| 14 | Lakshadweep | 2.57 | 70.91 | 27591 |
| 15 | Pondicherry | 1.95 | 33.68 | 17272 |
| 16 | Nagaland | 1.30 | 15.11 | 11623 |
| 17 | Chhattisgarh | 1.41 | 11.44 | 8113 |
| 18 | Mizoram | 0.02 | 0.09 | 4500 |
| 19 | All India | 2136.67 | 22680.03 | 10615 |

Source: Govt. of India (2015), "Views of Coconut Development Board on the fixation of Minimum Support Price (MSP) Milling and Ball Copra for the Season 2015", Coconut Development Board, Ministry of Agriculture, Kochi, India.

**Trends in Area, Production and Productivity of Coconut in Kerala**

Coconut in Kerala accounts for about 68 percentage of the area in India and has nearly 809 thousand hectare under cultivation. The production was about 5921 million nuts and productivity 7322 nuts per hectare. In Kerala the area and production of coconut is spread in all districts. Table 3 show that the area under cultivation of this crop during the last five decades witnessed tremendous progress in Kerala. Between 1961 and 2015, the largest area increase happened in the northern districts and many of the southern districts recorded decrease in the area under coconut.

TABLE 3: CHANGE IN THE CULTIVATION OF COCONUT IN KERALA (1961-2015).

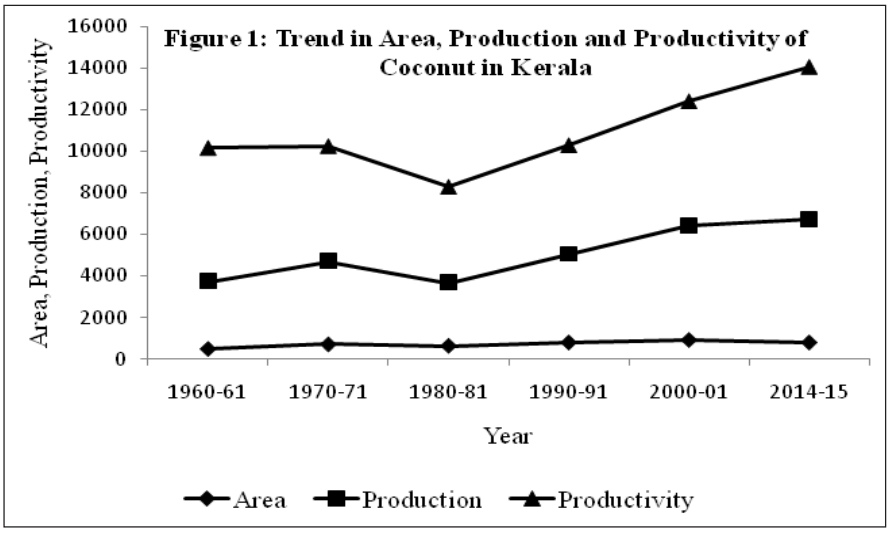
| Sl. No. | Districts | Change in Cultivation (in %) |
|---|---|---|
| 1 | Thiruvananthapuram | 32 |
| 2 | Kollam | -9 |
| 3 | Pathanamthitta | -35 |
| 4 | Kottayam | -40 |
| 5 | Alappuzha | -42 |
| 6 | Ernakulam | 12 |
| 7 | Idukki | 20 |
| 8 | Trissur | 127 |
| 9 | Palakkad | 227 |
| 10 | Malappuram | 75 |
| 11 | Kozhikkode | 24 |
| 12 | Wayanad | 173 |
| 13 | Kannur | 70 |
| 14 | Kasaragod | 29 |
| 15 | State | 56 |

*Source:* Computed from (i) Statistics for planning (various issues), Department of Economics and Statistics, Govt. of Kerala, Thiruvananthapuram. (ii) Economic Review (various issues), State Planning Board, Govt. of Kerala, Thiruvananthapuram.

The growth trends in area, production and productivity of coconut in Kerala are shown in Table 4 and Figure 1.

TABLE 4: COMPOUND GROWTH RATE OF AREA, PRODUCTION AND PRODUCTIVITY

| Sl. No. | Item | Compound Growth Rate (1961-2015) |
|---|---|---|
| 1 | Area | 1.1 |
| 2 | Production | 1.4 |
| 3 | Productivity | 0.4 |




**Variability in Area, Production and Productivity of Coconut in Kerala**

In this section, it was attempted to specify the magnitude of changes that have happened in area, production and productivity by computing coefficients of variation for Period I and Period II, separately for nine districts in period I and for all districts in period II. The results are presented in table 5.

Considering the area, a perceptible change has been evident during the first period and was marginal in all districts. During the second period, Kollam, Kottayam, Palakkad and Wayanad districts have indicated a very high variation in area. For the state as a whole, the size of variation in coconut area has been 22.27 in the first period and 9.72 in the second period. In Kollam, Kottayam and Palakkad districts the coefficient of variation was higher in period II as compared to period I; but in Kannur, Thiruvananthapuram and Trissur districts it was higher in period I as against in period II.

The coefficient of variation in production for the state as a whole was 4.93 during the period I, while it was 38.69 in the second period. In period I, the coefficient of variation was observed to be highest in Kottayam district and lowest in Thiruvananthapuram district. In the second period Malappuram district recorded highest variation and was lowest in Idukki district. Here also there are inter-district variation in both the periods.

TABLE 5: COEFFICIENT OF VARIATION IN AREA, PRODUCTION AND PRODUCTIVITY OF COCONUT IN DIFFERENT DISTRICTS OF KERALA

| Districts | Area | | Production | | Productivity | |
|---|---|---|---|---|---|---|
| | Period I | Period II | Period I | Period II | Period I | Period II |
| Thiruvananthapuram | 18.89 | 1.73 | 0.80 | 33.49 | 22.00 | 35.12 |
| Kollam | 33.37 | 128.97 | 22.91 | 38.15 | 32.92 | 35.12 |
| Pathanamthitta | - | 39.07 | - | 33.98 | - | 5.44 |
| Kottayam | 11.43 | 40.93 | 43.55 | 37.51 | 32.93 | 3.68 |
| Alappuzha | 16.48 | 19.53 | 38.30 | 17.17 | 17.758 | 2.39 |
| Ernakulam | 21.48 | 20.42 | 10.59 | 27.78 | 17.68 | 7.57 |
| Idukki | - | 4.42 | - | 16.68 | - | 21.03 |
| Trissur | 33.14 | 25.69 | 35.95 | 19.97 | 0.97 | 10.45 |
| Palakkad | 18.34 | 56.11 | 35.95 | 19.97 | 33.02 | 32.09 |
| Malappuram | - | 35.41 | - | 134.34 | - | 52.97 |
| Kozhikkode | 0.46 | 7.01 | 17.25 | 31.45 | 17.71 | 24.71 |
| Wayanad | - | 75.47 | - | 121.21 | - | 84.29 |
| Kannur | 25.78 | 23.99 | 2.54 | 48.46 | 28.00 | 25.98 |
| Kasaragod | - | 39.23 | - | 107.87 | - | 87.06 |
| State | 22.27 | 9.72 | 4.93 | 38.69 | 17.37 | 29.53 |

Period I (1960-61 to 1984-85) and Period II (1985-86 to 2014-15).

As regards productivity, the extent of variation of second period is considerably higher than that in the first period in all the districts. For the state as a whole, the size of variation in coconut productivity was nearly double in the second period than that recorded in the first period.

Fluctuations in the production of coconut can be due to:

(1) Area effect: It reflects the impact of growth of average area on the increase in the level of production, keeping all other influences inoperative during the period.

(2) Yield effect: It reflects the impact of the growth of average yield

(3) Cropping pattern effect: It reflects the impact of cropping pattern changes during the current period as compared to the base period.

(4) Interaction effect between yield and cropping pattern signifies the influence of these factors over others in bringing about the changes in production. These four shows the disaggregation of the real component.

(5) Pure price effect, that is, an increase of this magnitude in the value of output which is solely due to rise in prices.

(6) Interactions between price and yield effect, that is, interaction between the two variables considered.

(7) Interactions between price and cropping pattern effect, that is, interaction between the two variables considered and

(8) Total interaction effect, that is, interaction between the three variables; changes in prices, cropping pattern and yields.

TABLE 6: Decomposition of growth of output of coconut crop in Kerala.

| Sl. No. | Elements | Growth of output of Coconut crop (in % ) |
|---|---|---|
| 1 | Increase in value of output | 6025.98 |
| 2 | Area effect | 0.93 |
| 3 | Yield effect | 0.38 |
| 4 | Cropping pattern effect | 0.92 |
| 5 | Interaction effect | 0.13 |
| 6 | Real Growth (2+3+4+5 ) | 2.36 |
| 7 | Pure price effect | 62.86 |
| 8 | Price Yield effect | 9.22 |
| 9 | Price cropping pattern effect | 22.29 |
| 10 | Total Interaction effect | 3.27 |
| 11 | Monetary Growth (7+8+9+10) | 97.64 |
| 12 | Total (6 +11) | 100.00 |

*Source*: Karunakaran N (2015), "Growth of crop-output in Kerala: Is it real or monetary", *Artha Journal of social science*, 14(4): 104-106

Table 6 shows the decomposition of growth of output of coconut crop in Kerala from 1961-2015 and revealed that the growth is monetary in nature rather than real growth.

**Volatility in the Price of Coconut in Kerala**

Table 7 demonstrated volatility in the farm harvest price of coconut for the last five decades in Kerala.

TABLE 7: Average farm harvest price of Coconut in Kerala

| Sl. No | Year | Price (Rs per 100 nuts with husk) |
|---|---|---|
| 1 | 1960-61 | 21.50 |
| 2 | 1965-66 | 39.50 |
| 3 | 1970-71 | 56.65 |
| 4 | 1975-76 | 66.85 |
| 5 | 1980-81 | 138.10 |
| 6 | 1985-86 | 146.90 |
| 7 | 1990-91 | 301.20 |
| 8 | 1995-96 | 360.25 |
| 9 | 2000-01 | 281.40 |
| 10 | 2005-06 | 494.90 |
| 11 | 2010-11 | 510.50 |
| 12 | 2014-15 | 550.50 |

*Source*: Computed from Coconut Development Board, Kochi, Kerala.

**Trend in the volatility in price of Coconut in Kerala**

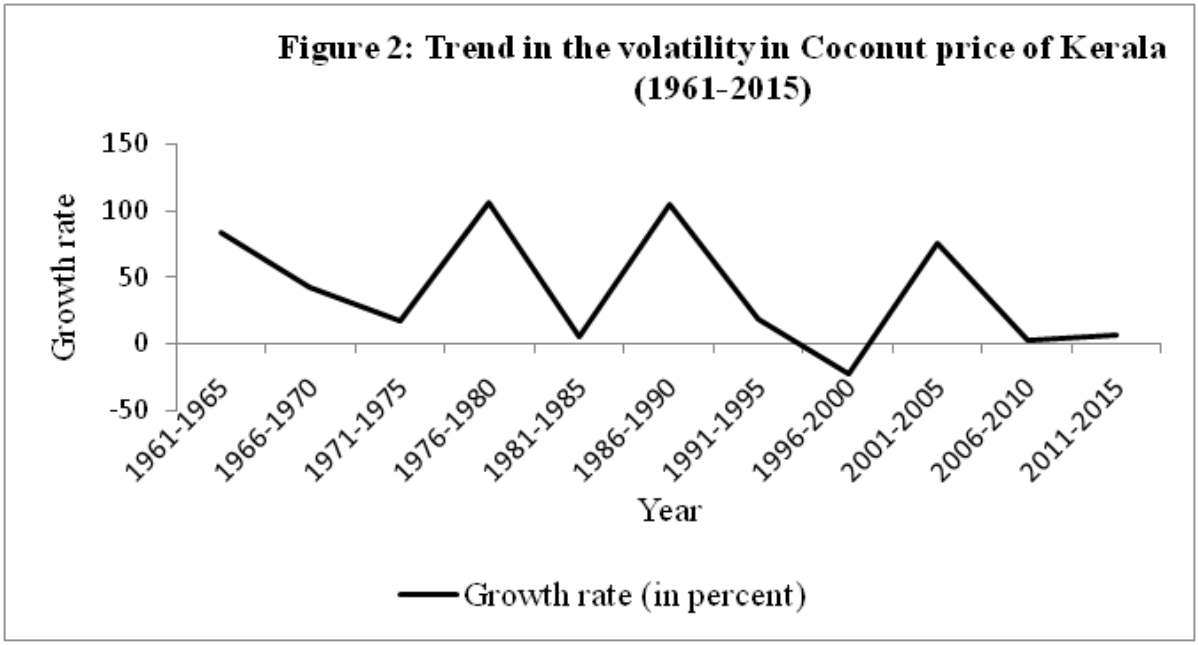
The marketing of coconut is commonly adopted through different channels. More than 90 percent of the produce from Kerala is supplied in the different parts of India. 80 percent of the area under the crop in Kerala is accounted by small holdings and is generally grown in lowlands, midlands and highlands. The small holding under coconut is mainly homestead planting and is lying adjacent to each other.

TABLE 8: Growth rate of Coconut price in Kerala (1961-2015)

| Sl. No | Year | Growth rate (in percent) |
|---|---|---|
| 1 | 1961-1965 | 83.72 |
| 2 | 1966-1970 | 43.42 |
| 3 | 1971-1975 | 18.00 |
| 4 | 1976-1980 | 106.58 |
| 5 | 1981-1985 | 6.37 |
| 6 | 1986-1990 | 105.03 |
| 7 | 1991-1995 | 19.60 |
| 8 | 1996-2000 | -21.88 |
| 9 | 2001-2005 | 75.87 |
| 10 | 2006-2010 | 3.15 |
| 11 | 2011-2015 | 7.83 |

*Source*: Computed from Coconut Development Board, Kochi, Kerala.

Figure 2 and table 8 shows the volatility in coconut price in Kerala in terms of growth rate during the period 1961-2015. It clearly revealed that there is an increasing and decreasing trend in price. Coconut price showed an increasing trend in 1981-85 and this continued up to 1990 and also in 1996-2000. Since then there is a negative trend in growth rate; after 2001 growth rate again decreased.




**Conclusion**

Kerala is endowed with diverse climatic, edaphic and socio-economic conditions and this has given rise to many location-specific cropping systems. Major cropping systems followed in the state include paddy based, coconut based, arecanut based, plantation crops based and other convenience based specific regional cropping pattern systems. The state was traditionally a coconut growing area along with the coastal belt of Karnataka, Tamil Nadu and Andra Pradesh. The area under coconut has been increasing over the years since 1960-61 and is the second largest crop. From the analysis of the growth trends of area, production and productivity and its variability, it is clearly established that the state made a significant change in coconut cultivation. The farmers in Kerala, at present, are facing many problems due to price volatility and government should provide more incentives to protect the small coconut growers; otherwise there will be a shift from growing coconut to other crops.

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# Export of Dairy Products from India

HEMANT SHARMA* AND S.S. BURARK**

**Abstract**

Indian Dairy Industry is one of the largest and fast growing industries in the country which provides ample job opportunities and contributes significantly to the economy of the country. India is the world's largest milk producer, accounting for more than 18.5 per cent of world's total milk production. During the year 2014-15, India's Export of dairy Products was 90131.33MT to the world with a net worth of Rs. 1676.90 crore. The dairy sector in India has shown remarkable development in the past decade and India has now become one of the largest producers of milk. However, the share of India in world trade in dairy products is still very less. Therefore, an attempt has been made in this paper to study the scope of export of dairy products from India. The study is based on secondary data for the period 1991 to 2014. The Herfindahl Index (HI) was used to measure the degree of diversification based on the shares of various importing countries in India's total dairy products export. India achieved an annual output of 146.3 million tonnes in milk production during 2014-15 . The per capita availability of milk in India has increased from 176 grams per day in 1990-91 to 322 grams per day by 2014-15. It is more than the world average of 294 grams per day during 2013. There are five countries importing Indian dairy products in large quantities, namely, Bangladesh, UAE, Nepal, Philippines, and Singapore. In 2014-15, these top 5 importers accounted for about 60.54 percent of India's total dairy export. Herfindahl index exhibited an increasing trend. It has increased from 0.06 in 2010-11 to 0.11 in 2014-2015. It means that India's dairy export has experienced a moderate increase in the degree of export market diversification. The share of skimmed milk in India's dairy export was highest (78.58 %), followed by ghee (5.50%), whole milk (3.37 %), cheese and curd (2.40 %), butter (2.33 %), whey (0.06 %) and other dairy products ( 7.75 ). The total export value of dairy product has increased from 79.94 million USD in the year 2004-05 to 546.15 million USD in the year 2013-14, showing a considerable progress in exports of dairy products.

