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From Editor's Desk

In this issue of Agricultural Situation in India, an effort has been made to provide our readers an outline of recent initiatives of the Government towards a holistic development of the farm sector, a general survey of agriculture, two scholarly articles in the field of agricultural and rural economics, and one agro-economic research study on pressurized irrigation network systems in India.

The major farm related news talked in this issue consist of the promotion of scientifically designed, tailor-made Integrated Farming Systems to realize the vision of doubling farmers' income by 2022; inclusion of more crops under Market Intervention Scheme to facilitate small and marginal farmers; compensation to farmers for losses due to natural calamities; decline in agriculture cost due to implementation of Soil Health Cards; promotion of protected cultivation through poly houses/ green house structures under the Integrated Development of Horticulture scheme; realignment of cropping pattern to enhance water use efficiency and judicious use of irrigation water. Among other important news are promotion of Zero Budget Natural Farming; the Cabinet's approval for the release of pulses procured from farmers under price support scheme; the Cabinet's approval for the Memorandum of Understanding between India UK and Northern Ireland on the cooperation in the field of animal husbandry, dairying and fisheries; release of Third Advance Estimate of area and production of horticulture crops and Fourth Advance Estimate of production of major crops for 2017-18.

During 10-11 September, the Department of Agriculture, Cooperation and Farmers Welfare organised second India Agricultural Outlook Forum 2018. Inaugurated with the announcement of a historical high of foodgrain and horticultural produce during 2017-18, and evergreat outlook by Dr. S.K. Pattanayak, Secretary, DAC&FW, and illuminated by distinguished speakers like Dr. Abhijit Sen, Professor Emeritus, JNU, and Dr. Robert Johansson, Chief Economist, USDA – the event was participated by a large number of national and international experts and delegates. The video recordings of the inaugural speakers and the power point presentations are available at the website. Begun with a plenary round headed by eminent experts like Dr. Abhijit Sen, Dr. Vijay Paul Sharma, Chairman CACP, the deliberations were participated by academic and industry leaders like Dr. Raka Saxena of NIAP, and Mr. S. Sivakumar of ITC Ltd., and enriched by the experience of leading economists, retired civil servants, eminent academicians Mr. Siraj Hussain, former Secretary, DAC&FW; Prof. Vasant Gandhi of CMA, Ahmedabad; Dr. Brajesh Jha of IEG, Delhi; Ms. Sudha P. Rao, Principal Adviser, DAC&FW; Dr. S.M. Jharwal, former Principal Adviser, DAC&FW; Dr. Sangeeta Verma, Pr. Adviser, Department Of Consumer Affairs.

The concurrent sessions turned out to be engrossing with the presentations of eminent speakers like Dr. Andrew Stephens, Senior Policy Advisor, USDA; Mr. Rajju Shroff, United Phosphorous Ltd. The distinguished speakers were: Dr. Arun Deshmukh of Netafim Irrigation India Private Ltd.; Dr. Y.D. Sharma of Indian Network of Participatory Irrigation; Dr. O.P. Chaudhary, DAH&DF; Dr. Smita Sirohi, Principal Scientist & Head, Dairy Economics and Statistics, National Dairy Research Institute, Karnal; Dr. Ranjan Kumar Ghosh, CMA, Ahmedabad; Dr. Parmod Kumar of Agro-Economic Research Unit of ISEC Bengaluru; Dr. Thomas W. Worth, Senior Actuary, USDA; Ms. Katia Covarrubias, FAO; Dr. Biswajit Dhar, JNU; Mr. Damian Kaminsky, First Secretary, EU; Dr. N. Bhaskar, FSSAI; and Ms. Anumita Roy, Executive Director, Centre for Science and Environment.

So far as the agricultural scenario is concerned, the wholesale price index of foodgrain decreased by 0.35 percent in, 2018 as compared to that in July, 2017. The WPI of cereals, wheat and paddy showed an increasing trend; while there was a decline in case of pulses during the same period. The cumulative South-West Monsoon season rainfall in the country has been 6 percent lower than the long period average during 1st June, 2018 to 29th August, 2018. Present live storage in 91 major water reservoirs in the country was 112.08 BCM as against 98.17 BCM of normal storage based on the average storage of last 10 years.

On academic contemplation, there are two insightful research articles on groundwater use in the eastern dry zone of Karnataka; and growth and instability of India's foodgrains production. The first article analyzes the marginal productivity of groundwater use in the Chikkaballapur taluk of eastern dry zone of Karnataka. The twin objectives of this article are to estimate: the cost of groundwater irrigation; and the marginal value product of groundwater. The findings reveal that the marginal productivity of groundwater was highest for grapes. Moreover, the marginal value product of groundwater per acre-inch was found to be 7.3 times than the irrigated cost per acre-inch. The policy implications of this study emphasize the economic value of groundwater which is essential for water allocation decisions and its pricing, which would promote water use efficiency. The second article assesses growth and instability in production, area and yield of India's two major foodgrains, namely, rice and wheat, for a period of 65 years from 1950-51 to 2014-15. The results reveal that production and yield of rice and wheat mostly remain unstable during the study period. The study recommends attaining more technological know-how for stability and sustained growth in the production of rice and wheat, which would ensure price stability.

In the agro-economic research column, this issue shares a report on the working of Pressurized Irrigation Network Systems (PINS) in four major states of India, viz., Rajasthan, Gujarat, Maharashtra and Telangana, prepared by AERC, Sardar Patel University, Anand, Gujarat. The primary objectives of this report are to: conduct a broad situation analysis of different PINS programs implemented in the selected states; measure the extent of adoption and performance of PINS in the country; analyse the institutional arrangements for management, operation and maintenance of PINS in the country; and identify major constraints in adoption, management, operation and maintenance of PINS in the country. The policy implications of this study suggest judicious utilization of water resources so that the slogan 'more crops per drop' of the Government can be realized. Farmers should be given more subsidies on electricity and fully automated solar system to meet their need, etc. Furthermore, it is recommended to promote the concept of PINS among farmers by encouraging suitable cropping pattern through some incentive structure as they usually don't want to change already existing highly water intensive cropping pattern.

P. C. Bodh

Farm Sector News

Scientifically designed, tailor-made Integrated Farming Systems being promoted to achieve Hon'ble Prime Minister Shri Narendra Modi's vision of Doubling Farmers' Income by 2022: Agriculture Minister

Scientifically designed and tailor-made Integrated Farming Systems (IFS) are being promoted to achieve the vision of Hon'ble Prime Minister Shri Narendra Modi of "Doubling Farmers' Income by 2022". This was stated by the Union Minister of Agriculture and Farmers Welfare Shri Radha Mohan Singh on 2nd August, 2018 at the in-session meeting to discuss the Integrated Farming Systems (IFS) for livelihood security and enhance income of the farmers. Members of the Parliamentary Consultative Committee of Ministry of Agriculture and Farmers Welfare, Government officials and scientists of Indian Council of Agricultural Research (ICAR) participated in the in-session meeting.

Shri Singh said that the IFS can be classified as natural and intentional integrated systems. The intentional integrated systems are one which addresses the multiple objectives of increasing production, profit, cost-reduction through recycling, family nutrition, sustainability, ecological security, employment generation, economic efficiency and social equity.

The Agriculture Minister said that high-yielding grain varieties heavily dependent on chemical fertilisers were used to reduce India's dependence on food imports and meet the country's food requirement. However, later, due to the use of low fertilizers, productivity fell leading to decline in the income of farmers. He highlighted the Economic Survey of India 2017-18 tabled in Parliament which indicates that over a period of 10 years, the share of income of farmers from crop production increased by only 1% while it increased by 7% for livestock.

Shri Singh further said that small farms (up to 2 ha) hold the key to ensure food and nutritional security of India. Therefore, location-specific integration of field crops, orchard, floriculture, agro-forestry, and livestock such as dairy, poultry, piggery, fishery and other less land requiring activities such as mushroom, apiary, and boundary plantations are being done for improving the livelihood of marginal and small households.

Expressing happiness, the Minister said that ICAR has partnered with 25 State Agricultural Universities (SAUs), 5 research institutes and one Central University through All India Co-ordinated Research Project (AICRP) and developed 45 Integrated Farming System (IFS) models suitable to 23 states and one Union Territory for providing better production and income.

He concluded by requesting the committee and the Members of Parliament to urge upon states to promote these location-specific IFS models and initiate the National Mission on Integrated Farming Systems by converging the schemes of crops, horticulture, livestock and fisheries in order to give impetus to integrated farming systems among farmers for fast-tracking the goal of doubling farmer's income by 2022.

Inclusion of more crops under Market Intervention Scheme

All the agricultural and horticultural commodities, for which Minimum Support Price (MSP) is not fixed and are generally perishable in nature, are covered under Market Intervention Scheme (MIS).

In order to give benefits to small and marginal farmers of the country including Jharkhand and Gujarat, the Government has implemented various schemes viz., Soil Health Card (SHC) scheme, Neem Coated Urea (NCU), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Paramparagat Krishi Vikas Yojana (PKVY), National Agriculture Market scheme (e-NAM), Pradhan Mantri Fasal Bima Yojana (PMFBY), Minimum Support Price (MSP) operation, Mission for integrated Development of Horticulture (MIDH), Sub-Mission on Seed and Planting Material (SMSP), Rashtriya Krishi Vikas Yojana (RKVY), etc. In addition, schemes relating to tree plantation (Har Medh Par Ped), Bee Keeping, Dairy and Fisheries are also implemented.

Source: www.pib.nic.in

Compensation to farmers for losses due to natural calamities

The State Government is primarily responsible for providing necessary relief measures in the wake of natural calamities. For undertaking relief measures, funds are available with the State Governments in the form of State Disaster Response Fund (SDRF). Additional financial assistance, over and above SDRF, is considered from National Disaster Response Fund (NDRF) for natural calamities of severe nature and is approved on the basis of Memorandum received from the State Government, in accordance with established procedures.

The Department of Agriculture, Cooperation and Farmers Welfare is concerned with providing relief under NDRF to farmers who have lost their crops due to drought, hailstorm, pest attack and cold wave/frost. An amount of Rs.22972.30 crore has been approved from NDRF during 2015-16 to 2017-18 to the States affected by the aforesaid calamities.

The Government of India has evolved several schemes/programmes to address the need for drought mitigation and other requirements of the farmers under Rashtriya Krishi Vikas Yojana (RKVY), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), besides implementation of Pradhan Mantri Fasal Bima Yojana (PMFBY) and National Agriculture Market Scheme (e-NAM), etc., for protecting farmers' interests. The states have been given flexibility under RKVY to plan region-specific interventions for the farmers.

The agriculture is a state subject. The State Governments are responsible for disbursement of funds to the affected farmers. All individual beneficiary-oriented assistance is mandatorily/ necessarily disbursed through the bank account of the beneficiary. In order to improve the disbursement and transparency in providing relief to the beneficiaries under various items, the State Government needs to prepare a consolidated list of individual beneficiaries in whose bank account funds would be transferred. The list to be prepared should be displayed on their website as well as the State/District and block/taluk levels for the purpose of verification and social audit.

Recent announcement of a remunerative price based on the recommendation of NCF is a very important step to ensure economic viability of farming: Dr. Swaminathan

The hon'ble Prime Minister Shri Narendra Modi led government has taken several important steps for the improvement of living standards of farmers and the upliftment of agriculture sector. This was stated by the Union Minister of Agriculture and Farmers Welfare Shri Radha Mohan Singh. Shri Singh, on several occasions, said that questions have been raised about the present Government's inaction on the National Commission on Farmers (NCF) report but the truth is that based on this report presented in the year 2006, Hon'ble Prime Minister Shri Narendra Modi led government, compared to the previous governments, has taken several important steps for improving living standards of farmers and upliftment of Agriculture sector. Dr. Swaminathan, while acknowledging this in his article in an English daily said "Although the NCF report was submitted in 2006, very little action was taken until the present government headed by Hon'ble Prime Minister Narendra Modi took office. Fortunately, over the last four years, several significant decisions have been taken to improve the status and income of farmers."

The Hon'ble Union Agriculture Minister said to help farmers get fair value of their produce and enhance their income, Hon'ble Prime Minister Shri Narendra Modi led government fulfilled its promise by recently announcing a hike in the Minimum Support Price (MSP) for Kharif 2018. Praising the decision of the government, Dr. Swaminathan said "The recent announcement of a remunerative price based on the recommendation of NCF is a very important step to ensure the economic viability of farming. To underline, the government has ensured in its notification that from Kharif 2018 onwards MSP of the notified crops would be minimum of 150% of the cost of production; it ranges from 150-200% for coarse cereals."

Decline in agriculture cost

Soil Health Card Scheme plays a vital role in enhancing agricultural production in a sustainable manner. The Government has introduced Soil Health Card (SHC) Scheme to assist State Governments to provide Soil Health Cards to all farmers across the country once in a cycle of two years. Soil Health Cards provides information to farmers on nutrient

status of their soil along with recommendations on appropriate dosage of nutrients to be applied for improving soil health and its fertility, which results in enhanced agricultural productivity.

National Productivity Council (NPC), in their study, has reported savings of 8-10% of fertilizers and 5-6% increase in crop yield, as a result of fertilizer application as per the recommendations of Soil Health Cards.

Poly houses

Mission for Integrated Development of Horticulture (MIDH), a centrally sponsored scheme, is implemented for the holistic development of horticulture sector in the country covering fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo through various interventions.