*Key words*: Dairy Products, Export, Milk, Herfindahl Index (HT), Diversification, Indian Dairy Product.

**Introduction**

India is the world's largest milk producer, accounting for more than 18.5 per cent of world's total milk production. India is the world's largest consumer of dairy products, consuming nearly 100 per cent of its own milk production. Dairy products are a major source of economical and nutritious food to millions of people in India and the only acceptable source of animal protein for large vegetarian segment of Indian population. Dairying has been considered as one of the activities aimed at alleviating the poverty and unemployment, especially in the rain-fed and drought-prone regions of the rural areas. The progress in dairy sector will result in a more balanced development of the rural economy. A specific Indian phenomenon is the unorganized sector of milkmen, vendors who collect the milk from local producers and sell the milk in both urban and non-urban areas, which handles 65-70% of the national milk production. In the organized dairy industry, the cooperative milk processors have 60% market share. The cooperative dairies process 90% of the collected milk as liquid milk, whereas the private dairies process and sell only 20% of the milk collected as liquid milk and 80% for other dairy products. In spite of being the largest milk producer, India is a very minor player in the world market of milk and milk products. As per the EXIM policy announced in April 2000, the Union Government has allowed free import and export of most dairy products. Indigenous milk products and desserts are becoming popular with the ethnic population spread all over the world. Therefore, the export demand for these products will increase. As the world is getting integrated into one market, quality certification is becoming essential in the market. All dairy plants, including private players are going for ISO certification of the dairy plants which involves adoption of high standards of hygiene, training of staff, taking into account the environment too. Some of the challenges that Indian dairy industry will have to face include clean milk production, preservation of raw milk, adoption of newer processing methods, mechanization of indigenous dairy based products, new product development life extension of perishable foods, storage and packaging technologies, promoting export of dairy products, energy saving, environment-friendly effluent treatment methods, reducing carbon foot print and so on. Though India is 'Numero Uno' in milk production, we need to upgrade the quality of milk produced (mainly from the villages) and need to avoid the wastage from spoilage of the perishable dairy commodities. We have to compete in the global market, especially with the advent of "Foreign Direct Investment" (FDI).

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Importance of livestock in general and dairying in particular hardly needs emphasis in a country like India. Dairying is one of the important sub-sectors of agriculture, next only to field crops (Saxena, et al., 2002). Dairy sector in India provides regular employment to 9.8 million people in principal status and 8.6 million people in subsidiary status, which together constitute about 5 per cent of total workforce (Kadirvel, 2004). In the Indian context of poverty and malnutrition, milk has a special role to play for its many nutritional advantages as well as providing supplementary income to some 70 million farmers in over five lakh remote villages.

The Indian dairy sector contributes a large share in the agricultural Gross Domestic Product (GDP). The contribution of agriculture and allied sectors to the national GDP has declined during the last few decades (from 34.72 per cent in 1980-81 to 11.84 per cent in 2012-13 at constant price of 2004-05), the contribution of livestock sector has decreased from 4.82 per cent in 1999-2000 to 3.46 per cent in 2012-13. The livestock sector alone has contributed to 29.20 per cent of the total value of agriculture gross domestic product in 2012-13. This has increased gradually from 13.88 per cent in 1980-81. The dairy sector in India has shown remarkable development in the past decade and India has now become one of the largest producers of milk and value-added milk products in the world. However, India has a negligible share in world trade in livestock products. During the 1990-91, the value of dairy product exports was Rs. 248.93 lakhs per annum, which was less than 1 per cent of the total export earnings. Therefore, an attempt has been made in this paper to study the scope of export of dairy products from India..

**Methodology**

The study is based on secondary data obtained from various issues of Basic Animal Husbandry Statistics, MoA, GoI and Agricultural and Processed Food Products Export Development Authority (www.apeda.com), etc. Besides tabular analysis, the compound growth rates of production and export were calculated by using semi-log function and Degree of Diversification.

***Degree of Diversification***

The Herfindahl Index (HI) was used to measure the degree of diversification based on the shares of various importing countries in India's total dairy products export at a point of time. The index was computed by taking the sum of the squares of the proportion of each importing country (Hirsch and Lev 1971). Algebraically,

$$HI = \sum_{i=1}^{n} P_i^2 \quad i = 1,2, \ldots, n.$$

where:

Pi = proportion of ith country in India's total dairy export, and

n = number of all importing countries.

**Results and Discussion**

**Trends in Milk Production**

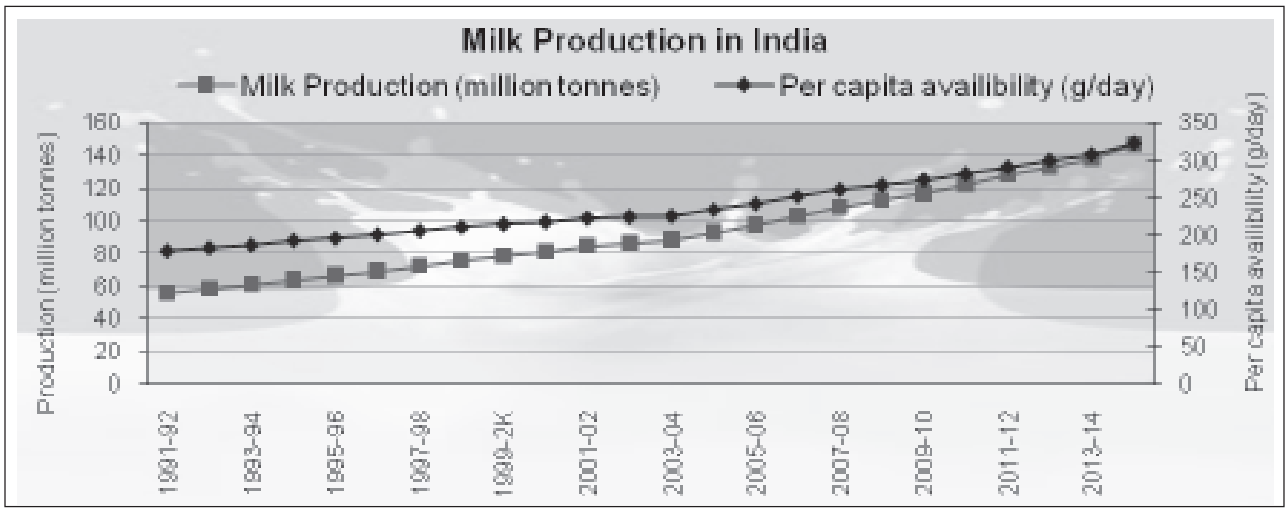
India ranked first in milk production, accounting for 18.5 % of world production, achieved an annual output of 146.3 million tonnes in milk production during 2014-15 as compared to 137.69 million tonnes during 2013-14 and recorded a growth of 6.26 per cent ( Table 1 and Fig. 1). Whereas, the Food and Agriculture Organization (FAO) has reported a 3.1 per cent increase in world milk production from 765 million tonnes in 2013 to 789 million tones in 2014. The per capita availability of milk in India has increased from 176 grams per day in 1990-91 to 322 grams per day by 2014-15. It is more than the world average of 294 grams per day during 2013. This represents a sustained growth in availability of milk and milk products for growing population. Dairying has become an important secondary source of income for millions of rural households engaged in agriculture. The success of the dairy industry has resulted from the integrated co-operative system of milk collection, transportation, processing and distribution, conversion of the same to milk powder and products, to minimize seasonal impact on suppliers and buyers, retail distribution of milk and milk products, sharing of profits with the farmer, which are ploughed back to enhance productivity and needs to be emulated by other farm produce/producers.

TABLE 1: Production and Per Capita Availability of Milk in India (1991-2014)

| Year | Production (Million tonnes) | Annual Growth (%) | Per Capita Availability (gms/day) |
|---|---|---|---|
| 1990-91 | 53.9 | - | 176 |
| 1991-92 | 55.6 | 3.15 | 178 |
| 1992-93 | 58 | 4.32 | 182 |
| 1993-94 | 60.6 | 4.48 | 186 |
| 1994-95 | 63.8 | 5.28 | 192 |
| 1995-96 | 66.2 | 3.76 | 195 |
| 1996-97 | 69.1 | 4.38 | 200 |
| 1997-98 | 72.1 | 4.34 | 205 |
| 1998-99 | 75.4 | 4.58 | 210 |
| 1999-2K | 78.3 | 3.85 | 214 |
| 2000-01 | 80.6 | 2.94 | 217 |
| 2001-02 | 84.4 | 4.71 | 222 |
| 2002-03 | 86.2 | 2.13 | 224 |
| 2003-04 | 88.1 | 2.20 | 225 |
| 2004-05 | 92.5 | 4.99 | 233 |
| 2005-06 | 97.1 | 4.97 | 241 |
| 2006-07 | 102.6 | 5.66 | 251 |
| 2007-08 | 107.9 | 5.17 | 260 |
| 2008-09 | 112.2 | 3.99 | 266 |
| 2009-10 | 116.4 | 3.74 | 273 |
| 2010-11 | 121.8 | 4.64 | 281 |
| 2011-12 | 127.9 | 5.01 | 290 |
| 2012-13 | 132.4 | 3.52 | 299 |
| 2013-14 | 137.7 | 4.00 | 307 |
| 2014-15 | 146.3 | 6.26 | 322 |

*Source*: Various issues of Basic Animal Husbandry Statistics, MoA,GoI

**FIGURE 1: Year Wise Milk Production and per capita availability in India (1991-2014)**




The National Dairy Development Board (NDDB), the main agency behind the co-operative dairy movement in India, is now actively seeking joint ventures and financial participation from the private sector including foreign investment for production of milk and milk products in India. Concerted efforts have been made by the Central Government in the field of cattle development. Facilities have been created in the cooperative/public sector to convert surplus milk into milk powder during the flush season. Certain facilities for manufacture of milk products have also developed in private sector.

**Plan wise Outlay and Expenditure under Dairying**

One of the indicators of a sector's importance is the budget allocation to that sector. The allocation of funds in almost all the Five Year Plan Schemes for development of animal husbandry activities has been insignificant. The plan outlay (at current prices) of central and centrally sponsored schemes under animal husbandry and dairying has increased from Rs. 22 crore in the First Plan to Rs. 1715.41 crore in the Tenth plan and Rs 5450.53 crore in the eleventh Plan ( Table 2). The outlay for dairying increased from Rs. 781 crore in the First Plan to Rs. 900 crore in the Eighth Plan and then declined in the Eleventh to Rs. 580 crore (at current prices). Although the dairy sector occupies a pivotal position and its contribution to the agricultural sector is the highest, the plan investment made so far does not appear commensurate with its contribution and future potential for growth and development. The strength of the dairy sector lies in the fact that inspite of limited investment, it has shown consistent and sustainable growth.

TABLE 2 : OUTLAY AND EXPENDITURE OF CENTRAL AND CENTRALLY SPONSORED SCHEMES UNDER ANIMAL HUSBANDRY AND DAIRYING SECTOR FROM FIRST PLAN - ALL INDIA

| | Total Plan | Animal Husbandry | | Dairy Development | | Total (AH & DD) | |
|---|---|---|---|---|---|---|---|
| | Outlay | Outlay | Exp. | Outlay | Exp. | Outlay | Exp. |
| First Plan (1950) | 1960 | 14.19 | 8.22 | 7.81 | 7.78 | 22 | 16 |
| Second Plan | 4600 | 38.5 | 21.42 | 17.44 | 12.05 | 55.94 | 33.47 |
| Third Plan (1960) | 8576.5 | 54.44 | 43.4 | 36.08 | 33.6 | 90.52 | 77 |
| Annual Plan | 6625.4 | 41.33 | 34 | 26.14 | 25.7 | 67.47 | 59.7 |
| Fourth Plan (1967) | 15778.8 | 94.1 | 75.51 | 139 | 78.75 | 233.1 | 154.26 |
| Fifth Plan | 39426.2 | - | 178.43 | - | - | 437.54 | 232.46 |
| Sixth Plan (1980) | 97500 | 60.46 | 39.08 | 336.1 | 298.34 | 396.56 | 337.42 |
| Seventh Plan | 180000 | 165.19 | 102.35 | 302.75 | 374.43 | 467.94 | 476.78 |
| Annual Plan | - | 43.71 | 36.18 | 79.67 | 41.43 | 123.38 | 77.61 |
| Annual Plan | - | 57.97 | 43.28 | 97.49 | 77.99 | 155.46 | 121.27 |
| Eighth Plan (1992) | 434100.1 | 400 | 305.43 | 900 | 818.05 | 1300 | 1123.48 |
| Ninth Plan (1997) | 1677.88 | 772.02 | 445.84 | 251.95 | 146.85 | 1023.97 | 592.69 |
| Tenth Plan (2002) | 2500 | 1425.87 | 1421.89 | 289.54 | 285.79 | 1715.41 | 1707.68 |
| Eleventh Plan | 8174 | 4870.53 | 2330.8 | 580 | 576.31 | 5450.53 | 2907.11 |

*Source*: Plan Co-ordination Unit, Deptt. of Animal Husbandry, Dairying & Fisheries

**Trade in Dairy Products**

India is the world's largest and the fastest growing market for milk and milk products. Today, India is 'The Oyster' of the global dairy industry. The Indian dairy industry is rapidly growing, trying to keep pace with the galloping progress around the world. Despite being the world's largest milk producing nation , India is producing enough milk and milk products to feed its growing population. As on today, it has little dairy surpluses for export and is an insignificant player in the world dairy product trade. However, India has turned out to be the net exporter of dairy product since 1990s, exporting primarily skimmed milk powder (SMS), ghee, butter, milk and other products. It exported 90131.33 MT of dairy products in 2014-15 as compared to 622.04 MT in 1990-91 as depicted in Table 3. Export earnings from dairy products increased to Rs.167690.3 lakhs in 2014-15 as compared to about Rs. 248.93 lakhs in 1990-91 showing an annual growth rate of about 22.74 per cent. The maximum quantity of dairy products was exported in the year 2013-14 ( 159228.5MT ) and earned foreign exchange of Rs 331857.4 lakh. Further, a wide fluctuation was observed in quantity of dairy products exported during the study period.

Although import demand for dairy product has dried up, after the abolition of dairy produce quota by European Union, the imposition of an EU ban on exports to the soviet Union and significantly lower demand from China has led to a glut of milk products in the international markets.

India has a comparative advantage in milk product trade and has been exporting milk products to deficient neighboring countries such as Bangladesh, Pakistan, Nepal, Bhutan and Afghanistan and to the UAE, South East Asia and Africa. It can look forward to continue access in these markets for its dairy products in the medium term.

TABLE 3: Export of Dairy Products from India

| Year | Qty in MT | Annual Growth (%) | Value in Rs. Lacs | Annual % Change |
|---|---|---|---|---|
| 1990-91 | 622.04 | - | 248.93 | - |
| 1991-92 | 2643.42 | 324.95 | 1124.34 | 351.66 |
| 1992-93 | 1091.93 | -58.69 | 835.94 | -25.65 |
| 1993-94 | 1940.06 | 77.67 | 1150.57 | 37.64 |
| 1994-95 | 8837.2 | 355.51 | 3845.08 | 234.19 |
| 1995-96 | 4190.79 | -52.58 | 2627.07 | -31.68 |
| 1996-97 | 1437.67 | -65.69 | 1206.62 | -54.07 |
| 1997-98 | 1626.25 | 13.12 | 970.18 | -19.60 |
| 1998-99 | 959.57 | -40.99 | 635.18 | -34.53 |
| 1999-00 | 4210.17 | 338.76 | 2762.97 | 334.99 |
| 2000-01 | 9528.37 | 126.32 | 7569.7 | 173.97 |
| 2001-02 | 21548.74 | 126.15 | 16431.62 | 117.07 |
| 2002-03 | 14775.35 | -31.43 | 10046.1 | -38.86 |
| 2003-04 | 8918.38 | -39.64 | 8710.16 | -13.30 |
| 2004-05 | 42160.06 | 372.73 | 35869.23 | 311.81 |
| 2005-06 | 75551.39 | 79.20 | 67668.25 | 88.65 |
| 2006-07 | 45371.84 | -39.95 | 43457.8 | -35.78 |
| 2007-08 | 69415.44 | 52.99 | 86656.36 | 99.40 |
| 2008-09 | 70146.77 | 1.05 | 98086.06 | 13.19 |
| 2009-10 | 34379.97 | -50.99 | 40268.39 | -58.95 |
| 2010-11 | 37435.87 | 8.89 | 54797.37 | 36.08 |
| 2011-12 | 25639.51 | -31.51 | 28935.68 | -47.20 |
| 2012-13 | 87824.21 | 242.53 | 141209.8 | 388.01 |
| 2013-14 | 159228.5 | 81.30 | 331857.4 | 135.01 |
| 2014-15 | 90131.33 | -43.39 | 167690.3 | -49.47 |

*Source*: DGCIS

**Direction of India's Dairy Export**

There are five countries importing Indian dairy products in large quantities, namely,Bangladesh, UAE, Nepal, Philippines, and Singapore. The remaining importing countries are pooled under the 'others' category. The percentage shares of these top 5 importers of dairy products from India are reported in Table 4. The table shows that most of the Indian dairy products go to the Bangladesh and Nepal. The UAE and Singapore have experienced a gain in their importance as destinations for Indian dairy products. In 2014-15, these top 5 importers accounted for about 60.54 percent of India's total dairy export. Their relative shares were as follow: Nepal (25.71%), Bangladesh (16.49%), UAE (9.12%), Singapore (6.45%), and Philippines (2.78%).

TABLE 4: COUNTRY-WISE OF EXPORT OF DAIRY PRODUCTS FROM INDIA

(Qty In MT; Value in Crore)

| Product: Dairy Products | 2010-11 | | 2011-12 | | 2012-13 | | 2013-14 | | 2014-15 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Qty | Value | Qty | Value | Qty | Value | Qty | Value | Qty | Value |
| Bangladesh | 4979.66 | 64.92 | 68.21 | 1.77 | 17869.63 | 259.11 | 31482.15 | 637.42 | 14860.06 | 326.63 |
| UAE | 5845.35 | 94.79 | 4036.08 | 93.65 | 7026.47 | 142.82 | 12713.2 | 305.66 | 8216.64 | 244.37 |
| Nepal | 3058.7 | 44.03 | 12002.66 | 35.03 | 3282.13 | 30.93 | 7729.45 | 69.23 | 23176.06 | 143.49 |
| Philippines | 2363.84 | 29.53 | 146.15 | 3.24 | 2191.48 | 41.78 | 2363.81 | 55.83 | 2499.62 | 64.68 |
| Singapore | 2560.66 | 19.7 | 3062.65 | 25.97 | 5682.56 | 69.3 | 6151.7 | 89.74 | 5816.4 | 61.03 |
| Top 5 Total | 18808.21 | 252.97 | 19315.75 | 159.66 | 36052.27 | 543.94 | 60440.31 | 1157.88 | 54568.78 | 840.2 |
| Other Countries | 18627.66 | 295 | 6323.76 | 129.7 | 51771.94 | 868.16 | 98788.2 | 2160.69 | 35562.55 | 836.7 |
| Total | 37435.87 | 547.97 | 25639.51 | 289.36 | 87824.21 | 1412.1 | 159228.5 | 3318.57 | 90131.33 | 1676.9 |
| % Share of Top 5 Countries | 50.24 | 46.16 | 75.34 | 55.18 | 41.05 | 38.52 | 37.96 | 34.89 | 60.54 | 50.10 |

**Dairy Export Market Diversification**

The trend in the degree of diversification of India's dairy products export markets was worked out using the Herfindahl index. This measure was derived based on the shares of the first 5 leading importing countries in total export, over the period 2010-15. The results presented in Table 5 showed that the Herfindahl index exhibited an increasing trend. It has increased from 0.06 in 2010-11 to 0.11 in 2014-2015, representing an 85 percent increase. On the average, the value of the Herfindahl index increased from 0.06 during 2010-11 to 0.26 during to 2011-12, or a drop of 58 percent from 2011-12 to 2014-15. It means that India's dairy export has experienced an increase in the degree of export market diversification. However, the level of export market diversification is still moderate.

TABLE 5: TREND IN DEGREE OF INDIA'S DAIRY EXPORT DIVERSIFICATION

| Year | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | % Change during 2014-15 over 2010-11 |
|---|---|---|---|---|---|---|
| Herfindahl index | 0.06 | 0.26 | 0.05 | 0.05 | 0.11 | 85.57 |

The composition and value of the export of different dairy products from India in terms of value and as a share of total dairy export during from 2004-05 to 2013-14 is shown in Table 6. The export of skimmed milk, butter, ghee, cheese and curd, whey, whole milk, and other dairy products have gone up considerably in value terms during the last ten years. During the period from 2004-05 to 2013-14, the average annual value of India's dairy export has increased more than five times, from USD 79.94 million to USD 546.15 million. The value of export of Skimmed milk in the country has increased by 839 per cent during last ten year, i.e., from 45.7 million USD in 2004-05 to 429.16 million USD in 2013-14 followed by butter (553.33 per cent) which increased from 1.95 million USD to 12.74 million USD. The value of export of ghee and whole milk has also increased by 282.06 and 466.46 per cent, respectively. The highest value of export of cheese and curd has increased by 1747.89 percent and negative value of export in whey about (-)81.77 per cent during the same period. However, there were fluctuations in the export of different dairy products over the years. In 2004-05, skimmed milk (57.17%), ghee (9.83%), whole milk (4.07%),butter(2.44 %), whey (2.40 %), cheese and curd (0.89 ) and other milk products (23.20%) constituted a major share of export of dairy products. On the other hand, during the year 2013-14, the share of skimmed milk in India's total dairy export was highest (78.58 %), followed by ghee (5.50%), whole milk (3.37 %), cheese and curd (2.40 %), butter (2.33 %), whey (0.06 %) and other dairy products (7.75%). Over the period under study, the Indian dairy export basket has been diversified.

TABLE 6: VALUE OF EXPORT OF MAJOR DAIRY PRODUCTS FROM INDIA( MILLION USD)

| Commodity | Skimmed Milk | Ghee | Cheese and Curd | Whey | Whole Milk | Butter | Other dairy Product | Total Dairy Product |
|---|---|---|---|---|---|---|---|---|
| 2004-2005 | 45.7 | 7.86 | 0.71 | 1.92 | 3.25 | 1.95 | 18.55 | 79.94 |
| | (57.17) | (9.83) | (0.89) | (2.40) | (4.07) | (2.44) | (23.20) | (100) |
| 2005-2006 | 80.36 | 11.68 | 2.33 | 3.74 | 19.73 | 6.72 | 28.28 | 152.84 |
| | (52.58) | (7.64) | (1.52) | (2.45) | (12.91) | (4.40) | (18.50) | (100) |
| 2006-2007 | 59.89 | 9.18 | 2.36 | 4.35 | 2.72 | 1.24 | 16.65 | 96.39 |
| | (62.13) | (9.52) | (2.45) | (4.51) | (2.82) | (1.29) | (17.27) | (100) |
| 2007-2008 | 113.77 | 18.8 | 7.73 | 14.04 | 5.89 | 14.46 | 39.45 | 214.14 |
| | (53.13) | (8.78) | (3.61) | (6.56) | (2.75) | (6.75) | (18.42) | (100) |
| 2008-2009 | 86.21 | 33.35 | 10.58 | 3.96 | 23.01 | 26.39 | 29.78 | 213.28 |
| | (40.42) | (15.64) | (4.96) | (1.86) | (10.79) | (12.37) | (13.96) | (100) |
| 2009-2010 | 29.25 | 17.51 | 8.14 | 1 | 2.31 | 4.22 | 22.52 | 84.95 |
| | (34.43) | (20.61) | (9.58) | (1.18) | (2.72) | (4.97) | (26.51) | (100) |
| 2010-2011 | 33.87 | 32.9 | 8.14 | 2.34 | 4.99 | 21.32 | 16.66 | 120.22 |
| | (28.17) | (27.37) | (6.77) | (1.95) | (4.15) | (17.73) | (13.86) | (100) |
| 2011-2012 | 0.01 | 32.93 | 9.42 | 0.26 | 0.25 | 7.65 | 9.81 | 60.33 |
| | (0.02) | (54.58) | (15.61) | (0.43) | (0.41) | (12.68) | (16.26) | (100) |
| 2012-2013 | 199.67 | 27.8 | 14.04 | 1.48 | 0.16 | 4.58 | 12.03 | 259.76 |
| | (76.87) | (10.70) | (5.40) | (0.57) | (0.06) | (1.76) | (4.63) | (100) |
| 2013-2014 | 429.16 | 30.03 | 13.12 | 0.35 | 18.41 | 12.74 | 42.34 | 546.15 |
| | (78.58) | (5.50) | (2.40) | (0.06) | (3.37) | (2.33) | (7.75) | (100) |
| % Change during 2013-14 over 2004-05 | 839.08 | 282.06 | 1747.89 | -81.77 | 466.46 | 553.33 | 128.25 | 583.20 |

*Note*: Figures in parentheses indicate share in the total dairy export in terms of percentage

Ghee includes butter oil as well

**Export Prospects**

The future of the Indian dairy industry is promising and its growth potential is high as there will be considerable domestic demand and good scope for exports of milk and milk products. For this, we have to increase the productivity of milch animals through technological intervention and quality of milk and milk products on farm and firm level. Regional Comprehensive Economic Partnership (RCEP) is a proposed free trade agreement (FTA) between the 10 member countries of the ASEAN and the 6 countries ( Australia, China, India, Japan, South Korea and New Zealand) with which ASEAN has existing FTAs. To capture the market for milk and milk products overseas, we have to take care of competing countries like New Zealand and Australia, whose cost of milk production is similar to us. Thus, there is a need to protect domestic dairy sector from other competing countries through appropriate policy reforms .

**Conclusion**

The production of milk and its per capita availability has increased during the period from the year 1991 to 2015.The exports of dairy products from India are also increasing over the years. It exported 90131.33metric tones of dairy products in 2014-15 as compared to 622.04 MT in 1990-91. Export earnings from dairy products increased to Rs.167690.3 lakhs in 2014-15 as compared to about Rs. 248.93 lakhs in 1990-91 showing an annual growth rate of about 22.74 per cent. The maximum quantity of dairy products was exported in the year 2013-14 ( 159228.5 MT ) and earned foreign exchange of Rs 331857.4 lakh. Further, a wide fluctuation was observed in quantity of dairy products exported during the study period. Most of the Indian dairy products are exported to Bangladesh and Nepal. The value of dairy export product has increased during the study period. The share of skimmed milk in India's dairy export was highest (78.58 %), followed by ghee (5.50%), whole milk (3.37 %), cheese and curd (2.40 %), butter (2.33 %), whey (0.06 %) and other dairy products ( 7.75 ). The total export value of dairy product has increased from 79.94 million USD in the year 2004-05 to 546.15 million USD in the year 2013-14, showing a considerable progress in exports of dairy products. The Asian countries are the major destination for exports. At present, India's share in international trade is very limited. Though we have comparative advantage in dairy product trade such as higher quantum of production and lower cost of production than many other countries but suitable policy support is required to further increase our exports.

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# Efficient Solution in Common Canal Irrigation

SUKUMAR SARKAR*

**Abstract**

Policies of successful conservation of natural resources generally assume that community of resource users will organize and take care of the essential management. Evidence with collaborative management programs shows that this does not occur effectively. Allocative inefficiency results in the tragedy of commons in canal irrigation. Moreover, canal water being a sequential common pool resource, the external cost of water extraction is mostly felt by the downstream users. There are some internal or social solutions and external or governmental solution of water allocation. This study shows that internal policies bring in significantly efficiency improvement. It shows that the water left by the head-enders to the tail-enders significantly depends on socio-economic factors. The most interesting finding is that village-wise efficacy varies significantly. We found that in a village with strong interaction among inhabitants, mutual understanding appears to be the most equitable policy. Thus, the existing canal tax policy is sub-optimal in terms of achieving efficiency and equity, and more importantly, the contextual policy might be equity-promoting.

*Keywords*: Canal irrigation, Common pool resources, Conflict, Efficiency, Solution.

**Introduction**

The decentralization of management and control over natural resources from central agencies to resource-user groups has become an extensive policy trend that cuts across nations and natural resource sectors, embracing water (especially irrigation), forests and fisheries. Such management program is known as Community-based Natural Resource Management (CBNRM) and varies from those that simply try to increase users' participation in management as an alternative to state management. Analysis of the deficiencies of forestry, fisheries, and irrigation authority of commons (common pool resources, CPRs) in developing and enforcing appropriate rules for conservation of the resources placed under their stewardship have accumulated; and also have studies indicating that local user groups can develop institutions to conserve the natural resources sustainably (Baland and Platteau, 1996; Ostrom, 1992). The relation between these two bodies (state and local community) has challenged the notion that the state is the only, and the best, institution to conserve natural resources. Even if local resource-users who live and work in the area are seen to have a comparative advantage over state agents in monitoring resource use and, because their livelihoods highly depend on the resource, the local resource usages are assumed to have the greatest incentives to sustain the resource base over time. Social capital reduces the costs of working together, it enhances cooperation. Majority of the studies have shown the importance of social capital foundations for sustainable conservation of natural resources, successful policy interventions, and community development (Pretty 2003).

As decentralization trends become prevalent, affecting the management of vast areas of critical water, land, fishery and forest resources as well as the livelihoods of millions of people, it becomes essential to inspect the experience of such management programs. To what extent the visible successes of collaborative management in selected areas have been generalizable as programs have attempted to "scale up" beyond the areas in which users have impulsively organized to conserve their local resources with key investments (in terms of time, cash or kind) in organizing communities to take on an extended responsibility in resource conservation? While in many cases state agencies have been performing these tasks ineffectively, it cannot be assumed therefore that farmers will involuntarily be willing or able to take on those responsibilities. We need to rigorously examine their willingness to become concerned. Recognizing factors that produce incentives for user involvement is significant for developing better programs and efficient implementation of any decentralization policies. This study addresses these issues with an empirical test of participatory canal irrigation management programs in West Bengal, India. Simply looking for officially registered organizations of communities is not adequate, as informal communities may be more effective. Davies et al. (2004) distinguishes between two types of collective actions which are cooperation and coordination. Cooperation implies bottom-up, farmer-to-farmer collective action and coordination mean top-down, agency-led collective action. While a number of bottom-up collective actions may accept government support, others may be carried out without government support. Even if collective action is often linked with activities carried out by formal institutions, according to Ostrom (2004), more attention should be paid to informal collective action, where local

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networks or local groups of people organize and coordinate local action in order to achieve specific short-term purposes. This paper presents evidence on the extent of local people participation in informal organizations and collective maintenance.

The standard solution to the tragedy of the commons is to hand over broad-based property rights, thereby internalizing the externality. When property rights are not easy to impose or when their assignment is politically ineffective, a multitude of direct regulations may arise. A particularly interesting common-pool resource problem arises when resource availability follows in an unidirectional flow, such that usage by upstream producers only imposes externalities on those farther downstream. Social solutions along with governmental solutions may also exist for effective resource conservation. Social pressures may result in some improvements, especially for small groups of economically or ethnically homogeneous users. Therefore, in this study the query is: which policy ensures allocative efficiency?

We examine the effectiveness of solution which farmer usually employs to share water and identify the factors for water sharing among themselves in irrigation systems. In section 2, we discuss the study perspective and hypotheses. The data and methods of this study are described in section 3. Section 4 presents findings on solutions and the effectiveness. In section 5 We look at the outcome of farmer participation in terms of resources mobilized, and conclude the study with a brief summary of findings and implications for devolution programs.

**Study Perspective and Hypotheses**

India has a long history of farmer-managed canal irrigation systems, as well as abundant studies of low irrigation efficiencies and performance deficiencies in the irrigation sector (Chambers, 1988), so long as the state gave priority to funding irrigation systems, suggestions to increase local people involvement as a means of enhancing irrigation performance had little impact on policy (Brewer et al., 1999). The state and national governments considered irrigation as a welfare measure, and kept service fees low. Budget constraints and priorities shifting away from irrigation, from 1990s, neither government subsidies nor foreign funding were sufficient to make up the difference between what was collected as irrigation fees (water rate) and what would be required for sufficient operation and management. In reaction to these pressures, India is now adopting a wide range of policy reforms aimed at increasing farmer involvement in irrigation management. A number of studies have attempted to identify for success in farmer participation in irrigation (and other commons), based on reviews of the case study literature (Baland and Platteau, 1996; Bardhan, 1993). A review of this literature engenders considerable optimism for the potential of decentralization to Water Users' Associations (WUAs) to solve many of the problems of natural resource conservation. A few authors have questioned whether the forms of farmer organization found in small-scale systems would apply to large-scale systems in which the government controls the head works. The outcome on success of participation and decentralization programs is mixed. Analysis of the conditions under which collective action operates, becomes effective, and is sustained over time are of great value in developing programs to increase farmer participation. Ostrom (1992) has developed 'design principles of long-enduring, self-organized irrigation systems.' These focus primarily on the structure and process of self-governing organizations. But under what conditions are we likely to find communities that apply these principles? It is useful to think of critical conditioning factors in terms of the physical, socioeconomic, and policy environment affecting the effectiveness of organization and collective action, which in turn influence the performance of irrigation networks. The environment can facilitate or constrain organization, create incentives or disincentives for people to work together. One major difference in the policy environment between traditional farmer-managed irrigation systems and decentralization contexts is that with devolution, farmers do not operate spontaneously, but within an overall context of continuing state involvement. Hence, user groups are constrained in the extent of institutional autonomy, especially in the ability to set rules. This means that farmers do not do all operation and maintenance activities themselves, but rather share responsibility with state agencies.