Under MIDH, assistance is provided for protected cultivation through Green House structures/poly houses. For Fan & Pad and Naturally ventilated system Green House (Tubular structure), assistance is provided @ 50% of cost for a maximum area of 4000 sq. mtrs. per beneficiary. For wooden and bamboo structure green house, assistance is provided @50% of cost limited to 20 units per beneficiary and each unit not exceeding 200 sq. m. Assistance for protected cultivation is also being provided under Rashtriya Krishi Vikas Yojana (RKVY) and National Mission for Sustainable Agriculture (NMSA).

Under the Human Resource Development (HRD) programme of MIDH, training for poly-houses to farmers, entrepreneurs, field level workers and officials are envisaged. Further, 22 Precision Farming Development Centres (PFDCs) have been established in the country to standardize precision farming, promote use of various plasticulture technologies and to provide training & awareness programmes. Farmers are also provided technical literature and information about financial assistance under the scheme in local languages.

The cabinet approved the release of pulses procured from farmers under Price Support Scheme to States with Central Subsidy of Rs. 15 per Kg for utilization under Welfare Schemes

The Cabinet Committee on Economic Affairs, chaired by the Hon'ble Prime Minister Shri Narendra Modi, approved the release of pulses to States/UTs at discounted rate to be utilized for various Welfare Schemes from the stock of pulses procured under Price Support Schemes (PSS).

Impact:

The decision would enable the States/UTs to use pulses in various Welfare Schemes like PDS, Mid-Day Meal Scheme, etc., besides making available the warehouses, which may be required in coming Kharif season for storage of commodities procured under Price Support Scheme.

Details:

Under this approved Scheme, the States/UT Governments are offered to lift 34.88 lakh MT of tur, chana, masoor, moong and urad at discount of Rs.15 per Kg over the prevailing wholesale market price of the sourcing state on first come first serve basis. The State/UTs Governments utilize these pulses in their various Welfare Schemes/Programmes like Mid-Day Meal, Public Distribution System, Integrated Child Development Programmes (ICDP) etc. This would be one-time dispensation for a period of 12 months or complete disposal of 34.88 lakh MT of pulses stock whichever is earlier. Government will spend Rs. 5,237 crore for implementation of this Scheme.

Insurance cover for damage of crops by animals

The latest available estimates of average income per agricultural household in the country are based on the "Situation Assessment Survey of Agricultural Households" conducted by National Sample Survey Office (NSSO) during its 70th round (January 2013 – December 2013). As per the survey results, the average monthly income per agricultural household from all sources is estimated to be Rs. 6,426/.

Government has not conducted any such Survey since 2013. However, the National Statistical Commission (NSC) has decided to conduct the next Situation Assessment Survey (SAS) of Agricultural Households in the NSS 77th round (January 2019-December 2019) with reference to the agricultural year July 2018 – June 2019.

Under SAS 2013, among other things, the reasons for the crop loss with respect to each major crop were ascertained. As per the survey results, during

the first half of the agricultural year (July 2012-Dec 2012), inadequate rainfall/ drought was the most reported reason for crop loss for all the selected crops, except coconut and urad, wherein 'disease/ insect/animal' was reported as the major reason for crop loss.

During the period (Jan 2013-June 2013), 'disease/ insect/animal' was the most reported reason for crop loss for most of the crops. For crops like gram, potato, rapeseed/ mustard, other natural calamities was one of the major reasons reported by households.

Under the Pradhan Mantri Fasal Bima Yojana (PMFBY), a comprehensive risk insurance package is provided to cover yield losses due to non-preventable risks, viz., natural fire and lightning, storm, hailstorm, cyclone, typhoon, tempest, hurricane, tornado, flood, inundation and landslide, drought, dry spells, pests/diseases, etc. The losses to crops due to wild animals are preventable in nature and therefore, not covered. Further, due to the involvement of issue of moral hazard at the time of assessing the loss/risk, insurance companies are at present not providing cover for this risk.

However, there are systems in place, both at the Centre and State level, for compensation for losses to farmers in the country due to destruction of crops by wild animals. The Ministry of Environment, Forest and Climate Change provides financial assistance to State/UTs under the Centrally Sponsored Schemes of "Integrated Development of Wildlife Habitats", "Project Tiger" and 'Project Elephant" for management of wildlife and its habitats in the country. It includes compensation for depredation by wild animals including cattle lifting, crop damage, loss of life and property. State Governments also provide relief from their own funds for damage to crops by wild animals.

Realignment of cropping pattern

The Department of Agriculture, Cooperation & Farmers Welfare emphasizes for holistic development of agriculture including land, crop and water productivity. In order to enhance water use efficiency and judicious use of irrigation water, incentives are given for water saving devices like sprinklers, drip, raingun, etc., besides promotion of resource conservation technologies under the Schemes like Pradhan Mantri Krishi Sinchai Yojana (PMKSY) (per drop more crop), etc.

The cropping pattern is dependent on various factors, viz., agro- climatic condition of the region, availability of resources like land & water, market forces, socio-economic condition of the farmers and change as per the available resources. Accordingly, Government of India has been emphasizing promotion of various cropping system under crop development programmes.

The Department of Agriculture, Cooperation & Farmers Welfare supplements the efforts of the states to diversify agricultural/horticultural crops as per the local need through various schemes, viz., National Food Security Mission (NFSM), National Mission on Oilseeds and OilPalm (NMOOP), Rashtriya Krishi Vikas Yojana (RKVY)/ Mission for Integrated Development of Horticulture (MIDH)/ National Mission for Sustainable Agriculture (NMSA)/Rainfed Area Development (RAD), etc.

The farmers are encouraged to use available resources like land and water judiciously. The new technologies on cropping pattern are demonstrated at the farmers' fields through State Department of Agriculture/Indian Council of Agricultural Research (ICAR)/State Agricultural Universities (SAUs)/Krishi Vigyan Kendras (KVKs), etc.

Promotion of Zero Budget Natural Farming

NITI Aayog held a meeting on 9th July, 2018 to discuss the promotion of Zero budget Natural Farming. Government of India has been promoting organic farming in the country through the dedicated schemes of Paramparagat Krishi Vikas Yojana (PKVY) since 2015-16 and also through Rashtriya Krishi Vikas Yojana (RKVY). In the revised guidelines of PKVY scheme during the year 2018, various organic farming models like Natural Farming, Rishi Farming, Vedic Farming, Cow Farming, Homa Farming, Zero Budget Natural Farming (ZBNF), etc., have been included wherein flexibility is given to states to adopt any model of Organic Farming including ZBNF depending on farmer's choice. Under the RKVY scheme, organic farming/ natural farming project components are considered by the respective State Level Sanctioning Committee (SLSC) according to their priority/ choice.

Indian Council of Agricultural Research (ICAR) under Network Project on Organic Farming

(NPOF) and All India Coordinated Research Projects (AICRP) on Integrated Farming Systems, has initiated an experiment on "Evaluation of zero budget farming practices in basmati rice-wheat system" at Modipuram (Uttar Pradesh), Ludhiana (Punjab), Pantnagar (Uttarakhand) and Kurukshetra (Haryana) from Rabi 2017 to study the zero budget farming practices on productivity, economics and soil health including soil organic carbon and soil fertility. As already mentioned, farming that has been promoted under PKVY and other schemes aim at chemical free farming. Bio-pesticides, bio-fertilizers, onfarm / off farm natural inputs are used by farmers that results in reduction of input cost compared to inorganic cultivation which also contributes to savings.

Interest subvention on loan of farmers

The Government of India (GoI) has been implementing the Interest Subvention Scheme (ISS) since 2006-07 under which short term crop loans upto Rs. 3.00 lakh are made available to farmers at subvented interest rate of 7% per annum. Further, from 2009-10, to incentivize the prompt payee farmers, the GoI also introduced a provision of Prompt Repayment Incentive (PRI) under the Scheme. Presently, under ISS, the GoI provides PRI @ 3% to the prompt payee farmers for repayment of their crop loans as per the repayment schedule fixed by the banks or within a period of one year from the date of disbursement, whichever is earlier.

A request was received from the Government of Rajasthan for release of interest subvention by National Bank for Agriculture and Rural development (NABARD) to Rajasthan State Cooperative Bank Ltd. in the beginning of the year. Alternatively, it was suggested that a revolving fund for matching amount be created to enable Short Term Cooperative Credit Structure to avail timely interest subvention.

As per the current scheme, provisions funds are provided by the Government to NABARD only on reimbursement basis of audited claims of concerned banks and there is no proposal under consideration to provide funds in advance.

Cage farming in Karnataka

The Centrally Sponsored Scheme (CSS) on Blue Revolution: Integrated Development and Management of Fisheries approved by the Government in December 2015 inter-alia provides financial assistance for (i) open sea cage culture and (ii) installation of cages/pens in reservoirs and other open water bodies. Under the CSS, the unit cost of open sea cage was fixed at Rs. 5 lakh per cage and having minimum diameter of 6 m and depth of 4 m in case of each circular cage and 96 cubic meter volume (6mx4mx4m) in case of each rectangular cage. Similarly, the unit cost for installation of cages/ pens in reservoirs and other open water bodies was fixed at Rs. 3 lakh per cage including installation and inputs for first crop.

The Government of Karnataka reported the installation of 8 marine cages with an expenditure of Rs. 29.9 lakh for Seabass and Cobia culture and a total of 102 cages in reservoir with an expenditure of Rs.81 lakh. Besides, National Fisheries Development Board (NFDB), Hyderabad has also sanctioned 500 brackish-water cages to the Central Marine Fisheries Research Institute (CMFRI) for installation in the selected District of Karnataka.

The Union Agriculture Minister, Shri Radha Mohan Singh discussed ways to strengthen bilateral ties and promoting closer cooperation in agriculture sector with Minister of Foreign Affairs and European Integration of Republic of Moldova, Mr. Tudor Ulianovschi

The Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh, met the Minister of Foreign Affairs and European Integration of the Republic of Moldova, Mr. Tudor Ulianovschi, in Krishi Bhawan, New Delhi on 14th August, 2018 and called for strengthening traditional ties between the two countries by promoting closer cooperation in the agriculture sector.

Shri Singh reiterated India's tremendous progress in the agriculture sector and the commitment to double farmers' income by 2022 through a series of reforms, namely, Soil Health Card, organic farming, crop insurance, irrigation, e-NAM, etc. He said "we have achieved food security and have become a net exporter of agriculture commodities''.

The Minister said that the agriculture sector has immense opportunities and huge potential for both the countries and there is a need to promote interaction among government agricultural institutions, experts, scientists and agro business.

Shri Singh called for businesses from both sides to explore possibilities for enhancing agricultural trade and welcomed Moldovan companies to participate in the World Food Festival in India. He further said that it is imperative to enhance agricultural trade between the two countries and assured Moldova that India has already initiated the enabling processes for export of apples from Moldova and urged them to consider import of agriculture commodities including fruits and vegetables from India.

The Union Minister of Agriculture and Farmers Welfare proposed to United Nations Food & Agriculture Organization to declare an upcoming year as "International Year of Millets"

The Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh, has written to the Director General, United Nations Food & Agriculture Organization (FAO) and proposed the declaration of an upcoming year as "International Year of Millets".

In a letter to Mr. Jose Graziano da Silva, Director-General, United Nations Food & Agriculture Organization, Shri Singh said that to garner wider global attention and action, India has mooted a proposal for declaration of an upcoming year as International Year of Millets.

The Union Agriculture Minister stated that India is celebrating the year 2018 as the National Year of Millets and is promoting cultivation by amending cropping pattern of areas which are especially susceptible to climate change. He further added that government under the leadership of Hon'ble Prime Minister Shri Narendra Modi has been actively promoting millets. Millets are highly nutritious and useful in various lifestyle diseases, enhancing resilience and risk management in face of climate change especially for small and marginal farmers.

Shri Singh further added that the government recently increased the MSP of millets by more than 50 percent of cost of production which is an important component of efforts to achieve the national commitment of doubling farmers' income by 2022.

This letter follows his earlier communication to the Secretary General of the UN in November 2017 in this regard. The Minister has requested the inclusion of this proposal in the agenda of the 26th session of the Committee on Agriculture (COAG) meeting, scheduled during October 1-5, 2018 in Rome.

Shri Singh said that adoption of this proposal by FAO with the support of its Member Nations will enable it to be moved to the UNGA for declaration of an upcoming year as International Year of Millets.

He said that the matter has received support of the member countries when placed in the Bureau meeting of the committee on agriculture held on July 5, 2018.

"It is highly desirable that global efforts are stepped up to bring these nutri-cereals back to the food basket of a wide range of consumers, rural and urban as well as rich and poor, for boosting their production as well," he added.

The Cabinet apprised the MoU between India and United Kingdom and Northern Ireland on the Cooperation in the fields of Animal Husbandry, Dairying and Fisheries

The Union Cabinet, chaired by Hon'ble Prime Minister Shri Narendra Modi, apprised the Memorandum of Understanding (MoU) between India and United Kingdom (UK) and Northern Ireland for cooperation in the fields of Animal Husbandry, Dairying and Fisheries. The MoU was signed on 17.04.2018.

The MoU aims to develop bilateral cooperation in the field of Animal Husbandry, Dairying and Fisheries for the purpose of increasing production and productivity of Indian livestock and fisheries.

Impact:

The partnership is expected to improve livestock health, livestock breeding and Fisheries aiming at enhancing Dairy, Fisheries and Animal Products for domestic consumption and export. The MoU would promote consultation and cooperation on livestock husbandry, fisheries and dairy through:

- Matters of mutual concern or interest in relation to livestock husbandry, fisheries and related matters
- Collaboration in livestock health and husbandry, breeding dairying and fisheries

- Management and mechanism to enrich feed & fodder nutritionally and its bulk transportation in deficit areas to realise higher productivity and production in livestock

- Sanitary issues concerning trade in livestock, animal husbandry and animal products

- Development of high tech fodder tree species nurseries with fodder crops and promotion of agro-forestry tor planting fodder tree species under integrated farming system including soil moisture conservation in drought prone areas

- Areas of exchange of scientific personnel for study tour/training in mutually agreed areas

- Collaboration for joint research for cross-learning with regard to innovative Agriculture Extension approaches including the use of information and communication technology (ICT)

- Any other matter of joint interest

A Joint Working Group (JWG) consisting of representatives of each party should be created to formulate joint programs and to facilitate cooperation & consultation.

All India 2017-18 (Third Advance) Estimates of Area & Production of Horticulture Crops

The Department of Agriculture, Cooperation and Farmers Welfare released the 2017-18 (3rd Advance Est.) of area and Production of Horticulture Crops. These estimates are based on the information received from different State/UTs in the country.

Following Table summarises the All-India Final Estimates: 2016-17 and 2017-18 (3rd Advance Estimates):

Total Horticulture	2016-17	2017-18 (Third Adv. Est.)	% change of 2017-18 (3rd adv. Est.) w.r.t. 2016-17
Area ('000 Ha)	24851	25662	3.26
Production ('000 Tonnes)	300643	306818	2.05

Highlights:-

The Third Advance Estimates for horticulture crops have been prepared on the basis of information received from State Departments of Horticulture/ Agriculture and various agencies like Directorate of Arecanut & Spices Development (DASD), Directorate of Cashew & Cocoa Development (DCCD) and National Bee Board (NBB). The main highlights of horticulture scenario during 2017-18 are as under.

- The total horticulture production of the country is estimated to be 306.8 million tonnes during 2017-18 which is 2.05% higher than the previous year and 8.5% higher than the past 5 years' average production.
- Production of fruits is estimated to be about 97 million tonnes which is 4.5% higher than previous year.
- Production of vegetables is estimated to be about 179.7 million tonnes which is about 1.0% higher than the previous year.
- Onion production in the current year is likely to be around 220 lakh tonnes as against 224 lakh tonnes in 2016-17, which is 6%, higher than the last 5 years' average.
- Potato production is estimated at 485 lakh tonnes as against 486 lakh tonnes in 2016-17 which is about 5% higher than the last 5 years' average production.
- Tomato production in the current year is likely to be around 194 lakh tonnes as against 207 lakh tonnes in 2016-17 which is about 3% higher than the last 5 years' average production.

4th Advance Estimates of production of major crops for 2017-18

The 4th Advance Estimates of production of major crops for 2017-18 are released by the Department of Agriculture, Cooperation and Farmers Welfare on 28th August, 2018. The assessment of production of different crops is based on the feedback received from States and validated with information available from other sources. The estimated production of various crops as per the 4th Advance Estimates for 2017-18 vis-à-vis the estimates for the years 2003-04 onwards is enclosed.

2. As per 4th Advance Estimates, the estimated production of major crops during 2017-18 is as under:

- Foodgrains – 284.83 million tonnes (record)
- Rice – 112.91 million tonnes (record)

- Wheat – 99.70 million tonnes (record)
- Nutri/Coarse Cereals – 46.99 million tonnes (record)
- Maize – 28.72 million tonnes (record)
- Pulses – 25.23 million tonnes (record)
- Gram – 11.23 million tonnes (record)
- Tur – 4.25 million tonnes
- Urad – 3.56 million tonnes (record)
- **Oilseeds** – 31.31 million tonnes
- Soyabean – 10.98 million tonnes
- Groundnut – 9.18 million tonnes
- Rapeseed & Mustard – 8.32 million tonnes (record)
- Castorseed – 1.57 million tonnes
- **Cotton** – 34.89 million bales (of 170 kg each)
- **Sugarcane** – 376.91 million tonnes (record)

3. As a result of near normal rainfall during monsoon 2017 and various policy initiatives taken by the Government, country has witnessed a record foodgrain production in 2017-18. As per the Fourth Advance Estimates for 2017-18, total foodgrain production in the country is estimated at 284.83 million tonnes which is higher by 9.72 million tonnes than the previous record production of foodgrain of 275.11 million tonnes achieved during 2016-17. The production during 2017-18 is also higher by 24.66 million tonnes than the previous five years' (2012-13 to 2016-17) average production of foodgrain.

4. Total production of rice during 2017-18 is estimated at a record 112.91 million tonnes. Production of rice has increased by 3.21 million tonnes than the production of 109.70 million tonnes during 2016-17. It is also higher by 6.61 million tonnes than the five years' average production of 106.29 million tonnes.

5. Production of wheat, estimated at a record 99.70 million tonnes, is higher by 1.19 million tonnes as compared to wheat production of 98.51 million tonnes achieved during 2016-17. Further, the production of wheat during 2017-18 is higher by 6.36 million tonnes than the average wheat production of 93.34 million tonnes.

6. Production of nutri / coarse cereals estimated at a record 46.99 million tonnes is higher than the average production by 5.29 million tonnes. Further, it is also higher by 3.22 million tonnes as compared to their production of 43.77 million tonnes achieved during 2016-17.

7. Total pulses production during 2017-18 is estimated at record 25.23 million tonnes which is higher by 2.10 million tonnes than the previous year's production of 23.13 million tonnes. Moreover, the production of pulses during 2017-18 is higher by 6.39 million tonnes than the Five years' average production of 18.84 million tonnes.

8. Total oilseeds production in the country during 2017-18 is estimated at 31.31 million tonnes which is marginally higher than the production of 31.28 million tonnes during 2016-17. However, the production of oilseeds during 2017-18 is higher by 1.76 million tonnes than the average oilseeds production.

9. With a significant increase by 70.84 million tonnes over 2016-17, total production of sugarcane in the country during 2017-18 is estimated at record 376.90 million tonnes. The production of sugarcane during 2017-18 is also higher by 34.87 million tonnes than the average sugarcane production of 342.04 million tonnes.

10. Production of cotton estimated at 34.89 million bales (of 170 kg each) is higher by 2.31 million bales than the production of 32.58 million bales during 2016-17. Further, it is also higher by 1.39 million bales than its average production of 33.50 million bales. Production of jute & mesta is estimated at 10.14 million bales (of 180 kg each) during the 2017-18.

Secretary (DARE) & DG (ICAR) emphasized on creating "Mission for Youth in Agriculture" and "Regional Platform for Youth in Agriculture" with neighbouring countries as partners

Youth plays a vital role in transforming Agriculture in India. There are emerging challenges of empowering the youth to improve their skills and to enable them to stay in the agricultural enterprise in rural situation. To address these issues, certain economic models are to be created in the villages for developing certain youth entrepreneurs in rural areas who can be a guide to others in the villages. Realizing the importance of rural youth in agricultural development especially from the point of view of food security of the country, ICAR had initiated a program on "Attracting and Retaining Youth in Agriculture (ARYA) during 2015-16. Under this scheme, special efforts are being taken up to

attract the rural youth under the age of 35 years in agriculture so that the increase in the migration of rural youth towards cities is controlled.

In order to meet the challenge of providing sustainable livelihoods for a rapidly growing population and to motivate and attract youth in agriculture, Dr. Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR), inaugurated a two-day conference at NASC, New Delhi from 30-31 August, 2018 on Motivating and Attracting Youth in Agriculture (MAYA). He urged to create a "Mission for Youth in Agriculture" and "Regional Platform for Youth in Agriculture" with neighbouring countries as partners and said that we need to attract youth in agriculture by providing them lucrative alternatives.

Dr RS Paroda, Chairman, TAAS, speaking on the occasion, urged to mainstream youth in agriculture. He emphasized that youth should to be trained as employer rather than employment seeker. The farmers in India need one stop solution for all their problems like a multi-speciality hospital. Dr MS Swaminathan, the father of green revolution in India, addressed online and said that youth have potential to revolutionize agriculture in India. Dr Ravi Kheterpal, Executive Secretary, APAARI said youth want to get involved in glamorous jobs. If such jobs are created in agriculture, it will bring revolution.

Earlier, Dr AK Singh, DDG (Extension), ICAR, in his welcome address said that rural youth is running towards urban areas thereby putting tremendous pressure on the existing urban resources. Therefore, there is a need to create employment opportunities for the youth in rural areas in agriculture.

The two day conference provide an opportunity to all stakeholders to interact and discuss various options and avenues for not only attracting youth to agriculture but even motivating them towards entrepreneurship in agriculture and allied fields.

More than 200 participants including farmers from various states, senior research, development and policy related officials/managers from national and regional organizations, NGOs, the private sector, education and training institutions, and other members of civil society participated to discuss ways to Motivate and Attract Youth in Agriculture (MAYA). The regional conference has attracted participants from Afghanistan, Bhutan, India, Nepal and Sri Lanka.

The conference was organized by the Trust for Advancement of Agricultural Sciences (TAAS), Indian Council of Agricultural Research (ICAR), MS Swaminathan Research Foundation (MSSRF), Asia-Pacific Association of Agricultural Research Institutions (APAARI), Skill India, Agriculture Skill Council of India (ASCI), Young Professionals for Agricultural Development (YPARD) and National Bank For Agriculture And Rural Development (NABARD).

General Survey of Agriculture

Trends in Foodgrain Prices

Based on Wholesale Price Index (WPI) (2011-12=100), foodgrains price decreased by 0.35 percent in July, 2018 over July, 2017. During the same period, the WPI of pulses decreased by 17.03 percent, whereas WPI of cereals, wheat and paddy increased by 3.51 percent, 6.31 percent and 3.96 percent, respectively.

The WPI of pulses and paddy showed an increase of 2.81 percent and 0.71 percent, respectively, in July, 2018 over June, 2018. During this period the WPI of foodgrains, cereals and wheat increased by 1.21 percent, 0.89 percent and 1.26 percent, respectively.

Rainfall and Reservoir Situation
Rainfall Situation

- Cumulative South-West Monsoon Season, 2018 rainfall for the country as a whole during the period 1st June, 2018 to 29th August, 2018 has been 6% 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 9% in South Peninsula, equal to LPA in Central India and but lower than LPA by 27% in East & North East India and 5% in North-West India.

- Out of total 36 meteorological Sub-divisions, 1 met subdivision received Excess rainfall, 24 subdivisions received Normal rainfall and 11 Sub-divisions received Deficient rainfall.
- Out of 659 districts for which rainfall data available, 15(2%) districts received Large Excess rainfall, 88(13%) received Excess rainfall, 309(47%) received Normal rainfall, 230(35%) districts received Deficient rainfall and 17(3%) received Large Deficient rainfall.

Water Storage in Major Reservoirs

Central Water Commission monitors 91 major reservoirs in the country which have total live capacity of 161.99 Billion Cubic Metre (BCM) at Full Reservoir Level (FRL). Current live storage in these reservoirs (as on 30th August, 2018) was 112.08 BCM as against 85.07 BCM on 30.08.2017 (last year) and 98.17 BCM of normal storage (average storage of last 10 years). Current year's storage is 132% of last year's storage and 114% of the normal storage.

Sowing Position during Kharif, 2018

As per latest information available on sowing of Kharif crops upto 31.08.2018, area sown under Kharif crops taken together has been reported to be 1022.87 lakh hectares at All India level which is lower by 4.26 lakh ha. than the area coverage of 1027.13 lakh hectares during the corresponding period of last year.

Economic Growth

The provisional estimates (PE) of national income released by Central Statistics Office (CSO) on 31st May 2018, estimated the growth of Gross Domestic Product (GDP) at constant market prices for the year 2017-18 to be 6.7 percent (Table 1) The growth rate of GDP at constant market prices was 7.1 percent (first revised estimate) in 2016-17 and 8.2 percent in 2015-16.

The growth in Gross Value Added (GVA) at constant basic prices for the year 2017-18 is estimated to be 6.5 percent (PE). At the sectoral level, agriculture, industry and services sectors are estimated to grow at the rate of 3.4 percent, 5.5 percent and 7.9 percent respectively in 2017-18.

As per the quarterly estimates, the growth of GDP at constant prices for first quarter (April - June) of 2018-19 was 8.2 percent, as compared to the growth of 5.6 percent recorded in the corresponding quarter of the last year.

The upswing trend of quarterly growth, which started in the second quarter of 2017-18, reinforced in Q1 of 2018-19 with higher growth as compared to that of in third and fourth quarters of 2017-18 (Table 2).

The share of total final consumption in GDP at current prices in 2017-18 is estimated to be 70.5 percent, as compared to 69.9 percent in 2016-17. The fixed investment rate (ratio of gross fixed capital formation to GDP) is estimated to be 28.5 percent in 2017-18, which is the same as in previous two years. After a transient slowdown in fixed investment growth in Q1 of 2017-18, it rebounded in second quarter and sustained momentum in the rest of the year.

The saving rate (measured as a share of gross saving to GDP) for the year 2016-17 was 30.0 percent, as compared to 31.3 percent in 2015-16. The investment rate (measured as a share of gross capital formation to GDP) was 30.6 percent in 2016-17, as compared to 32.3 percent in 2015-16.