Therefore, institutional arrangements in canal irrigation networks are mixed (state and community) in most of the cases. In canal irrigation with unidirectional flow (sequential externality), many of the same potential solutions remain available for the efficient outcome such as indirect form of Coasian marketable resource appropriation rights (Bargaining), Government intervention in the form of exogenous pricing scheme (water rate), informal social arrangements (Mutual understanding), with the involvement of leadership, farmers, in a body, go to the departmental office (section office) and submit appeal for releasing sufficient water from canal (Appeal) and department often distribute the water by way of rotation (Rotation). These policy of water allocation may effectively mitigate the "tragedy" of the commons (Ostrom and Gardner 1993). The water sharing motivation of the farmers depends on some socio-economic factors like family adult member, land size, availability of canal water, distance of the farmer's land from canal and so on. Therefore, the hypothesis of this study are: (i) Existing water rate solution is not a conflict reducing or cooperation enhancing mode. (ii) Water sharing among the households depends more on: land size, availability of canal water, political connections, pro-sociality of households.

**Study site, Data Collection and Method**

We have administered a primary survey considering the canal water user households located in the rural areas of West Bengal between September, 2016 and May 2017 with some intervals. The heads of 163 farming households from seven villages participated randomly in the household surveys.

These villages were Suata, Lakshmiganj, Gonna and Majhergram from the district of Bardhaman. The villages are situated on the Damodar Vally Corporation (DVC) project. In the original project, DVC canal system was designed primarily to provide irrigation in Kharif and Rabi period. Now, the system has started providing irrigation to summer paddy (Boro) also. Shirsi, Salbani and Joyalbhanga are on the Kangshabati project in West Midnapur district of West Bengal. The project though initially planned for Kharif and limited Rabi crops, later on extended for Boro cultivation in an area of 27,944 ha.

***Indicators of efficient canal irrigation:*** There are six types of policies/solutions in canal irrigation: bargaining, mutual understanding, understanding with the involvement of leadership, water rate, collective appeal and rotation. The former 3 policies are considered as social-solution and the latter 3 policies are called governmental-solution for the efficient (equitable, due to homogeneous cropping pattern and land quality) allocation of water. We have collected the data of the policies on a six point qualitative scale where, 1 implies low and 6 implies the best policy for efficiency enhancing for the maximum productivity of the crops. We have also taken the ranking in two phases: abundant (kharif paddy) and scarce water (summer paddy) phase. There are also three types of land holdings: small (less than 2 acre), medium (from 2-5 acre) and large (more than 5 acre). Overall, 14% head of household were unable to complete the ranking or ordering on efficiency basis.

**Measurement of Variables**

In our study, we measure conflict in terms of efficient allocation of canal water. Conflicts are generally directly related with inefficient water allocation among the farmers.

***Bargaining (due to scarce water problem):*** A considerable number of farmers are not cultivating their land mainly due to the water collection problem. Instead they are giving away the use of right of those land to the marginal farmers who pay a price in terms of either kind or cash. The payment depends on the bargaining power between the actual land cultivator and land owners. It varies from ½ (summer crop) to 1/3 (kharif crop) of total yield.

***Mutual understanding:*** Mutual understanding among cultivators may be a way out of water sharing problem. Social network among farmers is important in natural resource management. It promotes the development of and compliance with mutual norms in relation to what is considered acceptable with respect to resource use and extraction (Coleman 1990).

***Leadership:*** A common form of collective action is the adoption of a group authority or, particularly in small group dilemmas, a leader to regulate the provision of common goods (Edney, 1980). We have considered yhe person as a leader ("Mondal/Morol" in the local vocabulary) who may be a rich farmer or may have strong connection with the ruling political party or he may be a natural leader accepted by other farmers.

***Canal tax (water rate):*** According to the West Bengal Irrigation (Imposition of Water Rate) Act, 11th December, 1974 (http://www.wbiwd.gov.in/index.php/applications/canel_act) the state by notification can declare its intention to impose a water rate in such areas. The water rates are Rs. 15/acre and Rs. 50/acre in kharif and summer season, respectively.

***Appeal:*** When the water supply is low and there is a great demand for the same the farmers, in a body, go to the departmental section office and appeal for releasing sufficient water from canal (farmer's deputation).

***Rotation:*** Water (limited supply), being a scares resource, the department often distribute the same by way of rotation, such as, distributing water for two days per week to each village.

***Policy effectiveness in conflict resolution:*** We have collected different types of conflicts related to: resources, users and authority. We have accounted total number of conflicts related to canal water irrigation from the previous five seasons of cultivation and side by side we have also noted the conflict mitigation mechanism. We have distributed the conflicts under the concerned policy treatments and then taken the proportions. We have assumed low (high) proportions are less (more) effective in resolving conflict regarding water allocation.

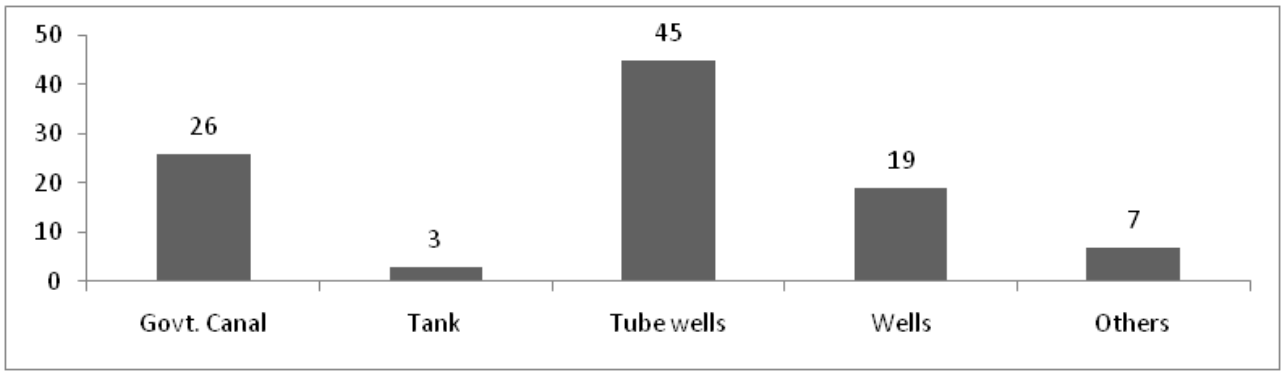
***Pro-sociality indicator:*** We have quantified pro-social indicator on the basis of ten criteria in terms of groups and networks, trust and solidarity, collective action and so on (Neela, 2002). We use a five point Likert-type format (Likert,1932) with the response categories for each indicator ranging from negative (1) to very high (5). Each indicator is given the same weight for the sake of simplicity. The value of pro-sociality indicator ranges from 10 to 50. If the individual sum-total is more than 60%, we consider it as high pro-sociality.

**Statistical Analysis**

We have calculated mean difference of the alternative water allocation solutions (standard error, t statistic and p value) to compare the mean allocative solution of rating and the level of significance. We have also considered chi-squared test, Pearson correlation and logit regression analysis (Stata 14).

## I. Results and Discussion

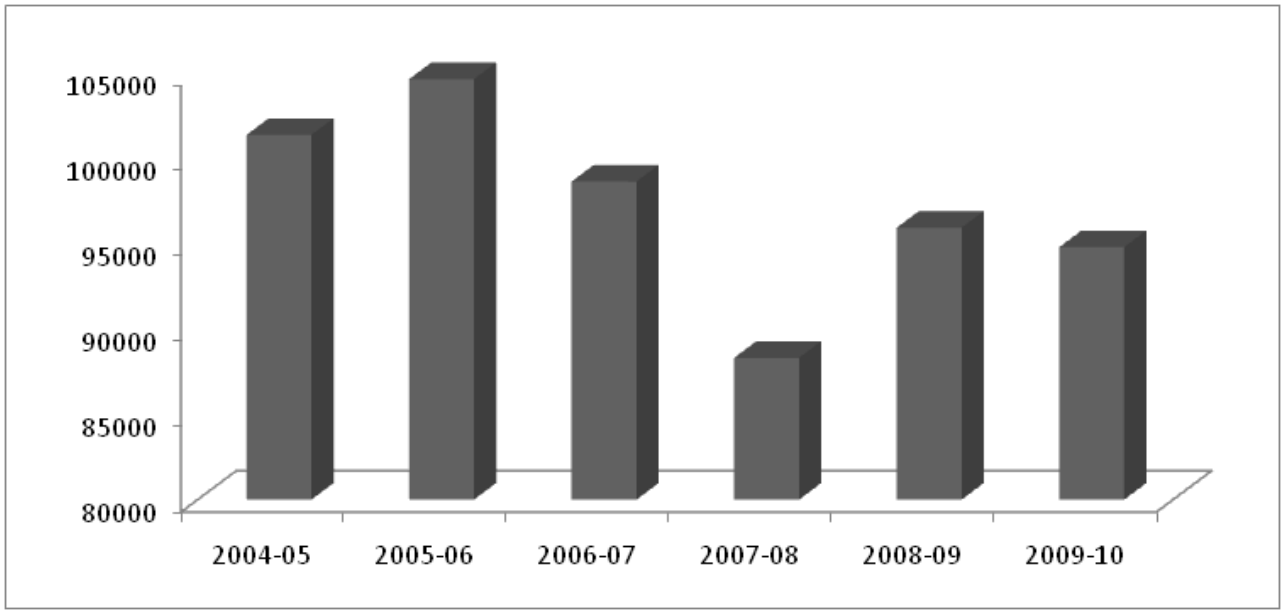
*Figure: 1 Sources of irrigation in India (2010-2011)*




(N.B,. All figures in percentage) Sources: Department of agriculture and cooperation (Agricultural Census 2010-2011)

Figure 1 shows the percentage distribution of water from alternative sources in India.

*Figure: 2 Trend of Government canal irrigation in India (2004-10)*




Source: Directorate of Economics and Statistics (all figures are in hectors).

According to Directorate of Economics and Statistics, canal net irrigated area was falling in India from 101,397 hectors in 2004-05 to 94,813hectors in 2009-10 (Figure 2).

TABLE: 1 Area irrigated by different sources (in thousand hectares)

| Districts | Govt. Canal | Tank | HDTW | MDTW | LDTW | STW | RLI | ODW | Others | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Bardhaman | 245.63 | 0.0 | 7.82 | 0.75 | 11.78 | 0.0 | 12.00 | 0.0 | 0.0 | 277.98 |
| Paschim Midnapur | 19.02* | 26.51 | 9.63 | 66.19 | 2.28 | 103.69 | 14.81 | 6.47 | 19.32 | 267.92 |

*Source*: Government of west Bengal, District Statistical Hand Book, 2010-11. HDTW: High Capacity Deep Tubewell, MDTW: Middle Capacity Deep Tubewell, LDTW: Low Capacity Deep Tubewell, STW: Shallow Tubewell, RLI: River Lift Irrigation, ODW: Open Dug Well. * indicates irrigation suffered due to severe drought situation.

The rate of rainfall also affects the availability in canal water. On an average, rainfall in the districts is around 1400-1500 mm. On an average, there are 70 rainy days in a year (District Statistical Hand Book, 2010-11). Table 1 shows the different alternative sources of irrigation water along with tank water. This table also shows no tank irrigation water in Bardhaman. But, we have found tank irrigated data across the villages from the same source!

The survey district wise distribution of the landholdings is not significantly different (chi-square= 3.75; p value = 0.154; df= 2). We have captured perception in two phases. There is no significant difference in the weights of the landholdings of rural farmer (Chi-square= 0.61; p value = 0.737; df= 2) and the test-retest result is highly correlated (r = 0.971; n= 6 and p value = 0.0012) between two phases of data collections.

TABLE: 2 HOUSEHOLDS, RELATION BETWEEN CANAL IRRIGATED LAND TO TOTAL IRRIGATED LAND IN VILLAGES.

| Name of the Villages | Total households | Total Irrigated land | Canal irrigated land |
|---|---|---|---|
| Gonna[D] | 300 (30) | 301.6 | 183.2 |
| Majhergram[D] | 505 (51) | 285 | 251.1 |
| Suata[D] | 326 (32) | 180,9 | 166.7 |
| Lakhshmiganj[D] | 177 (18) | 192.2 | 123 |
| Shirshi[K] | 122 (12) | 68.2 | 47.1 |
| Salboni[K] | 135 (14) | 16 | 16 |
| Joyalbhanga[K] | 57 (6) | 45 | 20 |

*Sources*: Census report of West Bengal, India, District statistical handbook (2010-2011)

N.B., D stands for Damodar Vally Corporation (DVC) and K stands for Kangsabati Reserver Projeck (KRP). Kangsabati Reservoir Project and Barrage and Irrigation System of DVC are in the district of West Midnapure and Bardhaman respectively. We have mentioned in brackets number of participating farmers in the canal survey.

Table 2 shows the relation between canal command area and total irrigated area is significant (r = 0.949 p = 0.001). Therefore, the result shows that people of the villages are highly dependent on the canal water.

TABLE: 3 OVERALL AND LANDHOLDING-WISE MEAN AND STANDARD DEVIATION OF POLICIES

| Land Size | | Small Landholding | | | Medium Landholding | | | Large Landholding | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Overall | Overall | A | S | Overall | A | S | Overall | A | S |
| Policies | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) | M(SD) |
| Bargaining | 3.90 | 4.48 | 3.99 | 4.97 | 3.93 | 2.97 | 4.89 | 2.53 | 3.97 | 1.10 |
| | (1.26) | (0.66) | (0.40) | (0.48) | (1.10) | (0.40) | (0.65) | (1.50) | (0.41) | (0.40) |
| Mutual interaction | 5.61 | 5.43 | 4.90 | 5.96 | 5.90 | 5.90 | 5.90 | 5.42 | 4.94 | 5.90 |
| | (0.70) | (0.68) | (0.57) | (0.21) | (0.64) | (0.64) | (0.64) | (0.64) | (0.44) | (0.40) |
| Leadership | 4.12 | 4.46 | 5.90 | 3.01 | 3.10 | 4.97 | 1.22 | 5.45 | 5.87 | 5.03 |
| | (1.84) | (1.52) | (0.52) | (0.44) | (2.00) | (0.31) | (0.91) | (0.59) | (0.56) | (0.18) |
| Water rate | 2.77 | 3.52 | 3.09 | 3.96 | 2.06 | 1.13 | 2.98 | 2.56 | 1.10 | 4.03 |
| | (1.22) | (0.63) | (0.61) | (0.21) | (1.07) | (0.68) | (0.28) | (1.53) | (0.40) | (0.41) |
| Appeal | 2.51 | 2.01 | 1.97 | 2.04 | 3.05 | 4.02 | 2.08 | 2.53 | 3.10 | 1.97 |
| | (0.89) | (0.33) | (0.17) | (0.44) | (1.03) | (0.13) | (0.45) | (0.78) | (0.75) | (0.18) |
| Rotation | 2.09 | 1.11 | 1.16 | 1.06 | 2.96 | 2.02 | 3.90 | 2.50 | 2.03 | 2.97 |
| | (1.15) | (0.51) | (0.66) | (0.29) | (1.02) | (0.22) | (0.47) | (0.62) | (0.41) | (0.41) |

(N.B., A stands for abundant water scenario and S stands for scarce water scenario.)

Table 3 indicates mutual understanding as best effective solution and rotation is the worst effective one. The table points out that that overall mutual understanding and leadership (-0.49*** (0.154)), leadership and bargaining (-0.220(0.174)), bargaining and water rate (-1.130*** (0.137)), water rate and appeal (-0.26** (0.118)) and appeal and rotation (-0.42*** (0.114)) are significantly different in mean rating. In the case of the farmers of small and medium land holdings, farmer mutual interaction appears most effective solution for water allocation. The farmers with large land holding perceived leadership as the most efficient solution for water allocation.