Agriculture and Food Management

Rainfall:

There has been a deficiency in the cumulative rainfall received for the country as a whole during the period 1st June 2018 to 19th August 2018. The actual rainfall received during this period has been 572.4 mm, as compared to the normal rainfall of 623.1 mm. Out of the total 36 meteorological sub divisions, no sub division received large excess rainfall, 1 sub divisions received excess rainfall, 24 sub divisions received normal rainfall, 11 subdivisions received deficient rainfall.

All India production of foodgrains:

As per the 4th Advance Estimates (AE) released by Ministry of Agriculture & Farmers' Welfare on 28th August 2018, the production of foodgrains during 2017-18 is estimated at 284.8 million tonnes, as compared to 275.1 million tonnes in 2016-17 (Final Estimate) (Table 3).

Procurement:

Procurement of rice as on 31st July 2018 during Kharif Marketing Season 2017-18 was 36.4 million tonnes, whereas procurement of wheat during Rabi Marketing Season 2018-19 was 35.5 million tonnes (Table 4).

Offtake:

The offtake of rice (all schemes) during the month of June 2018 has been 28.5 lakh tonnes. This comprises 25.1 lakh tonnes under TPDS/NFSA (offtake against the allocation for the month of July, 2018) and 3.4 lakh tonnes under other schemes. In respect of wheat, the total offtake has been 19.2 lakh tonnes comprising of 17.8 lakh tonnes under TPDS/NFSA (offtake against the allocation for the month of July, 2018) and 1.5 lakh tonnes under other schemes. The cumulative offtake of foodgrains during 2018-19 is 18.7 million tonnes (Table 5).

Stocks:

The total stocks of rice and wheat held by FCI as on 1st August 2018 was 65.8 million tonnes, as compared to 53.8 million tonnes as on 1st August 2017 (Table 6).

TABLE 1 : Growth of GVA at Basic Prices by Economic Activity and GDP at Market Prices (percent)

Sectors	Growth Rate at Constant (2011-12) Prices (%)			Share in GVA at Current Prices (%)		
	2015-16 2nd RE	2016-17 1st RE	2017-18 PE	2015-16 2nd RE	2016-17 1st RE	2017-18 PE
Agriculture, forestry & fishing	**0.6**	**6.3**	**3.4**	**17.7**	**17.9**	**17.1**
Industry	**9.8**	**6.8**	**5.5**	**29.8**	**29.3**	**29.1**
Mining & quarrying	13.8	13.0	2.9	2.4	2.4	2.5
Manufacturing	12.8	7.9	5.7	16.8	16.8	16.7
Electricity, gas, water supply & other utility services	4.7	9.2	7.2	2.7	2.6	2.6
Construction	3.7	1.3	5.7	7.9	7.4	7.4
Services	**9.6**	**7.5**	**7.9**	**52.5**	**52.8**	**53.9**
Trade, Hotel, Transport Storage	10.3	7.2	8.0	18.3	18.2	18.5
Financial , real estate & prof services	10.9	6.0	6.6	20.9	20.6	20.8
Public Administration, defence and other services	6.1	10.7	10.0	13.2	13.9	14.5
GVA at basic prices	**8.1**	**7.1**	**6.5**	**100.0**	**100.0**	**100.0**
GDP at market prices	8.2	7.1	6.7	---	---	---

Source: *Central Statistics Office (CSO).*
Notes: *2nd RE: Second Revised Estimates, 1st RE: First Revised Estimates, PE: Provisional Estimates..*

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

Sectors	2016-17				2017-18				2018-19
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Agriculture, forestry & fishing	**4.3**	**5.5**	**7.5**	**7.1**	**3.0**	**2.6**	**3.1**	**4.5**	**5.3**
Industry	**8.3**	**6.8**	**7.1**	**5.0**	**0.1**	**6.1**	**7.1**	**8.8**	**10.3**
Mining & quarrying	10.5	9.1	12.1	18.8	1.7	6.9	1.4	2.7	0.1
Manufacturing	9.9	7.7	8.1	6.1	-1.8	7.1	8.5	9.1	13.5
Electricity, gas ,water supply & other utility services	12.4	7.1	9.5	8.1	7.1	7.7	6.1	7.7	7.3
Construction	3.0	3.8	2.8	-3.9	1.8	3.1	6.6	11.5	8.7
Services	**9.4**	**7.9**	**6.5**	**6.3**	**9.5**	**6.8**	**7.7**	**7.7**	**7.3**
Trade, hotels, transport, communication and services related to broadcasting	8.9	7.2	7.5	5.5	8.4	8.5	8.5	6.8	6.7
Financial, real estate & professional **services**	10.5	8.3	2.8	1.0	8.4	6.1	6.9	5.0	6.5
Public administration, defence and Other Services	7.7	8.0	10.6	16.4	13.5	6.1	7.7	13.3	9.9
GVA at Basic Price	**8.3**	**7.2**	**6.9**	**6.0**	**5.6**	**6.1**	**6.6**	**7.6**	**8.0**
GDP at market prices	**8.1**	**7.6**	**6.8**	**6.1**	**5.6**	**6.3**	**7.0**	**7.7**	**8.2**

Source: (CSO).

TABLE 3 : Production of Major Agricultural Crops (3ND adv. est.)

Crops	Production (Million Tonnes)					
	2012-13	2013-14	2014-15	2015-16	2016-17 (FINAL)	2017-18 (4nd AE)
Total Foodgrains	**257.1**	**265.0**	**252.0**	**251.6**	**275.1**	**284.8**
Rice	105.2	106.7	105.5	104.4	109.7	112.9
Wheat	93.5	95.9	86.5	92.3	98.5	99.7
Total Coarse Cereals	40.0	43.3	42.9	38.5	43.8	47.0
Total Pulses	18.3	19.3	17.2	16.4	23.1	25.2
Total Oilseeds	30.9	32.8	27.5	25.3	31.3	31.3
Sugarcane	341.2	352.1	362.3	348.4	306.1	376.9
Cotton#	34.2	35.9	34.8	30.0	32.6	34.9

Source: *DES, DAC & FW, M/o Agriculture & Farmers Welfare.*
Notes: *4nd AE: 4nd Advance Estimates, # Million bales of 170 kgs. each.*

TABLE 4 : Procurement of Crops (Million Tonnes)

Crops	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Rice#	34.0	31.8	32.0	34.2	38.1	36.4*	
Wheat@	38.2	25.1	28.0	28.1	23.0	30.8	35.5#
Total	**72.2**	**56.9**	**60.2**	**62.3**	**61.1**	**67.2**	**35.5**

Source: *FCI and DFPD, M/o Consumer Affairs, Food and Public Distribution.*
Notes: *Procurement of rice as on 31.07.2018. # Procurement of wheat as on 06.07.2018*
 # : Kharif Marketing Season (October-September), @ Rabi Marketing Season (April-March)

TABLE 5 : Off-take of Foodgrains (Million Tonnes)

Crops	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19 *
Rice	29.2	30.7	31.8	32.8	35.0	11.2
Wheat	30.6	25.2	31.8	29.1	25.3	7.5
Total (Rice & Wheat)	**59.8**	**55.9**	**63.6**	**61.9**	**60.3**	**18.7**

Source: *DFPD, M/o Consumer Affairs, Food and Public Distribution.*
Note: *upto May 2018.*

TABLE 6 : Stocks of Foodgrains (Million Tonnes)

Crops	1st August 2017	1st August 2018
1. Rice	19.9	21.9
2. Unmilled Paddy#	5.7	4.6
3. Converted Unmilled Paddy in terms of Rice	**3.8**	**3.0**
4. Wheat	**30.1**	**40.9**
Total (Rice & Wheat)(1+3+4)	**58.7**	**65.8**

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

As on : 28.08.2018

Fourth Advance Estimates of Production of Foodgrains for 2017-18

Million Tonnes

Crop	Season	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17		2017-18	
															4th Advance Estimates	Final Estimates	Targets	4th Advance Estimates
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20
Rice	Kharif	78.62	72.23	78.27	80.17	82.66	84.91	75.92	80.65	92.78	92.37	91.50	91.39	91.41	96.39	96.30	94.50	97.50
	Rabi	9.91	10.90	13.52	13.18	14.03	14.27	13.18	15.33	12.52	12.87	15.15	14.09	13.00	13.76	13.40	14.00	15.41
	Total	88.53	83.13	91.79	93.36	96.69	99.18	89.09	95.98	105.30	105.24	106.65	105.48	104.41	110.15	109.70	108.50	112.91
Wheat	Rabi	72.16	68.64	69.35	75.81	78.57	80.68	80.80	86.87	94.88	93.51	95.85	86.53	92.29	98.38	98.51	97.50	99.70
Jowar	Kharif	4.84	4.04	4.07	3.71	4.11	3.05	2.76	3.44	3.29	2.84	2.39	2.30	1.82	1.85	1.96	2.75	2.10
	Rabi	1.84	3.20	3.56	3.44	3.81	4.19	3.93	3.56	2.69	2.44	3.15	3.15	2.42	2.72	2.60	3.00	2.85
	Total	6.68	7.24	7.63	7.15	7.93	7.25	6.70	7.00	5.98	5.28	5.54	5.45	4.24	4.57	4.57	5.75	4.95
Bajra	Kharif	12.11	7.93	7.68	8.42	9.97	8.89	6.51	10.37	10.28	8.74	9.25	9.18	8.07	9.80	9.73	9.50	9.13
Maize	Kharif	12.73	11.48	12.16	11.56	15.11	14.12	12.29	16.64	16.49	16.19	17.14	17.01	16.05	19.24	18.92	19.00	20.24

Fourth Advance Estimates of Production of Foodgrains for 2017-18 -*CONTD.*

Million Tonnes

Crop	Season	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17		2017-18
															4th Advance Estimates	Final Estimates	Targets	4th Advance Estimates
	Rabi	2.25	2.70	2.55	3.54	3.85	5.61	4.43	5.09	5.27	6.06	7.11	7.16	6.51	7.02	6.98	7.00	8.47
	Total	14.98	14.17	14.71	15.10	18.96	19.73	16.72	21.73	21.76	22.26	24.26	24.17	22.57	26.26	25.90	26.00	28.72
Ragi	Kharif	1.97	2.43	2.35	1.44	2.15	2.04	1.89	2.19	1.93	1.57	1.98	2.06	1.82	1.40	1.39	2.00	1.98
Small Millets	Kharif	0.56	0.48	0.47	0.48	0.55	0.44	0.38	0.44	0.45	0.44	0.43	0.39	0.39	0.42	0.44	0.50	0.44
Barley	Rabi	1.30	1.21	1.22	1.33	1.20	1.69	1.35	1.66	1.62	1.75	1.83	1.61	1.44	1.74	1.75	1.90	1.77
Nutri/ Coarse Cereals	Kharif	32.22	26.36	26.74	25.61	31.89	28.54	23.83	33.08	32.44	29.79	31.20	30.94	28.15	32.71	32.44	33.75	33.89
	Rabi	5.39	7.10	7.33	8.31	8.86	11.49	9.72	10.32	9.58	10.25	12.09	11.92	10.37	11.48	11.33	11.90	13.10
	Total	37.60	33.46	34.07	33.92	40.75	40.04	33.55	43.40	42.01	40.04	43.29	42.86	38.52	44.19	43.77	45.65	46.99
Cereals	Kharif	110.84	98.59	105.01	105.78	114.55	113.45	99.75	113.73	125.22	122.16	122.70	122.34	119.56	129.10	128.74	128.25	131.38
	Rabi	87.45	86.64	90.21	97.30	101.46	106.45	103.70	112.52	116.98	116.63	123.09	112.53	115.66	123.63	123.24	123.40	128.21
	Total	198.28	185.23	195.22	203.08	216.01	219.90	203.45	226.25	242.20	238.79	245.79	234.87	235.22	252.73	251.98	251.65	259.59
Tur	Kharif	2.36	2.35	2.74	2.31	3.08	2.27	2.46	2.86	2.65	3.02	3.17	2.81	2.56	4.78	4.87	4.25	4.25
Gram	Rabi	5.72	5.47	5.60	6.33	5.75	7.06	7.48	8.22	7.70	8.83	9.53	7.33	7.06	9.33	9.38	9.75	11.23
Urad	Kharif	1.20	0.95	0.90	0.94	1.12	0.84	0.81	1.40	1.23	1.48	1.15	1.28	1.25	2.17	2.18	1.85	2.84
	Rabi	0.27	0.38	0.35	0.50	0.34	0.33	0.42	0.36	0.53	0.47	0.55	0.68	0.70	0.63	0.66	0.75	0.73
	Total	1.47	1.33	1.25	1.44	1.46	1.17	1.24	1.76	1.77	1.95	1.70	1.96	1.95	2.80	2.83	2.60	3.56
Moong	Kharif	1.43	0.81	0.69	0.84	1.25	0.78	0.44	1.53	1.24	0.79	0.96	0.87	1.00	1.62	1.64	1.65	1.44
	Rabi	0.28	0.25	0.26	0.28	0.27	0.26	0.25	0.27	0.40	0.40	0.65	0.64	0.59	0.55	0.52	0.65	0.57
	Total	1.70	1.06	0.95	1.12	1.52	1.03	0.69	1.80	1.63	1.19	1.61	1.50	1.59	2.16	2.17	2.30	2.01
Lentil	Rabi	1.04	0.99	0.95	0.91	0.81	0.95	1.03	0.94	1.06	1.13	1.02	1.04	0.98	*	1.22	*	1.61
Other Kharif Pulses	Kharif	1.18	0.61	0.54	0.70	0.96	0.80	0.49	1.33	0.93	0.62	0.71	0.77	0.72	0.86	0.89	1.00	0.82
Other Rabi Pulses	Rabi	1.44	1.32	1.36	1.37	1.19	1.28	1.28	1.33	1.34	1.60	1.51	1.74	1.50	3.02	1.77	3.00	1.76
Total Pulses	Kharif	6.16	4.72	4.86	4.80	6.40	4.69	4.20	7.12	6.06	5.91	5.99	5.73	5.53	9.42	9.58	8.75	9.34
	Rabi	8.74	8.41	8.52	9.40	8.36	9.88	10.46	11.12	11.03	12.43	13.25	11.42	10.82	13.53	13.55	14.15	15.89
	Total	14.91	13.13	13.38	14.20	14.76	14.57	14.66	18.24	17.09	18.34	19.25	17.15	16.35	22.95	23.13	22.90	25.23
Total Foodgrains	Kharif	117.00	103.31	109.87	110.58	120.96	118.14	103.95	120.85	131.27	128.07	128.69	128.06	125.09	138.52	138.33	137.00	140.73
	Rabi	96.19	95.05	98.73	106.71	109.82	116.33	114.15	123.64	128.01	129.06	136.35	123.96	126.47	137.16	136.78	137.55	144.10
	Total	213.19	198.36	208.60	217.28	230.78	234.47	218.11	244.49	259.29	257.13	265.04	252.02	251.57	275.68	275.11	274.55	284.83

* Included in Other Rabi Pulses.

As on : 28.08.2018

Fourth Advance Estimates of Production of Commercial Crops for 2017-18

Lakh Tonnes

Crop	Season	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17		2017-18	
															4th Advance Estimates	Final Estimates	Targets	4th Advance Estimates
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Groundnut	Kharif	68.60	52.62	62.98	32.94	73.62	56.17	38.52	66.43	51.27	31.87	80.58	59.30	53.68	62.21	60.48	75.00	75.40
	Rabi	12.67	15.12	16.95	15.69	18.20	15.51	15.76	16.22	18.37	15.08	16.56	14.71	13.66	13.43	14.14	15.00	16.39
	Total	81.27	67.74	79.93	48.64	91.83	71.68	54.28	82.65	69.64	46.95	97.14	74.02	67.33	75.65	74.62	90.00	91.79
Castorseed	Kharif	7.97	7.93	9.91	7.62	10.54	11.71	10.09	13.50	22.95	19.64	17.27	18.70	17.52	14.21	13.76	19.00	15.68
Sesamum	Kharif	7.82	6.74	6.41	6.18	7.57	6.40	5.88	8.93	8.10	6.85	7.15	8.28	8.50	7.84	7.47	10.00	7.51
Nigerseed	Kharif	1.09	1.12	1.08	1.21	1.10	1.17	1.00	1.08	0.98	1.02	0.98	0.76	0.74	0.83	0.85	2.00	0.74
Soyabean	Kharif	78.18	68.76	82.74	88.51	109.68	99.05	99.64	127.36	122.14	146.66	118.61	103.74	85.70	79.77	131.59	147.00	109.81
Sunflower	Kharif	3.06	4.31	4.56	3.66	4.63	3.57	2.14	1.92	1.47	1.87	1.54	1.11	0.66	1.54	0.98	1.00	0.83
	Rabi	6.24	7.56	9.83	8.62	10.00	8.01	6.36	4.59	3.69	3.57	3.50	3.23	2.30	0.78	1.53	2.00	1.28
	Total	9.30	11.87	14.39	12.28	14.63	11.58	8.51	6.51	5.17	5.44	5.04	4.34	2.96	0.97	2.51	3.00	2.11
Rapeseed & Mustard	Rabi	62.91	75.93	81.31	74.38	58.34	72.01	66.08	81.79	66.04	80.29	78.77	62.82	67.97	1.43	79.17	81.00	83.22
Linseed	Rabi	1.97	1.70	1.73	1.68	1.63	1.69	1.54	1.47	1.52	1.49	1.41	1.55	1.25	2.41	1.84	2.00	1.75
Safflower	Rabi	1.35	1.74	2.29	2.40	2.25	1.89	1.79	1.50	1.45	1.09	1.13	0.90	0.53	137.94	0.94	1.00	0.47
Total Nine Oilseeds	Kharif	166.72	141.49	167.67	140.12	207.13	178.08	157.28	219.22	206.91	207.91	226.12	191.89	166.80	224.01	215.13	254.00	209.96
	Rabi	85.14	102.04	112.11	102.77	90.42	99.11	91.53	105.57	91.08	101.52	101.37	83.21	85.71	96.96	97.62	101.00	103.12
	Total	251.86	243.54	279.78	242.89	297.55	277.19	248.82	324.79	297.99	309.43	327.49	275.11	252.51	320.97	312.76	355.00	313.08
Sugarcane	Total	2338.62	2370.88	2811.72	3555.20	3481.88	2850.29	2923.02	3423.82	3610.37	3412.00	3521.42	3623.33	3484.48	3067.20	3060.69	3550.00	3769.05
Cotton #	Total	137.29	164.29	184.99	226.32	258.84	222.76	240.22	330.00	352.00	342.20	359.02	348.05	300.05	330.92	325.77	355.00	348.88
Jute # #	Total	102.52	93.99	99.70	103.17	102.20	96.34	112.30	100.09	107.36	103.40	110.83	106.18	99.40	100.88	104.32	110.00	96.28
Mesta # #	Total	9.21	8.73	8.70	9.56	9.90	7.31	5.87	6.11	6.63	5.90	6.07	5.08	5.83	5.12	5.30	7.00	5.08
Jute & Mesta # #	Total	111.73	102.72	108.40	112.73	112.11	103.65	118.17	106.20	113.99	109.30	116.90	111.26	105.24	106.00	109.62	117.00	101.37

 # Lakh bales of 170 kgs. each

 # # Lakh bales of 180 kgs. each

Articles

Estimation of Marginal Productivity of Groundwater in Eastern Dry Zone of Karnataka

A.V. MANJUNATHA*[1], C. M. DEVIKA[2] AND D. T. PREETHIKA[3]

Abstract

This paper draws attention to two important issues surrounding groundwater use in the Eastern Dry Zone (EDZ) of Karnataka, India. First, it attempts to discern whether farmers are profiting after accounting for factor cost of groundwater. Second, if they are, then what would be the maximum 'willingness to pay' for groundwater. To gain insights on these two aspects, primary data of 100 groundwater irrigated farmers located in the EDZ of Karnataka was analyzed using the Residual Imputation Method (RIM). The results revealed that the net returns per acre and net returns per acre-inch of groundwater were Rs.45236 and Rs.2028, respectively. The marginal productivity of groundwater was highest for grapes (Rs.5382) followed by gourds (Rs.5167), flowers (Rs.3486) and mangoes (Rs.3276) as compared to other crops. The ratio of marginal productivity of groundwater to the irrigation cost at farm level showed that Marginal Value Product of groundwater per acre-inch (Rs.2179) was 7.3 times higher than the irrigated cost per acre-inch (327). The empirical findings on the economic value of groundwater provide useful information to the policy makers regarding water allocation decisions and pricing of groundwater, which aid in promoting water use efficiency.

Keywords: *Groundwater, Marginal Productivity, Primary data, Willingness to pay, Residual imputation method, Karnataka.*

Introduction

Scope for increasing agricultural production by increasing total water availability is at a prohibitive cost and is not limitless (Saleth, 1996). Thus, increasing productivity through water use efficiency (Palanisami, 2009) is pragmatic. Current inefficiencies of water use in irrigation are of the order 60 to 70 percent and hence, there is more scope for improving water use efficiency (Palanisami, 2009). Demand management strategies such as water pricing and water markets are the tools for reallocation of scarce water resources towards efficient and value-added uses. Such reallocation is expected to augment crop production including higher valued produce per drop of water (Saleth, 1997; Saleth, 1998; Palanisami, 2009). Currently, formal water pricing exists in surface water irrigated areas, while informal water pricing exists in groundwater-irrigated niche areas. In canal irrigation, even with formal pricing, authorities are still unable to collect the water charges from farmers. Major cost of groundwater irrigation, on the other hand, is virtually borne by farmers, and hence is paying for water implicitly.

Studies on the estimation of Marginal Value Product (MVP) of groundwater in Indian agriculture (Somanathan and Ravindranath, 2006; Chandrakanth et al., 2013) are few and none of the studies have used the Residual Imputation Method (RIM) which is relevant in the Indian context where irrigation is substantially subsidized. In this study, crop-wise estimates of MVP of groundwater was estimated using RIM and is compared with the irrigation cost of groundwater, estimated using amortized cost technique.

Methodology

Data and Study Area

Primary data was collected from 100 randomly selected groundwater irrigated farmers in Chikkaballapur taluk of Eastern Dry Zone (EDZ)

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of Karnataka, during the period 2009-10. The region receives an annual rainfall of 762 mm and the area has no perennial rivers or canal irrigation infrastructure. As such, more than 90 percent of the irrigated area is fed by groundwater (GoK, 2010). Due to the increasing demand for high value crops such as vegetables and flowers from Bangalore, there has been intensive groundwater extraction in the area to cultivate vegetables, flowers, fruits throughout the year.

Estimation of Irrigation Cost

Cumulative interference of irrigation wells in the area resulted in high probability of initial and premature failure of wells and the associated reciprocal negative externalities in the groundwater irrigation. All open wells have virtually failed, including shallow borewells. Therefore, to determine the cost of borewell irrigation, the historic cost of all wells drilled by the farmer over the past generation needs to be considered, for both functioning and failed irrigation wells. These investments have been compounded at 3 percent from the year of construction till the year of study (2010). The estimate treats historical investment in irrigation wells at 2010 prices, using the real interest rate of 3 percent.

Estimation of groundwater irrigation cost inclusive of the externalities of well failures is crucial for decision making (Chandrakanth et al., 2004; Chandrakanth, 2015). The amortized cost of borewells represents the annual fixed cost component of irrigation water and depends on the status of the well, its year of construction, working life of the well, and the choice of an interest rate (Chandrakanth et al., 2004).

Theoretically, the variable cost of extraction of groundwater was almost negligible, as farmers were not charged for electricity. According to Chandrakanth et al. (2013), pumping costs account for 20 to 30 percent of the total cost of irrigation in hard rock areas. Therefore, the major cost of groundwater irrigation was represented by the frequent investments made in drilling new borewells due to high probability of initial and premature failure of existing borewells. Thus, the annual cost of irrigation covers all the wells on a farm including both functioning and non-functioning wells. The methodology for cost of irrigation has been mentioned below.

The cost thus obtained was appropriated over individual crops, according to the volume of water used for irrigation in each crop. As the probability of initial and premature failure was around 0.4 due to the cumulative well interference externality, farmers were forced to invest in additional borewell/s, as also incur maintenance costs due to repairs of pump and motor including conveyance pipes (sometimes). In some cases, farmers who cannot afford to drill well/s incurred huge expenditure, buy groundwater from neighbouring farmer. Hence, as the sunk cost of all irrigation wells was frequently incurred due to high probability of failure, sunk costs on well irrigation, were obviously the variable costs. The labour cost of irrigation was merged with the costs of other farm operations (Chandrakanth et al, 2004; Deepak et al, 2005).

Life of irrigation wells

The life of irrigation well was calculated using the 'Life tables approach' which includes both age and life of the wells. The age of irrigation well applies to wells that are functioning at the time of field data collection (2010). The life of irrigation well refers to the number of years a well had been functioning and was no longer functioning at the time of field data collection (Chandrakanth et al., 2004). As the years of drilling irrigation wells drilled from among sample farmers ranged from 1990 to 2010, the field data was collected from sample farmers from all their irrigation wells which were of 20 years age/ life. The average working life of a borewell was calculated using the following equation (1):

$$W = \frac{\sum f_i x_i}{\sum f_i} \qquad \ldots\ldots\ldots(1)$$

Where, W = average working life of a borewell, f_i = frequency of the ith borewell, x_i = age or life of a borewell, and i = ranges from zero to n, where n refers to the longest age of well in the group, which was 20 years.

Total amortized cost of borewell investment

The Total Amortized Cost (TAC) of borewell investment was estimated using the equation (2):

$$TAC = \left[CB \times \left(\frac{(1+r)^W \times r}{(1+r)^W - 1} \right) \right] \qquad \ldots\ldots\ldots(2)$$

As investments on borewell were made by different farmers in different years, it was necessary

to order these components to the present year of analysis for relative comparison. Therefore, borewell investments made in different years were compounded to the present year as under (Equation 3):

$$CB = \sum BI(1+r)^{d-c} \qquad \text{.....(3)}$$

Here, *CB*= compounded investment in borewell/s, *BI*= initial investment in the borewell, *d*= year of data collection (i.e. 2010) and *c* = initial year of well drilling, *r* = compound rate of interest and W = average age or life of borewell.

Groundwater extracted and used for irrigation

Total groundwater used for irrigation was estimated using the equation (4):

$$TWU = \left[\frac{Y \times T \times F \times D}{22611}\right] \qquad \text{.....(4)}$$

Where, *TWU* = total water used for irrigating a crop, *Y* = water yield of the well in gallons per hour, *T* = number of hours of irrigation needed for one irrigation for crop, *F* = frequency of irrigations for crop, *D* = duration of the crop in months. This procedure was applied for the estimation of water use for crops in different seasons cultivated by farmers and aggregated to obtain the total groundwater used for irrigation. The total groundwater use of the farmer was divided by 22,611 to obtain the water use in acre-inches since one acre-inch of water equals 22,611 gallons (102.79 cubic meter).