TABLE: 4 POLICY WISE MEAN DIFFERENCES BETWEEN THE TWO LAND HOLDER GROUPS

| Land Size | Bargaining | Mutual interaction | Leadership | Water rate | Appeal | Rotation |
|---|---|---|---|---|---|---|
| (Small-Medium) | -0.55***(0.16) | 0.47***(0.12) | -1.36***(0.31) | -1.46***(0.15) | 1.04***(0.13) | 1.85***(0.14) |
| (Medium -Large) | -1.4***(0.27) | -0.48***(0.14) | 2.35***(0.37) | 0.5*(0.27) | -0.52**(0.21) | -0.46**(0.20) |
| (Large- Small) | -1.95***(0.22) | -0.01(0.14) | 0.99***(0.28) | -0.96***(0.22) | 0.52***(0.11) | 1.39***(0.12) |

(N.B., *, **, *** indicates coefficients that are significant at the 10%, 5% and 1% level or below.)

This table 4 shows that policy wise mean differences between Small &Medium, Medium &Large and Large & Small. This implies that different size of land holdings matter significantly in the effectiveness of solutions. Only the mutual understanding solution is not significantly different between large and small land holding. In all other solutions, they are significantly different between any two land sizes.

TABLE: 5 COMPARISONS OF POLICIES BETWEEN SOCIAL AND GOVERNMENTAL SOLUTIONS

| Land Size | Water | Bargaining to External | | | Mutual understanding to External | | | Leadership to External | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scenario | (B - W) | (B - A) | (B - R) | (M- W) | (M- A) | (M- R) | (L -W) | (L-A) | (L- R) |
| Small | Abundant | -0.90*** | -2.02*** | -2.83*** | -1.81*** | -2.93*** | -3.74*** | -2.81*** | -3.93*** | -4.74*** |
| | | (0.09) | (0.05) | (0.09) | (0.10) | (0.07) | (0.10) | (0.10) | (0.07) | ( 0.10) |
| | Scarce | -1.10*** | -2.93*** | -3.91*** | -2*** | -3.92*** | -4.90*** | 0.95*** | -0.97*** | -1.95*** |
| | | (0.06) | (0.08) | (0.07) | (0.04) | (0.06) | (0.04) | (0.06) | (0.08) | (0.06) |
| Medium | Abundant | -1.84*** | 1.05*** | -0.95*** | -4.77*** | -1.88*** | -3.88*** | -3.84*** | -0.95*** | -2.95*** |
| | | (0.10) | (0.05) | (0.06) | (0.19) | (0.08) | (0.09) | (0.09) | (0.04) | (0.05) |
| | Scarce | -1.91*** | -2.81*** | -0.99*** | -2.92*** | -3.82*** | 2*** | 1.76*** | 0.86*** | 2.68*** |
| | | (0.09) | (0.10) | (0.10) | (0.09) | (0.10) | (0.10) | (0.12) | (0.13) | (0.13) |
| Large | Abundant | -2.87*** | -0.87*** | -1.95*** | -3.84*** | -1.84*** | 2.91*** | -4.77*** | -2.77*** | -3.84*** |
| | | (0.10) | (0.15) | (0.10) | (0.11) | (0.16) | (0.11) | (0.12) | (0.17) | (0.16) |
| | Scarce | 2.93*** | 0.87*** | 1.87*** | -1.87*** | -3.93*** | -2.93*** | -1.00*** | -3.06*** | -2.06*** |
| | | (0.10) | (0.08) | (0.10) | (0.10) | (0.08) | (0.10) | (0.08) | (0.05) | (0.08) |

(N.B., *, **, *** indicates coefficients that are significant at the 10%, 5% and 1% level or below.)

If we classify the policies in two categories such as policy choice by the farmer or social solution (bargaining, mutual understanding and leadership) and policy choice by the waterways department or governmental solution (appeal, rotation and water rate) we see that village level policy choice by the farmer was significantly efficiency enhancing than the policy choice imposed by the department.

TABLE: 6 POLICY EFFECTIVENESS UNDER AVAILABLE AND SCARCE WATER SCENARIO

| Policies | Small Landholding (Abundant - Scare) | Medium Landholding (Abundant - Scare) | Large Landholding (Abundant - Scarce) |
|---|---|---|---|
| Bargaining | 0.98***(0.75) | 1.92***(0.09) | -2.87***(0.10) |
| Mutual interaction | 1.06***(0.07) | 0(0.11) | 0.96***(0.11) |
| Leadership | -2.89***(0.08) | -3.75***(0.12) | -0.84***(0.11) |
| Water rate | 0.87***(0.07) | 1.85***(0.09) | 2.93***(0.10) |
| Appeal | 0.07(0.05) | -1.94***(0.05) | -1.13***(0.13) |
| Rotation | -0.1(0.08) | 1.88***(0.06) | 0.94***(0.10) |

(N.B., *, **, *** indicates coefficients that are significant at the 10%, 5% and 1% level or below.)

In case of small land holding, appropriateness of the policy in the available water scenario is significantly different from the scarce water scenario (table 6). This is also true in the case of the farmers of medium and large land holdings. Availability of water is a factor for effective implementation of a policy. The effectiveness of the policy of bargaining is significantly different in abundant and scarce water scenario. Therefore, the choice of policy depends upon the level of water available in the canal.

In the Logit model, if Pi be the probability of effective pro-social motivation (the upstream user motivates to leave water to the downstream user), then (1 - Pi) will be the probability of pro-social motivation which is not effective. Now Pi/(1 - Pi) is simply the odds ratio in favor of effective pro-social motivation. A natural log of the odds ratio will provide the following result $L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_i$. It shows that the log of odds ratio is not only linear in X, but also linear in the parameters. This is known as Logit, and hence, the name Logit Model has been given for such class of models.

TABLE 7 DESCRIPTION OF DEPENDANT AND INDEPENDENT VARIABLE

| Variables | Description/measurement | Mean | SD |
|---|---|---|---|
| Pro-social motivation: The amount of water left to the downstream user (PSM). | Positive motivation for the left of water=1; otherwise=0 | 0.30 | 0.46 |
| Pro-sociality (PS) | High social capital=1; otherwise=0 | 0.62 | 0.49 |
| Family able-bodied individual (FAI). | Less or equal 3=1; more than 3=0 | 0.58 | 0.50 |
| Availability of ground water (AGW). | If the availability of ground water=1; otherwise=0. | 0.15 | 0.36 |
| Land size (LS). | Less or equal 1 acre =1; more than 1acre=0 | 0.13 | 0.34 |
| Canal water availability (CWA). | If the canal water is abundant=1; scarce=0. | 0.52 | 0.50 |
| Distance from the source (DFS). | Head-ender =1; tail-ender =0 | 0.30 | 0.46 |
| Caste (C). | If the household belongs to upper caste=1; in case of lower caste=0 | 0.19 | 0.40 |
| Member of the ruling party as leader (MRP). | If the household is the supporter of the ruling party.=1; otherwise=0 | 0.12 | 0.33 |
| Household type (HT). | Dummy variable, =1 if the household male headed, otherwise=0 | 0.65 | 0.48 |
| Non-farm income (NFI). | Household's annual income from agriculture=1; non-agriculture=0 | 0.26 | 0.44 |

Now, in our study the logit model appears as -

$$LOGIT\,(PSM) = \ln = \left(\frac{P_i}{1-P_i}\right) \beta_1 + \beta_2\,(PS) + \beta_3\,(FAI) + \beta_4\,(AGW) + \beta_5\,(LS) + \beta_6\,(CWA) + \beta_7\,(DFS) + \beta_8\,(C) + \beta_9\,(MRP) + \beta_{10}\,(HT) + \beta_{11}\,(NFI) + u_i$$

$\beta$ i stands for coefficient of the ith variable ( i=1…..11) and ui is the random disturbance term.

TABLE: 8 LOGIT ESTIMATES WITH DEPENDENT VARIABLE: PRO-SOCIAL MOTIVATION; THE AMOUNT OF WATER LEFT TO THE DOWNSTREAM USER.

| Variable | Coefficient | Robust Standard. Error. | Marginal effect |
|---|---|---|---|
| Pro-sociality (PS) | 2.31*** | 0.76 | 0.299 |
| Family able-bodied individual (FAI). | 0.85 | 0.77 | 0.122 |
| Availability of ground water (AGW). | -0.88 | 1.06 | -0.107 |
| Lnd size (LS). | -11.85*** | 1.04 | -0.507 |
| anal water availability (CWA). | 0.91* | 0.49 | 0.135 |
| Distance from the source (DFS). | -1.22** | 0.59 | -0.156 |
| Caste (C). | -0.71 | 0.57 | -0.092 |
| Member of the ruling party as leader (MRP). | 15.97*** | 1.35 | 0.969 |
| Household type (HT). | 0.15 | 1.07 | 0.021 |
| Non-farm income (NFI). | 0.52 | 0.50 | 0.085 |
| constant | -3.92*** | 0.95 | |

*(N.B.,*, **, *** indicates coefficients that are significant at the 10%, 5% and 1% level or below.)* (Logistic regression: Number of observations = 155, Wald chi2(10) = 457.36, Probability > chi2 = 0.0000, Pseudo R2 = 0.3703 and Log pseudo likelihood = -59.353585) .

Village farmers, who are in leadership position, are also member of the ruling party and sharing more canal water increasing overall. Farmers with the large land size are less motivated to share water with the neighbour farmers. Farmers who are more pro-social sharing more water with the fellow farmers. Canal water is available in the Kharif seasons and there is also rain water in the agricultural field as a result water sharing among the farmer increases. If distance between the source of canal water and agricultural fields is increasing, water sharing is decreasing i.e., farmers whose agricultural fields are located in tail-head are getting share of water.

TABLE: 9 EFFECTIVENESS OF SOLUTION TO RESOLVE CONFLICTS ACROSS THE STUDY VILLAGES

| Name of the villages | Best | Second Best | Third Best | Fourth Best | Fifth Best | Sixth Best |
|---|---|---|---|---|---|---|
| Gunna (33) | M11 | L7 | B6 | W5 | A3 | R1 |
| Majhergram (37) | L10 | M8 | B6 | W6 | R4 | A3 |
| Swayata (39) | M13 | B7 | L6 | W6 | R5 | A2 |
| Laxmigunje (24) | M6 | B5 | L4 | W4 | R3 | A2 |
| Shirsi (11) | L5 | M3 | W2 | B1 | A | R |
| Salboni (8) | M4 | L2 | B1 | W1 | A | R |
| Joyalbhanga (4) | M3 | L1 | W | B | A | R |

(N.B, in the above table A, B, M, L, R and W imply Appeal, Bargaining, Mutual interaction, Leadership, Rotation and water rate (Canal tax) policy of water distribution respectively. Figure in brackets are village level pro-sociality)

Village level information analysis illustrates that mutual understanding is the best efficiency enhancing policy whereas existing rotation is the inefficient policy in conflict reduction or inefficient in allocating water. Therefore, canal tax (water rate) solution is less effective to resolve conflicts related to canal water allocation. Distribution of conflicts location wise and across landholdings: Bardhaman 85.25% west Midnapur 14.74%; Small land holding 26.28%, Medium land holding 45.51% and Large land holding 28.20%.

**Conclusion**

Strength of physical and psychological labour with 'love thy neighbour' attitude improves the quality of social capital. In case of canal irrigation, mutual understanding appears to be the most effective efficiency enhancing policy. Mutual understanding connects people which enhance the quality of networks among themselves. Land size and availability of water are also significantly affecting the efficient policy choice. Again, policy choices by the households are more efficient than that by the water way department. 'If we are given choices and when we have a deep feeling of togetherness we can solve our problem better than any external agency' (opinion of few villagers). We have also found that water sharing among the households significantly depends on: (i) political status of households, (ii) land size, (iii) pro-sociality, (iv) distance from the source of water (head or tail) and (v) availability of canal water. The marginal effects of these factors are high.

The most interesting finding is the variation in the effectiveness of alternative solutions across villages. We have noticed that mutual understanding is most effective as an efficiency enhancing policy in the village with strong pro-sociality (a natural outcome). Thus our study suggests that the existing canal tax policy is sub-optimal in terms of achieving efficiency and equality, and more importantly the contextual policy is equity promoting. Ultimately it boils down to the popular and appropriate saying that 'unity is strength'.

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AGRO- ECONOMIC RESEARCH

# An Economic Analysis of Cost and Return of Off-Season Vegetables with Focus on Poly House Effect in Uttarakhand*

## Background

In Uttarakhand, a hilly state, cultivation of vegetables constitutes an important part of agricultural activity undertaken with about 22.65 per cent of the area under production being devoted to vegetables. Since the climatic conditions of the hilly states are not suitable for production of conventional crops, diversification in terms of the vegetables offers enormous opportunity for the cultivators in the state. In that respect, off-season vegetable crops have huge potential. Here, off-season vegetables' farming refers to the production of vegetables by using different agro-climatic condition, adjusting the time of transplanting, selecting and improving the varieties and/ or creating a controlled environment. In fact, the agro-climatic condition of the hills is conducive for the production of vegetables such as tomato, cauliflower, cabbage, vegetable pea, cucumber, French beans, capsicum, etc., in different zones in the hills. Farmers also have higher incentive to grow off-season vegetables since they get higher value from producing these vegetables during summer and rainy season. This is because the off-season vegetables that are raised in the hilly areas are made available to the consumers in the plains at the time when these cannot be grown there due to hot climatic condition. Moreover, with the availability of new technology, it has become much easier for them to overcome the seasonal barriers associated with hill farming by making farming more remunerative for them.

However, for marketing of vegetables, Indian farmers have traditionally depended heavily on middlemen since major marketing costs are incurred on transport, loading/ unloading etc. Marketing of vegetable crops is quite complex owing to short shelf-life, high seasonality in production and bulkiness. These features make the marketing system for vegetables unique in terms of time, form, and space utilities. Moreover, the efficiency of vegetables marketing in India has been of significant concern in recent years; on the one hand there is high and fluctuating consumer prices and on the other hand, producer farmers end up getting only a small share of the consumer rupee. Therefore, to make vegetable production in hills viable, these factors need to be taken care of.

## Objectives

The specific objectives of the study are as under:

1. To analyse the trends in area and production of vegetables in the State;
2. To examine the costs and returns in various vegetables grown by farmers in Uttarakhand
3. To assess the marketing costs, margins and price spread in various vegetables in different markets;
4. To study the various problems faced by vegetable growers in production and marketing of vegetables in the State.
5. In addition to the above objectives, the following objectives are specific to off- season vegetables in polyhouses.
    i. To study the costs and returns of off season vegetables in polyhouses;
    ii. To study the marketing system of polyhouse vegetable crops;
    iii. To study the problems faced by polyhouse farmers in the State.

## Methodology

The study is conducted in the state of Uttarakhand. It is based on both primary data and secondary data collected from various sources. The scope of the study is limited to six off-season vegetable crops, namely, peas, tomato, cauliflower, cabbage, capsicum and French bean. Even for these six vegetables, the primary data has been collected in two phases- once for those grown without polyhouse and then for those grown inside it. Using multistage stratified random sampling five blocks each in district of Dehradun and Nainital were selected for study of off-season vegetable cultivation without poly house technology and district Chamoli was selected for studying cultivation inside poly house.

## Main Findings

Roughly 56 per cent of the total area in the state of Uttarakhand is assigned to cultivation of the six off-season vegetables under study during the year 2014-15.

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The cumulative increase in the area under these vegetables in the state between year 2005-06 and 2014-15 is close to 43 per cent.

In terms of the area under different crops in the two districts under study, highest percentage share of land under vegetables in Nainital district goes towards tomato cultivation (22.94) followed by peas (21.91), cabbage, beans and capsicum, whereas the highest percentage share of land under vegetables in Dehradun district goes to peas, followed by tomato, beans, cauliflower, cabbage and capsicum.

Although intermittent decline in production has been recorded between 2005-06 and 2014-15, overall, the production has increased by 59.06 per cent from the base year.

The overall age distribution of the heads in the sampled farms is such that 50 per cent of the household heads are in the age group of 41-60 years while only 14.75 per cent and 35.25 per cent, respectively, are in the age group 20-40 years and above 61 years. 87.7 per cent of the heads are involved primarily in agricultural activity. As far as literacy of the household heads is concerned, in Nainital district while 8.16 per cent of the heads in the marginal households are illiterate, none of the heads in the small and medium farm households was found to be illiterate. Further, while large proportion (44.26 per cent) of the household heads had completed primary level of education, 40.98 per cent had completed matriculation. Only 8.2 per cent of them have a literacy level of graduation and above. However, in Dehradun district, the percentage of illiterate household heads is higher at 40.98 which is second only to the percentage of heads completing matriculation (44.26). Highest percentage of illiterate heads was found among small households (50) followed by marginal (42.31) and medium households (20). The average family size of the sampled farmers in Nainital ranges between 6 and 9 while it is between 11 and 21 in Dehradun. In Nainital, 45.35 per cent of the household members are males, roughly 36 per cent are females and nearly 19 per cent are children. While the male to female ratio is 1 in medium (each constituting 41.18 per cent of the total) and small households (each constituting 40.48 per cent of the total), percentage of male members is higher at 46.86 vis-à-vis 34.59 per cent of females in marginal households. Children constitute less than 20 per cent of the total members across farmers of all categories. In Dehradun district, male-female ratio is close to one across categories of farmers with the number of females being higher than male in small farm households. The proportion of females among the workers in total is higher in Dehradun at 46.37 per cent compared to 41.83 per cent in Nainital with the percentage of males among the agricultural and non-agricultural labours being 55.22 and 46.25 per cent, respectively, in Dehradun whereas the corresponding figures for Nainital are 61.29 per cent and 51.67 per cent. Work participation of females as non-agricultural labour is much higher than in the agricultural labour category in both the districts. About 65 per cent of the marginal famers, 71 per cent of the small farmers and 86 per cent of the medum farmers have taken loan. All of them have borrowed from banks with the loan amount being highest in case of medium farmers. The rate of interest faced by small farmers is highest at 5.5 per cent followed by 4.92 per cent for marginal farmers and 4.75 per cent for medium farmers.

As far as the land owned by the sampled farmers is concerned, while the average area per farm for marginal and medium farmers is higher in Nainital than in Dehradun, it is lower for the small farmers. It can be further seen that the farmers in either district hold very little barren land or fallow land, with the proportions of both barren and fallow lands being relatively higher in Dehradun (11.81 per cent and 13.5 per cent, respectively) as compared to Nainital (4.45 per cent and 6.10 per cent, respectively). In Nainital, there is very little grassland, that too only with marginal farmers. In Dehradun, grassland occupies 4.03 per cent of the total owned land. Much of the cultivated land, that is about 57 per cent in Nainital and roughly 56 per cent land in Dehradun is cultivated and field crops are grown in it. 31.57 per cent of the land is utilized as orchard in Nainital while only about 15 per cent of the owned land in Dehradun is used for the same. While about 61 per cent of the total owned land is irrigated in Nainital, nearly 59 per cent land is irrigated in Dehradun. As regards the land under field crop, the ratio of irrigated to unirrigated area is only 1.33 in Nainital whereas it is 2.33 in Dehradun. With respect to orchards, the ratio of irrigated to unirrigated area is close to 5 in Nainital, whereas it is roughly 1.8 in Dehradun. The net operated area of the sampled farmers is roughly same as the land owned by them since leasing (in or out) of land is not very common among the sampled farmers.

The primary sources of irrigation are canal, kuhl, pipeline, nalcoop and rainfed in both districts with an additional source of tank being used in Nainital. However, in terms of basic amenity like access to drinking water the status of the two districts is quite varied. In Nainital district while natural source of drinking water is not available to small and medium farmers, it is closest among the various sources for marginal farmers. On the other hand, while tap water is the easiest source of drinking water, for the medium farmers, it is farthest for marginal farmers. In Dehradun district, however, tap water is more difficult to access for farmers of all types with higher average distance compared to other sources. While for marginal farmers, sources like pipeline/ handset/ stampost/ nalcoop are easiest available than natural sources, it is the opposite for small and medium farmers.

The cropping pattern of the sampled farmers show that apart from growing vegetables, medium farmers in Nainital grow maize, wheat, potato, fruits and some other crops, small farmers grow barley and pulses along with these crops and the marginal farmers grow paddy as well. The cropping pattern is, however, quite different in Dehradun district. While both small and medium farmers grow paddy, wheat, barley, potato, pulses and fruits, marginal farmers grow maize instead of barley.

The cropping intensity (with fruits) ranges between 133 and 136 in Nainital with highest intensity being observed for marginal farmers and lowest for small farmers, whereas it lies between 122 and 139 in Dehradun with highest intensity for small farmers and lowest for medium farmers. While fruit is most productive of all crops grown (excluding the vegetables under study) in both the districts among all categories of farmers (with the exception of small farmers in Nainital), potato turns out to be the second most productive crop among all the sampled farmers with a huge difference in the productivities of fruits and potato. The least productive crop is pulses with its productivity being less than even 10 quintals per hectare for all sampled farmers. As far as yield of these six vegetables under study is concerned, it is highest for cauliflower in case of small farmers in Nainital, for tomato in case of medium farmers and for cabbage at 244 qtls per hectare for marginal farmers. On the other hand, it is lowest for peas in case of marginal farmers, beans in case of small and marginal farmers. On the contrary, yield of beans is highest at 198 qtls per hectare for medium farmers in Dehradun district. For small and marginal farmers the yield is highest for cauliflower and tomato, respectively. The yield of peas, however, is lowest for all categories of farmers in Dehradun. It has been further observed that crop rotation is widely practiced in both Nainital and Dehradun districts of Uttarakhand. In both districts, all crops under study excluding peas are sown in the first half of the year in irrigated lands and harvested two-three months after planting, whereas peas is sown throughout the year and harvested two to three months after planting. However, in parts of the districts where irrigation facility is not available sowing is usually done during monsoon, in the month of July and harvested in September.

The cost of cultivation per hectare for tomato came out to be Rs. 178775 at cost C in Nainital district and Rs. 183068 in Dehradun district. The total cost of cultivation on marginal farms is higher than that of medium and small farms. Rental value of land constitutes a sizable part of the cost in both districts on all size of farms. Further, the involvement of family labour was found to be quite high. The net return per hectare was found to be Rs. 191215 at cost C in Nainital and Rs. 262445 in Dehradun which indicates that farms of Dehradun were able to generate significantly higher gross return and net return in tomato farming. Peas, grown as vegetable, is another remunerative crop for all the hill farmers. Imputed value of family labour accounts for majority of cost C and the costs of hired human labour and seed/ seedlings are also substantial for all crops. In Dehradun district, the net return per hectare from peas is Rs. 65600 at cost C which is significantly lower than that generated in Nainital. In district Nainital, the output- input ratio over cost C is 2.07 for tomato, 2.42 for peas, 2.15 for cabbage, 2.77 for cauliflower, 2.68 for capsicum and 2.52 for beans indicating that cauliflower cultivation was most profitable among all six off-season vegetables crops under study. In district Dehradun, the output- input ratios are 2.37 for tomato, 1.25 for peas, 1.72 for cabbage, 2.86 for cauliflower, 3.00 for capsicum and 2.64 for beans indicating that capsicum cultivation was most profitable among all the off-season vegetable crops. When the overall situation is examined capsicum cultivation is found to be more profitable than cauliflower, beans, tomato, peas and cabbage. Not only is the total production of all vegetables higher in Dehradun district than in Nainital district across farmers, higher percentage of the produce is being marketed in the former than in the latter. Both wages in kind and losses constitute very negligible share of the produce thereby leaving out 85-99 per cent of the produce to be marketed. The losses, however much they are, happen primarily due to natural calamities, pests and diseases, due to packing and grading. The farmers in Nainital district market sell their entire produce in Haldwani market whereas those in Dehradun district sell their vegetables in Vikas Nagar market, both within the respective district itself. A huge gap has been noticed in the price paid by the consumers and those received by the growers there by indicating the presence of middlemen in the supply chain. A major part of this gap is accounted for by the retailers' as well as mashkors' margin. The survey on polyhouse covered only five vegetables, namely, tomato, capsicum, peas, cauliflower and French beans. In the studied area, particularly in Chamoli district, the size of most polyhouses is 33 m2 although there were two farmers who were operating on polyhouses of size 100 m2. The state government of Uttarakhand has announced an average subsidy of Rs. 38678 for construction of a poly-house under the state horticulture mission because of which the average net cost paid per farmer for constructing a polyhouse turns out to be about Rs. 3609. The most important cost item for polyhouse cultivation is manures. Other significant cost heads are formation of beds, seeds/ seedlings, harvesting/ picking and interculture. Net returns from cultivating these vegetables inside poly houses were invariably negative indicating that it was not economically viable to produce these vegetables inside polyhouses. Accordingly, output-input ratios are invariably less than one for all these vegetables indicating that by cultivating these vegetables inside poly houses commensurate return is not being generated. The losses in production of these vegetables

are less than 2 per cent of the production. Between 15 and 20 per cent of the produce are retained for family consumption and another 2-6 per cent are retained for gifts and wages in kind. Rest of the produce is marketed. All the vegetables are being sold entirely in one or more of the three major markets of the district itself, namely, Joshimath, Gopeshwar and Karna Prayag, which are located at a distance of roughly 60- 80 kms from the polyhouses covered under the study. Although French beans and peas are sold at higher prices, very less quantity of these vegetables (5-18 boxes) are sold in the market whereas 249 boxes of capsicum are being sold by the farmers in spite of it being the least valuable of these vegetables. Farmers growing vegetables inside polyhouse stated delayed or lack of information, cumbersome clearance process, unavailability of construction material at the local level, delay in technology transfer, lack of skilled labour, high construction cost as some of the problems they have encountered. Low quality and high price of inputs required in cultivation are reported as two major problems by these farmers. Sowing time and intensity and irrigation intensity are some other problems they encounter with respect to cropping practice. All the growers said that they have problem with the time and method of such farming as well as marketing the produce. For farmers growing vegetables without using polyhouse technology, transporting their produce is a big issue and so are packing and storage. Inadequate storage facility or complete lack of it, inadequacy or non- availability of packing material at the time of need are some of the common problems reported by them. Late and partial or misleading information regarding marketing is a handicap that these farmers feel they are faced with quite frequently. Last but not the least, the problem of malpractice plague the system as has been reported by the sampled growers. Many of them complained about late payment, part payment, overcharging, undue deductions, quotation of less than actual prices in the market.

**Policy Implications**

The profitability of these crops can be improved if steps are taken towards regulating the markets.

Keeping a check on the middlemen can reduce the gap between the final price charged at the market and that received by the growers.

Improving storage facility is another direction where government interventions would be helpful.

Since grading and packing is another area where the farmers encounter problems, timely availability of packing material should be ensured and the price of such materials should be controlled.

Communication channels should be made more effective. In fact, various media like television, radio, newspapers and even internet can be used more effectively to achieve this. Cultivation inside poly house should be promoted and encouraged more. Towards this 100 per cent subsidies, at least in the initial phase, should be continued for construction of poly houses and technology transfer should be done in a timely manner and should be managed well.

## Foodgrains

During the month of October,2017 the Wholesale Price Index (Base 2011-12=100) of pulses decreased by 3.52%, cereals increased by 0.07 & foodgrains decreased by 0.63% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

*(Base: 2011-2012=100)*

| Commodity | Weight (%) | WPI for the Month of October, 2017 | WPI for the Month of September, 2017 | WPI A year ago | Percentage change during | |
|---|---|---|---|---|---|---|
| | | | | | A month | A Year |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Paddy | 1.43 | 149.6 | 148.8 | 145.1 | 0.54 | 3.10 |
| Wheat | 1.028 | 138.0 | 137.6 | 140.8 | 0.29 | -1.99 |
| Jowar | 0.067 | 122.9 | 126.3 | 121.9 | -2.69 | 0.82 |
| Bajra | 0.086 | 132.9 | 139.4 | 148.1 | -4.66 | -10.26 |
| Maize | 0.189 | 123.7 | 125.1 | 138.6 | -1.12 | -10.75 |
| Barley | 0.014 | 141.2 | 140.3 | 153.6 | 0.64 | -8.07 |
| Ragi | 0.007 | 233.7 | 252.5 | 178.1 | -7.45 | 31.22 |
| Cereals | 2.824 | 142.6 | 142.5 | 142.7 | 0.07 | -0.07 |
| Pulses | 0.639 | 145.2 | 150.5 | 210.6 | -3.52 | -31.05 |
| Foodgrains | 3.465 | 143.1 | 144.0 | 155.2 | -0.63 | -7.80 |

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

The following Table indicates the State wise trend of Wholesale Prices of Cereals during the month of October, 2017.

| Commodity | Main Trend | Rising | Falling | Mixed | Steady |
|---|---|---|---|---|---|
| Rice | Mixed | West Bengal | Gujarat | A.P.<br>Jharkhand<br>Kerala | |
| Wheat | Falling | Karnataka<br>Rajasthan | Haryana<br>M.P.<br>U.P.<br>West Bengal | Gujarat | Jharkhand<br>Punjab |
| Jowar | Falling | Karnataka | A.P.<br>Maharashtra<br>Rajasthan<br>Delhi | Gujarat<br>Tamilnadu | |
| Bajra | Falling | Maharashtra<br>U.P. | A.P.<br>Rajasthan<br>Delhi | Gujarat | Karnataka |
| Maize | Rising | Haryana<br>Punjab<br>Rajasthan<br>U.P. | Gujarat<br>M.P. | | Karnataka |

**Procurement of Rice**

The total procurement of rice in the current marketing season i.e 2017-2018, up to 06.11.2017 stood at 14.22 million tonnes, as against 13.47 million tonnes of rice procured, during the corresponding period of last year. The details are given in the following table :

PROCUREMENT OF RICE

(*In Thousand Tonnes*)

| State | Marketing Season 2017-18 upto 06.11.2017 | | Corresponding Period of last Year 2016-17 | | Marketing Year (October-September) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 2016-17 | | 2015-16 | |
| | Procurement | %age to Total | Procurement | %age to Total | Procurement | %age to Total | Procurement | %age to Total |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Andhra Pradesh | 0 | 0.00 | 0 | 0.00 | 3725 | 9.78 | 4326 | 12.65 |
| Chhatisgarh | 0 | 0.00 | 0 | 0.00 | 4022 | 10.56 | 3442 | 10.06 |
| Haryana | 3832 | 26.96 | 3439 | 25.54 | 3583 | 9.40 | 2861 | 8.36 |
| Maharashtra | 0 | 0.00 | 0 | 0.00 | 309 | 0.82 | 230 | 0.67 |
| Punjab | 10063 | 70.79 | 9844 | 73.10 | 11052 | 29.00 | 9350 | 27.33 |
| Tamil Nadu | 0 | 0.00 | 7 | 0.05 | 144 | 0.38 | 1191 | 3.48 |
| Uttar Pradesh | 158 | 1.11 | 48 | 0.36 | 2354 | 6.18 | 2910 | 8.50 |
| Uttarakhand | 11 | 0.08 | 33 | 0.25 | 706 | 1.85 | 598 | 1.75 |
| Others | 151 | 1.06 | 95 | 0.70 | 12210 | 32.04 | 9301 | 27.19 |
| Total | 14215 | 100.00 | 13466 | 100.00 | 38105 | 100.00 | 34209 | 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 August, 2017 is 30.80 million tonnes against a total of 22.96 million tonnes of wheat procured during last year. The details are given in the following table:

PROCUREMENT OF WHEAT

*(In Thousand Tonnes)*

| State | Marketing Season 2017-18 (upto 30.08.2017) | | 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 | 7432 | 24.11 | 6752 | 29.41 | 6722 | 29.32 | 6778 | 24.13 |
| Madhya Pradesh | 6725 | 21.82 | 3992 | 17.39 | 3990 | 17.40 | 7309 | 26.02 |
| Punjab | 11706 | 37.98 | 10649 | 46.38 | 10645 | 46.42 | 10344 | 36.83 |
| Rajasthan | 1245 | 4.04 | 762 | 3.32 | 762 | 3.32 | 1300 | 4.63 |
| Uttar Pradesh | 3699 | 12.00 | 797 | 3.47 | 802 | 3.50 | 2267 | 8.07 |
| Others | 18 | 0.06 | 10 | 0.04 | 9 | 0.04 | 90 | 0.32 |
| Total | 30825 | 100.00 | 22962 | 100.00 | 22930 | 100.00 | 28088 | 100.00 |

*Source*: Department of Food & Public Distribution.

## Commercial Crops

**Oil Seeds:** The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 128.1 in October, 2017 showing an increase of 0.1% over the previous month and a decrease of 2.5% over the year. The WPI of soyabean increased by +1.0%, sunflower by 0.7%, copra (coconut) by 0.6% and niger seed by 0.5% over the 3previous month. wpi of cotton seed decreased by 2.8%, safflower (kardi seed) by 2.1%, gingelly seed by 1.0%, groundnut seed by 0.6% and rape & mustard seed by 0.3% over the previous month.