The cost of groundwater irrigation was obtained by dividing the amortized cost of irrigation plus annual maintenance cost of borewell/s *(Mj)* by total water used in acre-inches gives the cost per acre inch as under (Equation 5):

$$IC = \frac{TAC + M}{TWU} \qquad \text{.....(5)}$$

Here, *IC* = irrigation cost per acre-inch of groundwater, *TAC* = total amortized cost of borewell investment, and *TWU* = total water use. The IC was calculated for each farmer and aggregated across all farms to estimate average irrigation cost for both the types of sample farmers.

Costs and Returns

While computing the cost of production for major crops, the variable costs have only been considered as the Primarg emphasis of this study is to study the cost of water – specifically cost of groundwater. Most of the research studies do not include the volumetric measurement of water applied and, therefore, most studies do not account for the cost of water, treating it as fixed cost. However, due to increasing probability of initial and premature well failure, the cost of irrigation which hitherto was treated as fixed cost, as the irrigation wells used to serve for over 20 years, has to be treated as a variable cost, as the life and age of wells has reduced to less than 5 years. Treating irrigation cost as fixed cost, even though it has become a variable cost, diluted the efforts of the farmer in risk taking, in venturing into new irrigation well/s as well as in coping mechanisms such as drilling new wells, sharing well water with relatives and in recharging their borewells.

It has been hypothesized that irrigation cost forms a major portion of the variable cost, which has been ignored by farmers, even though their decisions on farm operations totally rests upon the cost of irrigation. However, other overheads such as depreciation on equipments, rental value of land was not included in the study. For returns, the gross value of output per farm from crops was calculated by valuing the crop output at the price realized by farmer. The net returns of farmer were obtained by deducting the variable costs from gross returns.

Marginal Value Product of Groundwater

The marginal value product of irrigation water was obtained using the method proposed by Speelman et al. (2008), which is given as under (Equation 6):

$$MVP_W = \frac{TVP - \sum Q_i P_i}{Q_W} \qquad \text{.....(6)}$$

Where, Q_i = quantity of ith non-water input used by farmer; P_i= market price of ith non-water input and Q_W= quantity of water applied by the farmer and TVP = total value product which is equal to the yield multiplied by the market price of the output.
In the study, seeds, chemical fertilizers, organic manure, plant protection chemicals were used as non-water inputs for estimating MVP of water. The market prices of the inputs were considered for estimation. The MVP has been estimated for the major crops (tomato, green beans, carrot, potato and cauliflower) cultivated in the study area.

Results and Discussion

The socio-economic characteristics of sample farmers are presented in Table I. The average age of the farmer was 47 years ranging between 24 and 82 years and they were educated for an average of 9 years. In a family of six members, half of whom have been involved in farming operations while the others are mostly children or the old. With respect to a few farm households, construction works were a dominant source of income for the economically poor families. The average land holding size was 4.81 acres across different categories of farmers. On an average, farmers owned 2.16 acres of irrigated land and 2.35 acres of rainfed land. The size of the holding alone is not an important determining factor of economic status due to increasing off-farm / non-farm income of farmers prevalent among the sample farmers in the region.

TABLE I : SOCIO-ECONOMIC CHARACTERISTICS OF SAMPLE FARMERS

Particulars	Mean	Minimum	Maximum	Standard Deviation
Age (years)	47.05	24.00	82.00	11.63
Education level (years)	8.81	0.00	18.00	3.41
Family size (No.)	6.00	2.00	15.00	2.66
Agricultural labour (No.)	3.55	1.00	10.00	1.39
Rainfed/Dry land (Acres)	2.35	0.00	13.00	2.30
Irrigated land (Acres)	2.16	0.50	12.00	1.83
Uncultivated land (Acres)	0.30	0.00	7.00	1.00
Farm size (Acres)	4.81	0.5	25	4.22

The cropping pattern presented in Table II reflects the dominance of relatively higher water consuming crops like tomato (18 percent), carrot, potato (6 percent each) and grapes (19 percent). Area devoted to mulberry (22 percent) represented a coping mechanism to water scarcity since mulberry is a hardy crop which requires relatively less water.

Farmers in the region reduced the area irrigated based on seasons since groundwater output was low during winter and summer, while their borewell water output was relatively high during rainy season, due to recharge from rainfall.

On rainfed land, finger millet (73 percent) was the major crop grown as a staple food for home consumption, followed by maize (23 percent) with a modest area under eucalyptus (4 percent). It was found that sample farmers preferred maize due to the established market linkage for poultry feed that provides an assured income. Farmers grow more than two crops per year to meet the demand from Bangalore.

TABLE II : CROPPING PATTERN ON SAMPLE FARMS

Crops	Area (Acre)	Percentage to the total
Irrigated		
Carrot	18.5	6.04
Beetroot	1	0.33
Potato	18	5.87
Tomato	56	18.27
Cauliflower	22.5	7.34
Finger millet	5	1.63
Guards	4	1.31
Beans	18	5.87
Maize	7	2.28
Cabbage	6.5	2.12
Mulberry	67.5	22.02
Grapes	59.5	19.41
Mango	9	2.94
Banana	5	1.63
Flowers	7	2.28
Areacanut	2	0.65
Irrigated Total	306.5	100.00
Rainfed		
Finger millet	74.65	72.72
Maize	24	23.38
Eucalyptus	4	3.90
Rainfed Total	102.65	100.00
Gross Cropped Area		709.15
Net Cropped Area		318.65
Gross Irrigated Area		606.50
Net Irrigated Area		216.00
Cropping intensity (percent)		223
Irrigation intensity (percent)		281

Economics of Groundwater Irrigation

Table III presented the number of functioning wells, their working life, irrigation cost and the net returns. The average life of wells in the sample area have a premature life span of approximately 7 years in comparison to borewells that served for at least 10 years or longer in earlier periods. The proportion of well failures was 36 percent due to cumulative well interference and overdraft of groundwater. As a result of initial and premature failure of wells, decline in groundwater yield and lowering water table have been apparently seen in the study area (Chandrakanth et al., 2004; Manjunatha et al., 2011). The premature well failure has been reflected in high cost of groundwater irrigation being Rs. 327/ acre inch. The net returns per acre and net returns per acre-inch of water are Rs. 45,236 and Rs. 2,028, respectively. Net returns per rupee of irrigation cost is Rs. 6.19, a pertinent indicator of the efficiency with which farmers utilize scarce groundwater.

TABLE III : ECONOMICS OF GROUNDWATER IRRIGATION

Particulars	Value
Number of farmer (No.)	100.00
Gross irrigated area (Acres)	606.50
Functioning wells (No.)	119
Failed wells (No.)	68
Total wells (No.)	187
Proportion of Well failure (Percent)	36.36
Average working life of a well (Years)	7
Total irrigation costs (Rs.)	1736276.96
Water use per functioning well (Acre-inch)	56.49
Total groundwater use (Acre-inch)	6722.83
Total amortized cost (Rs.)	2200523
Irrigation cost per Acre-inch(Rs.)	327.32
Total net returns(Rs.)	13638662.79
Net returns per farm(Rs.)	136386.63
Net returns per acre(Rs.)	45236.03
Net return per acre-inch of groundwater use (Rs.)	2028.707
Net return per rupee of irrigation cost (Rs.)	6.19
Net return per functioning well (Rs.)	114610.61

Table IV elucidated the costs and returns of the major crops grown in the region on per acre basis with particular reference to water usage and irrigation costs. Tomato was grown in all the three seasons by 45 percent of the farmers, while cauliflower and potato were grown in two seasons by 18 percent and 15 percent of the farmers, respectively. The major perennial crops grown by the sample farmers were mulberry (41 percent) and grapes (28 percent). Water use for crops such as carrot, tomato, potato, cauliflower, beans, cabbage and grapes ranges from 20 to 25 acre-inches per acre. Whereas, among crops like mulberry, flowers, banana and arecanut; the water use ranged from 25 to 30 acre-inches per acre. Gourds (14.73) and mango (14.86) has used the least amount of water measured in acre-inches.

Irrigation cost formed 45 percent of the total cost for gourds and finger millets. The share of irrigation cost to the total cost for the remaining crops, varied from 13.58 to 26.86 percent except in case of mulberry where the irrigation cost was only 2.54 percent of the total cost.

The net returns were relatively higher for gourds (Rs.62815) and cabbage (Rs.40704) as compared with other crops. Whereas, among perennials the net return was highest among grapes (Rs. 110761) followed by banana (Rs.86275), flowers (Rs.84366) and mulberry (Rs.52704). The lowest net return realized was for finger millets (Rs.1186). Also, net return per acre-inch of water was higher for grapes (Rs.5018), gourds (Rs.4263) and flowers (Rs.2998) as compared to other crops. The net return per rupee of irrigation cost was higher among mulberry (Rs.18), grapes (Rs.14) and banana (Rs.11).

Therefore, farmers can realize relatively higher returns from perennial crops like mulberry, grapes, and banana and biannual crops like cabbage, gourds, maize and potato as compared with other crops depending upon the availability of groundwater, market price and the risks involved in production.

TABLE IV : SELECTED CROP-WISE COSTS AND RETURNS OF SAMPLE FARMS ON PER ACRE BASIS

Crop	Crops cultivated by farmers	Water used (Acre-inch)	Irrigation cost* (Rs.)	Total Cost (Rs.)	Gross returns (Rs.)	Net Returns (Rs.)	Net returns per acre-inch of water used (Rs.)	Net returns per rupee of irrigation cost (Rs.)
Cabbage	7	24.37	6551 (17.41)	37641	78346	40704	1670	6.21
Gourds	4	14.73	12309(45.71)	26934	89750	62816	4263	5.10
Maize	4	17.6	3430 (24.6)	13942	28000	14058	7989	4.10
Potato	15	22.63	6388 (21.09)	30293	52948	22654	1001	3.55
Carrot	16	21.94	5884 (26.55)	22165	40629	18464	841	3.14
Cauliflower	18	22.82	5701 (18.94)	30101	473267	17226	7545	3.02
Beans	2	21.58	6455 (26.86)	24037	41333	17296	801	2.68
Tomato	45	22.13	7148 (25.48)	28063	40017	11953	540	1.67
Finger Millet	5	17.13	6866 (46.55)	14748	15934	1186	69.23	0.17
Mulberry	41	25.70	2902 (2.84)	102132	154836	52704	2050.73	18.16
Grapes	28	22.07	8034 (17.21)	46667	157429	110761	5018.62	13.78
Flowers	9	28.14	13752 (11.98)	114745	199111	84366	2998.08	6.13
Banana	3	29.38	7831 (16.60)	47164	133440	86275	2936.52	11.01
Mango	3	14.86	4832 (18.96)	25475	69333	43858	2951.41	9.07
Arecanut	1	26.54	5191 (19.91)	26066	60000	33934.43	1278.19	6.53

Note: *Figures in the parenthesis indicates percentage of water cost to the total cost

Irrigation cost was compared with the marginal value product of water in Table V. The MVP of groundwater for crops was higher than the irrigation cost for all the crops. Marginal cost of groundwater was highest for grapes (Rs.5574), followed by gourds (Rs.4351), flowers (Rs.3473), mango (Rs.3325), banana (Rs.3202), mulberry (Rs.2163) cabbage (Rs.2111), arecanut (Rs.1473), beans (Rs.1187), potato (Rs.1093), carrot (Rs.1099), cauliflower (Rs.1074), maize (Rs.987) and tomato (Rs.926) and finger millet (Rs.472).

The MVP of groundwater considering all irrigated crops estimated using the RIM was Rs. 2179 per acre-inch. Also the ratio of MVP of groundwater to the irrigation cost showed higher values for mulberry followed by grapes, banana, mango, cabbage, arecanut, flowers, gourds, maize, cauliflower, carrot, beans, potato, tomato and finger millet.

Furthermore, the ratio of MVP of groundwater to the irrigation cost at farm level showed that MVP of groundwater per acre-inch (Rs. 2179) was 7.3 times higher than the irrigated cost per acre inch (325.32). In conclusion, the results revealed that farmers will benefit even after accounting for irrigation cost up to attaining the point of MVP of groundwater.