**Manufacture of Vegetable and Animal Oils and Fats:** The WPI of manufacture of vegetable and animal oils and fats as a group stood at 108.3 in October, 2017 showing an increase of 0.4% and 0.7% over the previous month and year respectively. The WPI of mustard oil increased by 2.3%, groundnut oil by 0.8% and soyabean oil by 0.4% over the previous month. The WPI of copra oil decreased by 2.5%, cotton seed oil by 1.3%, sunflower oil by 0.1% and rapeseed oil by 0.6% over the previous month.

**Fruits & Vegetable:** The WPI of fruits & vegetable as a group stood at 177.1 in October, 2017 showing an increase of 8.7% and 21.7% over the previous month and year respectively.

**Potato:** The WPI of potato stood at 119.6 in October, 2017 showing decrease of 2.7% and 44.3% over the previous month and year respectively.

**Onion:** The WPI of Onion stood at 236.8 in October, 2017 showing an increase of 22.2% and 127.0% over the previous month and year respectively.

**Condiments & Spices:** The WPI of condiments & spices (group) stood at 125.1 in October, 2017 showing an increase of 0.9% over the previous month and a decrease of 11.9% over the year. The WPI of chillies (dry) increased by 1.7% and turmeric by 5.5% over the previous month. The WPI of black pepper decreased by 2.4% over the previous month.

**Raw Cotton:** The WPI of raw cotton stood at 100.8 in October, 2017 showing a decrease of 5.4% and 4.8% over the previous month and year respectively.

**Raw Jute:** The WPI of raw jute stood at 158.0 in October, 2017 showing a decrease of 1.2% and 18.6% over the previous month and year respectively.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

| Commodity | Latest | Month | Year | % Variation Over | |
|---|---|---|---|---|---|
| | July, 2017 | June, 2017 | July, 2016 | Month | Year |
| OIL SEEDS | 128.1 | 128.0 | 131.4 | 0.1 | -2.5 |
| Groundnut Seed | 117.2 | 117.9 | 132.3 | -0.6 | -11.4 |
| Rape & Mustard Seed | 134.2 | 134.6 | 152.8 | -0.3 | -12.2 |
| Cotton Seed | 138.9 | 142.9 | 161.8 | -2.8 | -14.2 |
| Copra (Coconut) | 189.8 | 188.6 | 109.1 | 0.6 | 74.0 |
| Gingelly Seed (Sesamum) | 118.5 | 119.7 | 118.5 | -1.0 | 0.0 |
| Niger Seed | 205.9 | 204.8 | 207.6 | 0.5 | -0.8 |
| Safflower (Kardi Seed) | 137.2 | 140.2 | 137.2 | -2.1 | 0.0 |
| Sunflower | 99.1 | 98.4 | 113.0 | 0.7 | -12.3 |
| Soyabean | 126.0 | 124.8 | 132.3 | 1.0 | -4.8 |
| MANUFACTURE of VEG AND ANIMAL OILS & FATS | 108.3 | 107.9 | 107.6 | 0.4 | 0.7 |
| Mustard Oil | 118.5 | 115.8 | 128.1 | 2.3 | -7.5 |
| Soyabean Oil | 105.5 | 105.1 | 105.4 | 0.4 | 0.1 |
| Sunflower Oil | 102.0 | 102.1 | 105.3 | -0.1 | -3.1 |
| Groundnut Oil | 105.5 | 104.7 | 118.3 | 0.8 | -10.8 |
| Rapeseed Oil | 111.3 | 112.0 | 122.9 | -0.6 | -9.4 |
| Copra Oil | 163.3 | 167.5 | 126.8 | -2.5 | 28.8 |

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS—CONTD.

| Commodity | Latest | Month | Year | % Variation Over | |
|---|---|---|---|---|---|
| | July, 2017 | June, 2017 | July, 2016 | Month | Year |
| Cotton Seed Oil | 100.6 | 101.9 | 103.6 | -1.3 | -2.9 |
| FRUITS & VEGETABLES | 177.1 | 162.9 | 145.5 | 8.7 | 21.7 |
| Potato | 119.6 | 122.9 | 214.7 | -2.7 | -44.3 |
| Onion | 236.8 | 193.8 | 104.3 | 22.2 | 127.0 |
| CONDIMENTS & SPICES | 125.1 | 124.0 | 142.0 | 0.9 | -11.9 |
| Black Pepper | 154.0 | 157.8 | 186.9 | -2.4 | -17.6 |
| Chillies(Dry) | 109.0 | 107.2 | 137.4 | 1.7 | -20.7 |
| Turmeric | 129.3 | 122.6 | 115.0 | 5.5 | 12.4 |
| Raw Cotton | 100.8 | 106.5 | 105.9 | -5.4 | -4.8 |
| Raw Jute | 158.0 | 159.9 | 194.2 | -1.2 | -18.6 |

## STATISTICAL TABLES

### Wages

1 Daily Agricultural Wages in Some States (Category-wise)

*(In Rs.)*

| State | District | Centre | Month & Year | Daily Normal Working Hours | Field Labour | | Other Agri. Labour | | Herdsman | | Skilled Labour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| | | | | | M | W | M | W | M | W | M | M | M |
| Andhra Pradesh | Krishna | Ghantasala | Sep, 17 | 8 | 300 | 175 | 500 | NA | 250 | NA | NA | NA | NA |
| | Guntur | Tadikonda | Sep, 17 | 8 | 292 | 263 | 325 | NA | 275 | NA | NA | NA | NA |
| Telangana | Ranga Reddy | Arutala | Jan, 17 | 8 | 800 | NA | 375 | NA | 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, 17 | 8 | 229 | 229 | 229 | 229 | 229 | 229 | 317 | 317 | NA |

1.1 Daily Agricultural Wages in Some States (Operation-wise)

*(In Rs.)*

| State | District | Centre | Month & Year | Type of Labour | Normal Daily Working Hours | Ploughing | Sowing | Weeding | Harvesting | Other Agri-Labour | Herdsman | Skilled Labours | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| Assam | Barpeta | Laharapara | Dec, 16 | M | 8 | 250 | 250 | 250 | 250 | 250 | 200 | 350 | 250 | 350 |
| | | | | W | 8 | NA | NA | 200 | 200 | 200 | NA | NA | NA | NA |
| Bihar | Muzaffarpur | 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 | May, 17 | M | 8 | NA | NA | NA | 175 | 120 | 175 | 300 | 200 | 200 |
| | | | | W | 8 | NA | NA | NA | 150 | 120 | 120 | NA | NA | NA |
| Gujarat* | Rajkot | Rajkot | Dec, 16 | M | 8 | 254 | 254 | 241 | 229 | 211 | 208 | 500 | 475 | 488 |
| | | | | W | 8 | NA | 200 | 241 | 229 | 211 | 198 | NA | NA | NA |
| | Dahod | Dahod | Dec, 16 | M | 8 | 300 | 300 | 150 | 150 | 150 | NA | 400 | 350 | 300 |
| | | | | W | 8 | NA | 250 | 150 | 150 | 150 | NA | NA | NA | NA |
| Haryana | Panipat | Ugarakheri | April, 17 | M | 8 | 400 | 400 | 400 | 400 | 400 | NA | NA | NA | NA |
| | | | | W | 8 | NA | 300 | 300 | 350 | 300 | NA | NA | NA | NA |
| Himachal Pradesh | Mandi | Mandi | June,16 | M | 8 | NA | 182 | 182 | 182 | 182 | 182 | 300 | 300 | NA |
| | | | | W | 8 | NA | 182 | 182 | 182 | 182 | 182 | NA | NA | NA |
| Kerala | Kozhikode | Koduvally | Nov,16 | M | 4-8 | 945 | 785 | NA | 785 | 735 | NA | 885 | NA | NA |
| | | | | W | 4-8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Palakkad | Elappally | Nov,16 | M | 4-8 | NA | 500 | NA | 500 | 500 | NA | 600 | NA | NA |
| | | | | W | 4-8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Madhya Pradesh | Hoshangabad | Sangarkhera | Sep,17 | 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,17 | 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,17 | M | 8 | NA | 300 | 300 | NA | NA | 300 | 300 | 300 | NA |
| | | | | W | 8 | NA | 300 | 300 | NA | NA | 300 | NA | NA | NA |

1.1 Daily Agricultural Wages in Some States (Operation-wise) — *Contd.* (In Rs.)

| State | District | Centre | Month & Year | Type of Labour | Normal Daily Working Hours | Ploughing | Sowing | Weeding | Harvesting | Other Agri-Labour | Herdsman | Skilled Labours | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| Odisha | Bhadrak | Chandbali | July,17 | M | 8 | 300 | 300 | 300 | 300 | 320 | 300 | 450 | 400 | 350 |
| | | | | W | 8 | NA | 250 | 250 | 250 | 260 | 250 | NA | NA | NA |
| | Ganjam | Aska | July, 17 | M | 8 | 300 | 250 | 250 | 350 | 300 | 250 | 500 | 500 | 300 |
| | | | | W | 8 | NA | 200 | 200 | 250 | 220 | 200 | NA | NA | NA |
| Punjab | Ludhiyana | Pakhowal | Aug, 17 | M | 8 | 480 | 480 | NA | NA | 400 | NA | 480 | 480 | NA |
| | | | | 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 | Apr, 17 | M | 8 | NA | 341 | NA | NA | 363 | NA | 525 | 425 | NA |
| | | | | W | 8 | NA | NA | 143 | 128 | 128 | NA | NA | NA | NA |
| | Tirunelveli | Malayakulam | Apr, 17 | M | 8 | NA | 200 | NA | 500 | 387 | NA | NA | NA | NA |
| | | | | W | 8 | NA | 150 | 175 | 183 | NA | 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 | Aug, 17 | M | 8 | 275 | 265 | 264 | 271 | 264 | NA | 398 | NA | NA |
| | | | | W | 8 | NA | 205 | 211 | 208 | 211 | NA | NA | NA | NA |
| | Aurraiya | Aurraiya | Aug,17 | M | 8 | 170 | 175 | 185 | 307 | 171 | NA | 500 | NA | .NA |
| | | | | W | 8 | NA | NA | 185 | 307 | 171 | NA | NA | NA | NA |
| | Chandauli | Chandauli | Aug,17 | M | 8 | 200 | 200 | NA | 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

## Prices

2. Wholesale Prices of Certain Agricultural Commodities and Animal Husbandry Products at Selected Centres in India

| Commodity | Variety | Unit | State | Centre | Oct-17 | Sep-17 | Oct-16 |
|---|---|---|---|---|---|---|---|
| Wheat | PBW 343 | Quintal | Punjab | Amritsar | 1700 | 1650 | 1700 |
| Wheat | Dara | Quintal | Uttar Pradesh | Chandausi | 1640 | 1625 | 1640 |
| Wheat | Lokvan | Quintal | Madhya Pradesh | Bhopal | 1650 | 1671 | 1744 |
| Jowar | - | Quintal | Maharashtra | Mumbai | 2300 | 2500 | 2500 |
| Gram | No III | Quintal | Madhya Pradesh | Sehore | 4400 | 5276 | 9200 |
| Maize | Yellow | Quintal | Uttar Pradesh | Kanpur | 1335 | 1330 | 1330 |
| Gram Split | - | Quintal | Bihar | Patna | 7150 | 7000 | 8550 |
| Gram Split | - | Quintal | Maharashtra | Mumbai | 7300 | 7600 | 12300 |
| Arhar Split | - | Quintal | Bihar | Patna | 7800 | 7800 | 11000 |
| Arhar Split | - | Quintal | Maharashtra | Mumbai | 5950 | 5850 | 9100 |
| Arhar Split | - | Quintal | NCT of Delhi | Delhi | 5475 | 5600 | 9675 |
| Arhar Split | Sort II | Quintal | Tamil Nadu | Chennai | 5600 | 6500 | 11200 |
| Gur | - | Quintal | Maharashtra | Mumbai | 4050 | 3950 | 4050 |
| Gur | Sort II | Quintal | Tamil Nadu | Coimbatore | 5400 | 5000 | 4600 |
| Gur | Balti | Quintal | Uttar Pradesh | Hapur | 3400 | 3480 | 2810 |
| Mustard Seed | Black (S) | Quintal | Uttar Pradesh | Kanpur | 3650 | 3600 | 4325 |
| Mustard Seed | Black | Quintal | West Bengal | Raniganj | 4000 | 4000 | 4650 |
| Mustard Seed | - | Quintal | West Bengal | Kolkata | 4100 | 4200 | 4850 |
| Linseed | Bada Dana | Quintal | Uttar Pradesh | Kanpur | 4500 | 4450 | 6500 |
| Linseed | Small | Quintal | Uttar Pradesh | Varanasi | 4350 | 4430 | 4630 |
| Cotton Seed | Mixed | Quintal | Tamil Nadu | Virudhunagar | 2200 | 2000 | 2500 |
| Cotton Seed | MCU 5 | Quintal | Tamil Nadu | Coimbatore | 2580 | 2580 | 2500 |
| Castor Seed | - | Quintal | Telangana | Hyderabad | 3700 | 4000 | 3300 |
| Sesamum Seed | White | Quintal | Uttar Pradesh | Varanasi | 6200 | 6190 | 8530 |
| Copra | FAQ | Quintal | Kerala | Alleppey | 11550 | 11350 | 6500 |
| Groundnut | Pods | Quintal | Tamil Nadu | Coimbatore | 5200 | 5200 | 5500 |
| Groundnut | - | Quintal | Maharashtra | Mumbai | 5200 | 4800 | 8000 |
| Mustard Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1335 | 1340 | 1470 |
| Mustard Oil | Ordinary | 15 Kg. | West Bengal | Kolkata | 1425 | 1425 | 1550 |
| Groundnut Oil | - | 15 Kg. | Maharashtra | Mumbai | 1320 | 1250 | 1570 |
| Groundnut Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 1760 | 1825 | 1935 |
| Linseed Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1430 | 1425 | 1545 |
| Castor Oil | - | 15 Kg. | Telangana | Hyderabad | 1335 | 1410 | 1125 |
| Sesamum Oil | - | 15 Kg. | NCT of Delhi | Delhi | 1560 | 1560 | 1485 |
| Sesamum Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 2430 | 2325 | 2205 |
| Coconut Oil | - | 15 Kg. | Kerala | Cochin | 2475 | 2415 | 1410 |
| Mustard Cake | - | Quintal | Uttar Pradesh | Kanpur | 1825 | 1825 | 2550 |
| Groundnut Cake | - | Quintal | Telangana | Hyderabad | 2571 | 2643 | 3714 |
| Cotton/Kapas | NH 44 | Quintal | Andhra Pradesh | Nandyal | 4200 | 4300 | 4800 |
| Cotton/Kapas | LRA | Quintal | Tamil Nadu | Virudhunagar | 4200 | 4300 | NT |
| Jute Raw | TD 5 | Quintal | West Bengal | Kolkata | 3540 | 3610 | 3800 |
| Jute Raw | W 5 | Quintal | West Bengal | Kolkata | 3590 | 3660 | 3800 |
| Oranges | - | 100 No | NCT of Delhi | Delhi | NA | NA | NA |
| Oranges | Big | 100 No | Tamil Nadu | Chennai | NA | NA | 900 |
| Banana | - | 100 No. | NCT of Delhi | Delhi | 450 | 450 | 375 |

2. Wholesale Prices of Certain Agricultural Commodities and Animal Husbandry Products at Selected Centres in India—contd..

| Commodity | Variety | Unit | State | Centre | Oct-17 | Sep-17 | Oct-16 |
|---|---|---|---|---|---|---|---|
| Banana | Medium | 100 No. | Tamil Nadu | Kodaikkanal | 670 | 670 | 505 |
| Cashewnuts | Raw | Quintal | Maharashtra | Mumbai | 100000 | 100000 | 80000 |
| Almonds | - | Quintal | Maharashtra | Mumbai | 85000 | 85000 | 70000 |
| Walnuts | - | Quintal | Maharashtra | Mumbai | 100000 | 100000 | 70000 |
| Kishmish | - | Quintal | Maharashtra | Mumbai | 12000 | 12000 | 11000 |
| Peas Green | - | Quintal | Maharashtra | Mumbai | 3500 | 3600 | 3400 |
| Tomato | Ripe | Quintal | Uttar Pradesh | Kanpur | 2500 | 1800 | 1650 |
| Ladyfinger | - | Quintal | Tamil Nadu | Chennai | 1900 | 2000 | 1300 |
| Cauliflower | - | 100 No. | Tamil Nadu | Chennai | 3000 | 2000 | 1500 |
| Potato | Red | Quintal | Bihar | Patna | 900 | 940 | 1400 |
| Potato | Desi | Quintal | West Bengal | Kolkata | 670 | 620 | 1580 |
| Potato | Sort I | Quintal | Tamil Nadu | Mettuppalayam | 2120 | 1643 | 2200 |
| Onion | Pole | Quintal | Maharashtra | Nashik | 2300 | 1300 | 550 |
| Turmeric | Nadan | Quintal | Kerala | Cochin | 14500 | 14500 | 15500 |
| Turmeric | Salam | Quintal | Tamil Nadu | Chennai | 12000 | 12000 | 8400 |
| Chillies | - | Quintal | Bihar | Patna | 11500 | 11800 | 9500 |
| Black Pepper | Nadan | Quintal | Kerala | Kozhikode | 39000 | 38500 | 65000 |
| Ginger | Dry | Quintal | Kerala | Cochin | 14000 | 14000 | 14500 |
| Cardamom | Major | Quintal | NCT of Delhi | Delhi | 118500 | 118000 | 130500 |
| Cardamom | Small | Quintal | West Bengal | Kolkata | 95000 | 135000 | 105000 |
| Milk | Buffalo | 100 Liters | West Bengal | Kolkata | 5200 | 5200 | 3800 |
| Ghee Deshi | Deshi No 1 | Quintal | NCT of Delhi | Delhi | 70035 | 63365 | 34017 |
| Ghee Deshi | - | Quintal | Maharashtra | Mumbai | 46000 | 46000 | 46000 |
| Ghee Deshi | Desi | Quintal | Uttar Pradesh | Kanpur | 39500 | 39250 | 37150 |
| Fish | Rohu | Quintal | NCT of Delhi | Delhi | 13500 | 13000 | 11500 |
| Fish | Pomphrets | Quintal | Tamil Nadu | Chennai | 32500 | 33500 | 34500 |
| Eggs | Madras | 1000 No. | West Bengal | Kolkata | 4420 | 4330 | 4250 |
| Tea | - | Quintal | Bihar | Patna | 21300 | 21300 | 21200 |
| Tea | Atti Kunna | Quintal | Tamil Nadu | Coimbatore | 37000 | 37000 | 34000 |
| Coffee | Plant-A | Quintal | Tamil Nadu | Coimbatore | 24300 | 24800 | 26000 |
| Coffee | Rubusta | Quintal | Tamil Nadu | Coimbatore | 14500 | 15000 | 15500 |
| Tobacco | Kampila | Quintal | Uttar Pradesh | Farukhabad | 3300 | 3200 | 4550 |
| Tobacco | Raisa | Quintal | Uttar Pradesh | Farukhabad | 2300 | 2300 | 3600 |
| Tobacco | Bidi Tobacco | Quintal | West Bengal | Kolkata | 13300 | 13300 | 13500 |
| Rubber | - | Quintal | Kerala | Kottayam | 11500 | 12000 | 10200 |
| Arecanut | Pheton | Quintal | Tamil Nadu | Chennai | 32700 | 32700 | 32700 |

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 | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CARDAMOM | Guatmala Bold Green | U.K. | - | Dollar/MT | 9000 | 9000 | 17500 | 17500 | 17500 | 17500 | 17500 | 17500 | 17500 | 17500 |
| | | | | Rs./Qtl | 61335 | 60219 | 113383 | 112105 | 112928 | 112560 | 113138 | 112000 | 114363 | 113750 |
| CASHEW KERNELS | Spot U.K. 320s | U.K. | - | Dollar/MT | 10613 | 10692 | 11206 | 11662 | 11816 | 11717 | 11883 | 11544 | 11973 | 11652 |
| | | | | Rs./Qtl | 72324 | 71537 | 72602 | 74708 | 76251 | 75363 | 76826 | 73879 | 78245 | 75740 |
| CASTOR OIL | Any Origin ex tank Rotterdam | Netherlands | - | Dollar/MT | 1454 | 1498 | 1884 | 1859 | 1835 | 1835 | 1835 | 1790 | 1806 | 1806 |
| | | | | Rs./Qtl | 9907 | 10026 | 12206 | 11909 | 11840 | 11801 | 11862 | 11456 | 11802 | 11738 |
| CHILLIES | Birds eye 2005 crop | Africa | - | Dollar/MT | 4100 | 4100 | 7500 | 7500 | 7500 | 6800 | 6800 | 6800 | 6800 | 5800 |
| | | | | Rs./Qtl | 27942 | 27433 | 48593 | 48045 | 48398 | 43738 | 43962 | 43520 | 44438 | 37700 |
| CLOVES | Singapore | Madagascar | - | Dollar/MT | 7500 | 8400 | 8800 | 8800 | 8750 | 9500 | 9500 | 9850 | 8500 | 8000 |
| | | | | Rs./Qtl | 51113 | 56204 | 57015 | 56373 | 56464 | 61104 | 61418 | 63040 | 55548 | 52000 |
| COCONUT OIL | Crude Phillipine/Indonesia, cif Rotterdam | Netherlands | - | Dollar/MT | 1840 | 1590 | 1610 | 1600 | 2100 | 1810 | 1810 | 2005 | 1600 | 1405 |
| | | | | Rs./Qtl | 12540 | 10639 | 10431 | 10250 | 13551 | 11642 | 11702 | 12832 | 10456 | 9133 |
| COPRA | Phillipines cif Rotterdam | Phillipine | - | Dollar/MT | 905 | 838 | 800 | 832 | 840 | 838 | 838 | 837 | 821 | 807 |
| | | | | Rs./Qtl | 6168 | 5607 | 5183 | 5327 | 5421 | 5390 | 5418 | 5354 | 5362 | 5242 |
| CORRIANDER | | India | - | Dollar/MT | 1650 | 1650 | 1650 | 1650 | 1650 | 1650 | 1650 | 1650 | 1650 | 1650 |
| | | | | Rs./Qtl | 11245 | 11040 | 10690 | 10570 | 10647 | 10613 | 10667 | 10560 | 10783 | 10725 |
| CUMMIN SEED | | India | - | Dollar/MT | 2500 | 2500 | 2900 | 3500 | 3500 | 2900 | 2900 | 3300 | 3300 | 3300 |
| | | | | Rs./Qtl | 17038 | 16728 | 18789 | 22421 | 22586 | 18653 | 18749 | 21120 | 21566 | 21450 |
| MAIZE | | U.S.A. | Chicago | C/56 lbs | 366 | 371 | 359 | 359 | 371 | 385 | 385 | 342 | 339 | 351 |
| | | | | Rs./Qtl | 981 | 976 | 913 | 904 | 942 | 973 | 978 | 860 | 871 | 897 |
| OATS | | CANADA | Winnipeg | Dollar/MT | 337 | 333 | 312 | 304 | 323 | 345 | 331 | 301 | 309 | 359 |
| | | | | Rs./Qtl | 2295 | 2226 | 2021 | 1949 | 2085 | 2221 | 2141 | 1928 | 2019 | 2333 |
| PALM KERNAL OIL | Crude Malaysia/Indonesia, cif Rotterdam | Netherlands | - | Dollar/MT | 1820 | 1330 | 1190 | 1080 | 1200 | 1075 | 1075 | 1255 | 1350 | 1495 |
| | | | | Rs./Qtl | 12403 | 8899 | 7710 | 6918 | 7744 | 6914 | 6950 | 8032 | 8822 | 9718 |
| PALM OIL | Crude Malaysian/Sumatra, cif Rotterdam | Netherlands | - | Dollar/MT | 823 | 760 | 705 | 710 | 760 | 715 | 715 | 710 | 720 | 735 |
| | | | | Rs./Qtl | 5605 | 5085 | 4568 | 4548 | 4904 | 4599 | 4622 | 4544 | 4705 | 4778 |
| PEPPER (Black) | Sarawak Black lable | Malaysia | - | Dollar/MT | 7900 | 7700 | 7700 | 7700 | 7200 | 6200 | 6200 | 5000 | 5000 | 5000 |
| | | | | Rs./Qtl | 53839 | 51521 | 49888 | 49326 | 46462 | 39878 | 40083 | 32000 | 32675 | 32500 |
| RAPESEED | Canola | CANADA | Winnipeg | Can Dollar/MT | 522 | 518 | 494 | 530 | 524 | 510 | 510 | 505 | 493 | 506 |
| | | | | Rs./Qtl | 2720 | 2635 | 2400 | 2493 | 2510 | 2430 | 2546 | 2584 | 2585 | 2555 |
| | UK delivered rapeseed, delivered Erith(buyer) | U.K. | - | Pound/MT | 330 | 334 | 336 | 328 | 290 | 295 | 295 | 310 | 293303 | |
| | | | | Rs./Qtl | 2833 | 2783 | 2717 | 2709 | 2395 | 2417 | 2464 | 2548 | 2566 | 2583 |
| RAPESEED OIL | Refined bleached and deodorised ex-tanks,broker price | U.K. | - | Pound/MT | 827 | 765 | 763 | 738 | 742 | 725 | 725 | 766 | 723 | 738 |
| | | | | Rs./Qtl | 7099 | 6375 | 6169 | 6096 | 6127 | 5939 | 6054 | 6295 | 6331 | 6291 |
| SOYABEAN MEAL | UK produced 49% oil & | U.K. | - | Pound/MT | 325 | 329 | 310 | 310 | 271 | 284 | 284 | 278 | 285 | 291 |

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 | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | protein ('hi-pro') ex-mill seaforth UK bulk | | | Rs./Qtl | 2790 | 2742 | 2506 | 2561 | 2238 | 2327 | 2372 | 2285 | 2496 | 2480 |
| SOYABEAN OIL | | U.S.A. | - | C/lbs | 35 | 33 | 32 | 32 | 32 | 31 | 31 | 34 | 35 | 33 |
| | | | | Rs./Qtl | 5238 | 4825 | 4599 | 4505 | 4591 | 4446 | 4468 | 4796 | 5041 | 4728 |
| | Refined bleached and deodorised ex-tanks,broker price | U.K. | - | Pound/MT | 807 | 709 | 750 | 682 | 680 | 696 | 696 | 728 | 734 | 705 |
| | | | | Rs./Qtl | 6927 | 5908 | 6064 | 5633 | 5615 | 5702 | 5812 | 5983 | 6428 | 6009 |
| SOYABEANS | | U.S.A. | - | C/60 lbs | 1055 | 1023 | 969 | 946 | 948 | 931 | 931 | 936 | 953 | 976 |
| | | | | Rs./Qtl | 2639 | 2511 | 2304 | 2223 | 2246 | 2197 | 2208 | 2198 | 2286 | 2328 |
| | US NO.2 yellow | Netherlands | Chicago | Dollar/MT | 426 | 426 | - | 386 | 387 | 381 | 381 | 393 | 393 | 395 |
| | | | | Rs./Qtl | 2900 | 2841 | - | 2474 | 2498 | 2449 | 2461 | 2513 | 2571 | 2569 |
| SUNFLOWER SEED OIL | Refined bleached and deodorised ex-tanks,broker price | U.K. | - | Pound/MT | 796 | 786 | 791 | 766 | 760 | 756 | 756 | 793 | 747 | 746 |
| | | | | Rs./Qtl | 6833 | 6550 | 6395 | 6327 | 6276 | 6193 | 6313 | 6517 | 6541 | 6359 |
| Wheat | | U.S.A. | Chicago | C/60 lbs | 425 | 441 | 426 | 408 | 433 | 445 | 445 | 409 | 421 | 436 |
| | | | | Rs./Qtl | 1062 | 1084 | 1012 | 959 | 1024 | 1050 | 1055 | 961 | 1010 | 1040 |

Foreign Exchange Rates

| Currency | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|
| CanDollar | 52.06 | 50.83 | 48.6 | 47.01 | 47.93 | 47.7 | 49.98 | 51.2 | 52.46 | 50.53 |
| UKPound | 85.84 | 83.33 | 80.85 | 82.6 | 82.58 | 81.92 | 83.51 | 82.18 | 87.57 | 85.24 |
| USDollar | 68.15 | 66.91 | 64.79 | 64.06 | 64.53 | 64.32 | 64.65 | 64 | 65.35 | 65 |

# Crop Production

4. Sowing and Harvesting Operations Normally in Progress During January, 2018

| State | Sowing | Harvesting |
|---|---|---|
| (1) | (2) | (3) |
| Andhra Pradesh | Summer Rice, Ragi, (R), Small Millets (R) other Rabi, Pulses, Sugarcane, Onion | Winter Rice, Jowar (K), Maize (R), Ragi, (K), Tur (K), Urad (K), Mung (K), Winter Potato (Plains), Sugar cane, Groundnut, Castorseed, Cotton, Mesta, Sweet Potato, Garlic. |
| Assam Bihar | | Winter Rice, Winter Potato, Sugarcane, Sesamum, Cotton. |
| Bihar | Summer Rice, Winter Potato (Plains), Sugarcane | Winter Potato (Plains), Sugarcane, Groundnut, Rapeseed & Mustard, Linsed. |
| Gujarat | Sugarcane | Small Millets (R), Tur (K), Sugarcane Ginger, Chillies, Tobacco, Castorseed, Cotton, Turmeric |
| Himachal Pradesh | Winter Potato (Hills), Onion | — |
| Jammu & Kashmir | Onion | Winter Potato, Chillies (Dry). |
| Karnataka | Summer Rice, Ragi (R), Urad, Mung (R) Potato (Plains) Sugarcane | Winter Rice, Jowar (R), Bajra (K), Ragi (K), Wheat, Barley, Small Millets (K), Gram, Tur (K), Mung (K), Other Kharif Pulses Potats (Plains) Sugarcane Black Pepper, Chillies (Dry) Tobacco Castorseed, Rapeseed & Mustard, Linseed, Cotton, Mesta, Sweet Potato, Turmeric, Kardiseed, Tapioca. |
| Kerala | Summer Rice, Sugarcane, Sesamun (3rd Crop) | Winter Rice, Ragi, Tur, (K) Other Kharif Pulses, (Kulthi), Urad (R) Other Rabi Pulses, Sugarcans, Ginger, Black Pepper, Seamum (2nd Crops) Sweet, Potato, Turmeric, Tapioca. |
| Madhya Pradesh | Sugarcane, Onion | Jowar (K), Small Millets (R), Tur (K), Urad (R) Mung (R), Other Rabi, Pulses, Sugarcane, Ginger, Chillies (Dry), Tabacco, Castorseed, Rapeseed & Mustard, Cotton, Mesta, Sweet Potato, Turmeric, Sannhemp. |
| Maharashtra | Sugarcane | Winter Rice, Jowar Gram, Urad (R) Mung (R), Sugarcane, Chillies (Dry), Tobacco, Cotton Turmeric, Sannhemp. |
| Orissa | Summer Rice, Chillies (Dry). | Winter Rice, Winter Potato (Plains), Sugarcane, Chillies (Dry), Tobacco, Castorseed, Nigerseed. |
| Punjab and Haryana | Potato, Tabacco, Onion. | Potato, Sugarcane, Sweet Potato. |
| Rajasthan | Sugarcane, Tobacco | Tur (K), Winter Potato (Plains), Sugarcane, Chillies (Dry). |
| Tamil Nadu | Winter Rice, Jowar (R), Sugarcane, Tur (R), Tobacco, Groundnut, Sesamum, Onion, Bajra (R) | Rice, Jowar (K), Bajra (K), Ragi, Small Millets (K) Gram, Tur (K) Urad (K) Mung (K), Other Kharif Pulses Winter Potato (Hills), Sugarcane, Black Pepper, Groundnut, Castorseed, Sesamum, Cotton, Turmeric, Onion. |
| Tripura | Summer Rice | Winter Rice Gram, Winter Potato (Plains), Sugarcane, Rapeseed & Mustard, Sweet Potato. |
| Uttar Pradesh | Summer Rice, Sugarcane, Jute Onion Tobacco (Late). | Tur (K), Winter Potato (Plains), Sugarcane, Tobacco (Early), Castorseed Rapeseed & Mustard, Cotton, Sweet, Potato, Turmeric, Tapioca. |
| West Bengal | Summer Rice, Sugarcane. | Tur (K), Urad (R), Mung (R) Other Rabi Pulses, Winter Potato (Plains), Sugarcane, Ginger, Chillies (Dry), Sesamum, Rapeseed & Mustard. |
| Delhi | Winter Potato (Plains) Onion | Summer Potato (Plains), Sugarcane, Chillies (Dry), Onion. |
| Andaman & Nicobar Inlands | — | Winter Rice. |

(K)—Kharif (R)—Rabi



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