TABLE V : COMPARISON OF IRRIGATION COST WITH MARGINAL VALUE PRODUCT OF GROUNDWATER

Crop	Irrigation cost per acre-inch (Rs.)	MVP of groundwater per acre-inch (Rs.)	Ratio of MVP to the irrigation cost
Cabbage	268.79	2111.32	7.85
Gourds	835.4	4351.54	5.21
Maize	194.84	987.5	5.07
Potato	282.35	1093.52	3.87
Cauliflower	249.83	1074.12	4.30
Carrot	268.17	1099.84	4.10
Beans	299.11	1187.03	3.97
Tomato	323.03	926.51	2.87
Finger Millet	400.82	472.98	1.18
Mulberry	112.92	2163.66	19.16
Grapes	364.02	5574.68	15.31
Flowers	488.70	3373.58	6.90
Banana	266.54	3202.45	12.01
Mango	325.17	3325.82	10.23
Arecanut	195.51	1473.71	7.54
At farm level	268.79	2111.32	7.85

Conclusions and Policy Suggestions

Persistent increase in the scarcity of water and the tendency towards overexploitation are the major concerns and these facts increase the need for sound economic analysis on water productivity. For agriculture production and livelihoods in these dry zones to be sustained, priority needs to be given to improving groundwater productivity and enhancing the efficiency of water use that have hitherto not been sufficiently addressed by both farmers and policy makers. Therefore, the study would help setting priorities in the management of groundwater to meet wider objectives such as sustainability (Patil et al., 2015). This work having examined the irrigation costs and the marginal productivity of groundwater in the EDZ of Karnataka, found that the costs were relatively higher due to the high proportion of well failures and increased well depths in the region. On an average, farmers have received Rs.6.19 for every rupee of groundwater investment and Rs.2028 for every acre-inch of groundwater used. The indicators of net returns showed higher values for crops such as grapes, banana, mango, gourds, as compared with arecanut, flowers, cabbage, potato, beans, carrot, cauliflower, maize, tomato and finger millet. Therefore, marginal willing to pay for groundwater is consequently higher for these crops. The MVP of groundwater estimated at farm level using the RIM was Rs. 2179. This clearly indicates that farmers using groundwater earned profits even after accounting for irrigation cost and this situation will continue until marginal value product of groundwater equals the irrigation cost. These results shed light on the economic value of groundwater which is crucial for water allocation decisions and pricing of water (directly/indirectly), which aid in promoting water use efficiency.

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An Economic Inquiry into Growth and Instability of India's Foodgrains Production

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Abstract:

In the agricultural economy of India, the share of rice and wheat is larger among the foodgrains. These two foodgrains cover about 80 percent of the food requirement and about 60 percent of the nutritional requirement of the country's population. Rice is cultivated in more than 40 agro-economic sub-regions covering an area of 44 million hectares. In terms of production of rice, India ranks second to China among rice producing countries of the world. Wheat is the second most important staple food crop of the country after rice. Since rice and wheat are the two major foodgrains in India, instability in the production of these two crops affects price stability. In light of the above, the present study examines the growth and instability in area, production and yield of the two major foodgrains, viz., rice and wheat. In order to fulfill these objectives,, secondary data was collected from the websites of Ministry of Agriculture & Farmers Welfare, Government of India and from the publications of Reserve Bank of India for a period of 65 years from 1950-51 to 2014-15. The results of the study show that production and yield of the rice and wheat mostly remained volatile. The fluctuation and volatility in the rice and the wheat production is not a good sign for a country like India, which is already facing the problems arising out of inflation and population growth. Stability and sustained growth in the production of rice and wheat will ensure price stability which will not only help producers but consumers also. In India, the possibility to increase the area under cultivation is limited. This warrants more attention towards the technological know-how, if already available in wider dissemination.

Key words: Growth, Instability, Decomposition, Foodgrains.

Introduction

Agricultural production all over the world witnessed a phenomenal increase over the past six decades due to the technological developments. At the same time, world population also witnessed a threefold increase from 2.5 billion in 1950 to 7.4 billion in 2015. India and China accounted for most of the increase in the growth of population. These countries together substantially contributed to world agricultural production. Foodgrains remains the foundation of nearly two-third of the global human diet and serve as critical inputs for both animal feed and industrial products. Fluctuations in the production of foodgrains and food prices would produce ripple effects throughout the world.

The growth story of Indian agricultural production has been uneven in the recent times. Instability in food production has remained a subject of intense debate in the literature related to agricultural economics in India. Instability in production raises the risk involved in farm production and affects farmers' income. It also influences the decisions to adopt high paying technologies and to make investments in farming as well. Instability affects not only the farmers but also the price stability which affects consumers. Instability increases vulnerability of low income households to market fluctuations.

In India, among the foodgrains, rice and wheat take a larger share in the country's agricultural economy. These two foodgrains cover about 80 percent of the food requirement and about 60 percent of the nutritional requirement of Indian population. Rice is cultivated in more than 40 agro-economic sub-regions covering an area of 44 million hectares. In terms of production of rice, India ranks second to China among rice producing countries of the world. Wheat is the second most important staple food of the country after rice. Since rice and wheat are two major foodgrains in India, instability in the production of these two crops affects price stability.

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Against this backdrop, the present study was taken up to analyze the growth and instability in area, production and yield of two major foodgrains, viz., rice and wheat.

Objectives

The specific objectives of the study are:

1. To study the growth rates in area, production and yield of rice and wheat.
2. To find out the instability in area, production and yield of rice and wheat.
3. To analyze the contribution of area, yield and their interaction effect on production of rice and wheat in the country during the study period.

Data and Methodology

In order to fulfill the objectives of the study, secondary data pertaining to area, production and yield of rice and wheat was collected from the websites of Ministry of Agriculture & Farmers Welfare, Government of India and from the publications of RBI for the period 1950-51 to 2014-15. The total period of 65 years from 1950-51 to 2014-15 has been divided into three sub-periods, viz., Period – I: Pre-green Revolution Period (1950-51 to 1965-66), Period – II: Green Revolution Period/Pre-Economic Reform Period (1966-67 to 1990-91) and Period – III: Post Reform Period (1991-92 to 2014-15). Instability and growth rate of area, production and yield of rice and wheat were estimated and analyzed for the overall study period also.

Compound Growth Rate

To study the growth pattern of area, production and yield of rice and wheat in India for the period 1950-51 to 2014-15, the following semi-log transformation model was used:

$$Y=\beta o(1+g)^t e^u \quad \text{..... (1)}$$

Where,

Y = Area (or) Production (or) Yield of rice/ wheat in India,
t = Time period (years)
β_0 = a parameter,
g= a parameter that is the compound rate of the growth of Y.
u = the disturbance term

If we now take log on both sides of (1), we have

$$\log Y = \log \beta_0 + t \log (1+g) + u$$

If we let $Y^* = \log Y$
$\beta_0^* = \log \beta_0$
$\beta_1^* = \log (1+g)$
we obtain $Y^* = \beta_0^* + \beta_1^* t + u_t$

This tells us that a compound rate of growth implies a linear relationship, not between Y and t, but rather between log Y and t.

Instability

To measure the instability in area, yield and production of rice and wheat, the coefficient of variation (CV) of the variables has been worked out.

CV is defined as

$$CV = \frac{SD}{AM} \times 100$$

SD = Standard Deviation
AM = Arithmetic Mean

Decomposition Model

In order to measure the relative contribution of area, yield and their interaction effect on production, decomposition technique has been worked out by using simple decomposition model.

$$PN-P0 = \underbrace{(Y_N - Y_0) A_0}_{\text{Yield Effect}} + \underbrace{(A_N - A_0) Y_0}_{\text{Area Effect}} + \underbrace{(A_N - A_0)(Y_N - Y_0)}_{\text{Interaction effect}}$$

Where,

P_N = Average production in current years (Mean of the last 5 years of Period I, II, III& overall)
P_0 = Average production in the base years (Mean of the first 5 years of Period I, II, III & overall)
Y_N = Average yield in the current years (average of the last 5 years of Period I, II, III & overall)
Y_0 = Average yield in the base years (average of the first 5 years of Period I, II, III & overall)
A_N= Average area in the current years (average of the last 5 years of Period I, II, III & overall)
A_0 = Average area in the base years (average of first 5 years of Period I, II, III & overall)

Results and Discussion

The area, yield and production of rice and wheat during the period 1950-51 to 2014-15 are presented in Appendix. In the last six and half decades, the average area of rice cultivation in the Pre-Green Revolution Period (Period I) remained at 30.81 million hectares and increased to 39.28 million hectares in the post-green revolution period (Period II). During the post-reform period (Period III), the average area of rice showed a further increase from 39.28 million hectares to 43.38 million hectares. Similarly, the average production of rice showed a threefold increase and yield showed more than fourfold increase during the Period-I compared to Period-III. As far as wheat is concerned, a similar pattern of increase in area, production and yield was observed during the study period. Though the overall trend based on averages showed an increasing trend, the estimation of growth rate and instability of rice and wheat crops would exhibit the real situation and the status of foodgrains cultivation in the country.

Growth Rates of Area, Production and Yield of Rice and Wheat

The growth analysis would indicate the general pattern of growth of the crop. The compound growth rates of area, production and yield of rice and wheat were calculated for all the three sub-periods and for the overall period. The growth rates are presented in Table 1.

TABLE 1: GROWTH RATES OF RICE AND WHEAT IN INDIA DURING 1950-51 TO 2014-15

	Rice			Wheat		
	Area	Production	Yield	Area	Production	Yield
Period I	1.37	3.69	2.29	2.32	3.8	1.45
Period II	0.61	2.94	2.31	2.09	5.44	3.29
Period III	0.07	1.46	1.38	0.95	2.00	1.06
Overall Period	0.58	2.48	1.90	1.72	4.47	2.71

Source: Calculated from data given in the Appendix.

Growth in Area

It is observed from Table 1 that the area under rice in India recorded a growth rate of 1.37 percent during Period I. In Period II and III, the area witnessed 0.61 percent and 0.07 percent growth rates, respectively. Area under wheat showed a positive growth rate of 2.32 percent in Period I and it declined to 2.09 percent in Period II. In Period III, the growth rate of area under wheat recorded only 0.95 percent, which is much lower than the growth rate of 1.72 percent estimated for the overall period.

Growth in Production

Production of rice has recorded a positive growth rate of 3.69 percent in Period I. However, the Period II and Period III witnessed a comparatively lower growth rate of 2.94 percent and 1.46 percent, respectively. Production of Wheat witnessed a positive growth rate of 3.8 percent in Period I and recorded a growth rate of 5.44 percent in Period II which is much higher compared to Period I. However, the growth rate of production of wheat has declined to 2.00 percent during Period III. This decline is substantial compared to Period I and Period II.

Growth in Yield

The annual growth rate of the yield of rice was 2.29 percent during Period I, however, the growth rate of the yield of rice showed increase during Period II. However, this increase of 0.02 percent is not substantial. The yield growth rate of rice was 1.38 percent during Period III which was lower compared to Period I and Period II. The annual growth rate of the yield of wheat was 1.45 percent during Period I. However, it turned out to be 3.29 percent in Period II which is higher compared to Period I. Finally, the yield growth rate of wheat was 1.06 percent during Period III which was comparatively lower than that of Period I and Period II.

Instability Analysis

The magnitude of instability in area, production and yield of rice and wheat are worked out for all the three sub-periods and the results are presented in Table 2.

TABLE 2 : INSTABILITY IN AREA, PRODUCTION AND YIELD OF RICE AND WHEAT

	Rice								
	Area			Production			Yield		
	AM	SD	CV	AM	SD	CV	AM	SD	CV
Period I	33.00	2.21	6.69	29.58	5.58	18.88	890.25	117.69	13.22
Period II	39.28	1.98	5.05	50.71	11.82	23.31	1280.68	238.11	18.59
Period III	43.38	1.15	2.64	89.05	10.54	11.84	2050.42	220.49	10.75
Overall Period	39.25	4.39	11.18	59.67	26.10	43.74	1468.78	516.08	35.14
	Wheat								
	Area			Production			Yield		
	AM	SD	CV	AM	SD	CV	AM	SD	CV
Period I	12.14	1.49	12.30	9.37	1.81	19.32	767.60	77.94	10.15
Period II	20.75	3.21	15.45	33.89	12.35	36.43	1583.09	382.12	24.14
Period III	27.14	2.04	7.51	73.99	11.41	15.42	2715.59	230.03	8.47
Overall Period	20.99	6.30	30.01	42.66	27.93	65.46	1800.51	821.22	45.61

Source: Calculated from data given in the Appendix.

From the above table, it is clear that the instability in area under rice declined from 6.69 percent in the Period I to 5.05 percent in the Period II. Similarly, instability in the area under rice cultivation showed a further decline in the Period III. Instability in production of rice increased from 18.88 percent in the Period I to 23.31 percent in the Period II but declined thereafter. Similarly, instability in the yield of Rice increased from 13.22 percent in the Period I to 18.59 percent in the Period II. During Period III, i.e., Post-reform period, the instability in the yield of rice showed a decline. During the overall period, instability in rice production is higher than the instability in the area and yield at all India level.

As far as wheat is concerned, instability is higher in production compared to yield and area instability during 1950-51 to 2014-15. It is also observed that the instability in area, production and yield of wheat has increased in Period II and the same declined in the Period III.

Decomposition of Growth of Rice and Wheat Production

The compound growth rates of rice and wheat reveal the general pattern of growth and direction of changes in yield and area. But this analysis did not evaluate the contribution of area and yield towards the production growth. So, it is necessary to examine the sources of production growth. To appraise the sources of production growth for rice and wheat, the change in production is divided into three effects, i.e., area effect, yield effect and interaction effect. The relative contribution of each of the three effects to changes in production of rice and wheat is presented in Table 3.

TABLE 3 : GROWTH DECOMPOSITION IN PRODUCTION OF RICE AND WHEAT (%)

Crop	Effect	Period			
		I	II	III	Overall
Rice	Area	58.81	74.67	91.27	61.42
	Yield	30.55	16.14	6.66	12.53
	Interaction	10.64	9.19	2.06	26.05

Crop	Effect	Period			
		I	II	III	Overall
Wheat	Area	42.26	48.09	47.83	27.96
	Yield	49.14	27.88	41.60	17.18
	Interaction	8.60	24.03	10.57	54.86

Source: Calculated from data given in the Appendix.

Decomposition of Growth in Rice Production

The decomposition analysis showed that an increase in rice production was mainly due to the increase in area in all the three sub-periods and also in the overall study period (Period I – 58.81 percent, Period II – 74.67 percent, Period III – 91.27 percent, and Overall Period – 61.42 percent). It is also observed that the contribution of area effect, in the growth of Rice production, increases from 58.81 percent in Period I to 91.27 percent in Period III. The contribution of interaction effect is very meager in all the three sub-periods and showed a declining trend from 10.64 percent to 2.06 percent.

Decomposition of Growth in Wheat Production

In the Period I, the yield effect was the major driving force for wheat production (49.14 percent) followed by area effect (42.26 percent). However, in the Period II and Period III, the growth in wheat production was mainly due to area effect. A little over 48 percent in Period II and 47.83 percent in Period III were due to area effect. The decomposition analysis for the overall study period (1950-51 to 2014-15) revealed that the growth in wheat production was mainly due to interaction effect (54.86 percent).

Conclusion

The results of the present study show that the growth rates of area, production and yield of rice and wheat during Period III, i.e., post-reform period, is much lower compared to that of Period I and Period II. A decline in the magnitude of instability in respect of area, production and yield of rice and wheat is observed during Period III. The instability analysis showed that the production and yield of rice and wheat mostly remained volatile during the overall study period. The results of decomposition analysis which was carried out to examine the sources of output growth show that the increase in the production of rice is predominantly due to area affect. In case of the production of wheat, the effect of yield on output was more pronounced in Period I compared to other two sub-periods. During the overall period, the interaction effect was found to contribute more to the growth of wheat output.

The fluctuation and volatility in rice and wheat production is not a good sign for a country like India, which is already facing the problems arising out of inflation and population growth. Stability and sustained growth in the production of rice and wheat would ensure price stability which not only helps producers but consumers also. In India, the possibility to increase the area under cultivation is limited. This warrants more attention to the technological know-how, if already available in wider dissemination.

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Appendix – I

All-India Area, Production and Yield of Rice and Wheat during 1950-51 to 2014-15

Area - Million Hectare
Production - Million Tonne
Yield - Kg./Hectare

Year	Area	Production	Yield	Area	Production	Yield
1950-51	30.81	20.58	668	9.75	6.46	663
1951-52	29.83	21.30	714	9.47	6.18	653
1952-53	29.97	22.90	764	9.83	7.50	763
1953-54	31.29	28.21	902	10.68	8.02	750
1954-55	30.77	25.22	820	11.26	9.04	803
1955-56	31.52	27.56	874	12.37	8.76	708
1956-57	32.28	29.04	900	13.52	9.40	695
1957-58	32.30	25.53	790	11.73	7.99	682
1958-59	33.17	30.85	930	12.62	9.96	789
1959-60	33.82	31.68	937	13.38	10.32	772
1960-61	34.13	34.58	1013	12.93	11.00	851
1961-62	34.69	35.66	1028	13.57	12.07	890
1962-63	35.69	33.21	931	13.59	10.78	793
1963-64	35.81	37.00	1033	13.50	9.85	730
1964-65	36.46	39.31	1078	13.42	12.26	913
1965-66	35.47	30.59	862	12.57	10.40	827
1966-67	35.25	30.44	863	12.84	11.39	887
1967-68	36.44	37.61	1032	14.99	16.54	1103
1968-69	36.97	39.76	1076	15.96	18.65	1169
1969-70	37.68	40.43	1073	16.63	20.09	1208
1970-71	37.59	42.22	1123	18.24	23.83	1307
1971-72	37.76	43.07	1141	19.14	26.41	1380
1972-73	36.69	39.24	1070	19.46	24.74	1271
1973-74	38.29	44.05	1151	18.58	21.78	1172
1974-75	37.89	39.58	1045	18.01	24.10	1338
1975-76	39.48	48.74	1235	20.45	28.84	1410
1976-77	38.51	41.92	1089	20.92	29.01	1387
1977-78	40.28	52.67	1308	21.46	31.75	1480

All-India Area, Production and Yield of Rice and Wheat during 1950-51 to 2014-15 -*CONTD.*

Area - Million Hectare
Production - Million Tonne
Yield - Kg./Hectare

1978-79	40.48	53.77	1328	22.64	35.51	1568
1979-80	39.42	42.33	1074	22.17	31.83	1436
1980-81	40.15	53.63	1336	22.28	36.31	1630
1981-82	40.71	53.25	1308	22.14	37.45	1691
1982-83	38.26	47.12	1231	23.57	42.79	1816
1983-84	41.24	60.10	1457	24.67	45.48	1843
1984-85	41.16	58.34	1417	23.56	44.07	1870
1985-86	41.14	63.83	1552	23.00	47.05	2046
1986-87	41.17	60.56	1471	23.13	44.32	1916
1987-88	38.81	56.86	1465	23.06	46.17	2002
1988-89	41.73	70.49	1689	24.11	54.11	2244
1989-90	42.17	73.57	1745	23.50	49.85	2121
1990-91	42.69	74.29	1740	24.17	55.14	2281
1991-92	42.65	74.68	1751	23.26	55.69	2394
1992-93	41.78	72.86	1744	24.59	57.21	2327
1993-94	42.54	80.30	1888	25.15	59.84	2380
1994-95	42.81	81.81	1911	25.70	65.77	2559
1995-96	42.84	76.98	1797	25.01	62.10	2483
1996-97	43.43	81.74	1882	25.89	69.35	2679
1997-98	43.45	82.53	1900	26.70	66.35	2485
1998-99	44.80	86.08	1921	27.52	71.29	2590
1999-00	45.16	89.68	1986	27.49	76.37	2778
2000-01	44.71	84.98	1901	25.73	69.68	2708
2001-02	44.90	93.34	2079	26.34	72.77	2762
2002-03	41.18	71.82	1744	25.20	65.76	2610
2003-04	42.59	88.53	2077	26.60	72.16	2713
2004-05	41.91	83.13	1984	26.38	68.64	2602
2005-06	43.66	91.79	2102	26.48	69.35	2619
2006-07	43.81	93.36	2131	27.99	75.81	2708
2007-08	43.91	96.69	2202	28.04	78.57	2802
2008-09	45.54	99.18	2178	27.75	80.68	2907
2009-10	41.92	89.09	2125	28.46	80.80	2839
2010-11	42.86	95.98	2239	29.07	86.87	2988
2011-12	44.01	105.3	2393	29.86	94.88	3177
2012-13	42.75	105.24	2461	30.00	93.51	3117
2013-14	43.95	106.65	2424	31.19	95.85	3075
2014-15	43.86	105.48	2390	30.93	86.53	2872

Source: Ministry of Agriculture & Farmers Welfare, Government of India

Agro-Economic Research

WORKING OF PRESSURIZED IRRIGATION NETWORK SYSTEMS (PINS) IN INDIA*

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Background

Water scarcity for agriculture has been growing year after year due to various reasons, for which the government has been very keen to increase the water use efficiency with its new slogan 'more crops per drop'. The government has envisaged promoting MIS and increasing the area under these water saving technologies. The Pressurised Irrigation Network System (PINS) is one such new innovative concept that acts as an interface between the water source and MIS in farm plots and increases the area under irrigation through the adoption of MIS. It comprises of pipe network with controls, pumping installations, power supply, filtration, intake well/ diggy. It is a common and shared infrastructure (by a group of farmers) facilitating individual beneficiary for installing and operating MIS.

The present study was undertaken with major objectives as (i) to undertake a broad situation analysis of various PINS programs implemented in select states of India; (ii) to assess the extent of adoption and performance of PINS in different scenarios in the country; (iii) to analyse the institutional arrangements for management, operation and maintenance of PINS in the country; and (iv) to identify the major constraints in adoption, management, operation and maintenance of PINS in the country. The study covers four major states (Rajasthan, Gujarat, Maharashtra and Telangana) of the country promoting PINS with MIS. The data were collected from sample households as well as PINS-WUAs of selected states as per the distribution presented in Table 1.

TABLE 1: PINS SAMPLE SIZE DISTRIBUTION IN THE SELECTED STATES

States	No. of Beneficiary Households	No. of Non-Beneficiary Households	Total Households	No. of PINS-WUAs
Gujarat	200	100	300	27
Rajasthan	200	100	300	26
Maharashtra	250	105	355	75
Telangana	200	100	300	32
Grand Total	850	405	1255	160

In Gujarat and Telangana, all the selected PINS were tube well PINS whereas in Rajasthan, all the selected PINS were canal PINS. In Maharashtra, three types of PINS were observed: Government PINS (100% government funded), Cooperatives PINS (partially funded by government and managed by a group of farmers) and private PINS (owned and managed by individual farmers).

Overview of PINS Programme in India

During the last six decades period, the land area under irrigation in India has expanded from 22.6 million hectares in 1950 to about 91.53 million hectares in 2011-12, with 52 percent area being irrigated by surface irrigation through canal network. Unfortunately, the overall efficiency of the canal irrigation system is very low which leads to poor utilization of irrigation potential, created at a huge cost. On the other hand, the demand for increasing irrigation coverage has been growing. For enhancing the irrigation efficiency, the MIS is being promoted through many programmes. The concept of Pressurized Irrigation Network System (PINS) is one such programme which was developed at Design Office of Sardar Sarovar Narmada Nigam Limited

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(SSNNL) as a necessary step to introduce MIS in the command area of Sardar Sarovar Narmada Project (SSP). Later on, the concept has been used in various other states. Since it is a new concept got popularised in the last ten years, the literature and statistics on the same is mostly unavailable. Therefore, only the aforesaid four front-runner states were included in the study for the detailed study.

Gujarat: Government of Gujarat has put in lots of efforts to replace conventional irrigation by micro-irrigation so as to improve water use efficiency and to increase the area under irrigation in the state. The pilot project on Pressurized Irrigation Network System (PINS) is one such effort started in 2007-08 in the command area of SSP. Accordingly, about 25 pilot projects were initiated in the state covering 1029 farmers with 1491.6 ha of CCA and an estimated budget of Rs 1306.3 lakh. The average spending incurred per PINS was Rs 35.4 lakhs against the estimated Rs 52.3 lakhs. The estimated per hectare expenditure on PINS at Chak level was Rs 20340/-. Because of PINS, the per hectare water savings was estimated to be to the tune of Rs 15000/- for Bhal and Bara areas (mainly saline areas) and Rs 19560/- for other zones, respectively. The project work was carried out by three agencies, viz., Jain Irrigation Ltd (56%), Parikhit Industries (32.0%) and EPC Industries (8.0%) etc.

Though the Government of Gujarat followed a proactive approach to increase the adoption of PINS by the water users, the existing practices of farmers such as relying more on conventional flow method for irrigation did not change much due to various reasons. The farmers did not prefer to change the cropping pattern which was highly water intensive. They did not want to spend anything on the installation of MIS since canal water was available to them in plenty, almost free of cost. There are not much strict rules and regulations enforced to check the illegal use of canal water and water theft.

Looking at the unsatisfactory experience of Canal PINS in the state, an attempt was made by the Irrigation Department in devising a suitable solution to address various issues. The main features included promotion of Under Ground Line System (UGPL) Network for micro canals such as Minors. The combination of UGPLs and PINS replacing Minors, Sub-Minors and FCs has also been put in some places in the state.

However, the tube well PINS have been operating in the state since a long ago as a viable method of irrigation in the state. The Government of Gujarat introduced a policy of pressurized irrigation system in the command area of public tube wells under Gujarat Water Resources Development Corporation (GWRDC). As per the Government norms, Micro Irrigation System (MIS) is provided in the command area of 309 tube wells covering 1452 Ha in five districts of the state i.e. Banaskantha, Mehsana, Patan, Gandhinagar and Sabarkantha. The State Government has decided in March 2013 to provide MIS in Government tube wells at 100 percent Government cost in total nine districts. Accordingly, State Government provided MIS system in 162 tube wells in 2013-14 covering 1531 ha and 1037 farmers. The MIS works covering 2984 ha of 3780 farmers were in progress in 208 tube wells which were likely to be completed in 2014-15. Till January 2016, a total of 674 tube wells have been covered by GWRDC out of which 54.0 percent was through government subsidy and remaining 44 percent were given partial assistance.

Rajasthan: The Government of Rajasthan has put in lots of efforts to replace conventional irrigation by micro-irrigation so as to improve water use efficiency and to increase the area under irrigation in the state. The Pressurised Irrigation Network System (PINS) Programme in Rajasthan is mainly concentrated in two major irrigation projects, i.e., Indira Gandhi Neher Project in Bikaner district and Narmada Irrigation Project in Jalore and Barmer districts. Thus, the main feeder source for PINS programme was a canal. No other kinds of PINS such as tube well PINS or private PINS were not available in the selected areas of Rajasthan.

Under IGNP, the PINS project was started on pilot basis in Bikaner district from 2012-13 and initially only 33000 hectare area was covered. Recently, the Centre has approved around Rs 1,659 crore for PINS projects in the state. With these new irrigation projects, around 347.66 lakh hectares of the area can be irrigated with sprinkler system in Bikaner, Churu, Hanumangarh, etc. Under these projects, sprinkler irrigation systems are proposed for optimum utilisation of available water. Total culturable command area (CCA) of these projects is 3,47,566 hectares, out of which sprinkler irrigation system has already been established in 27,449 hectares under the pilot project.

The PINS projects under IGNP are being operated in a bigger area of around 200 to 600 ha in one diggy, whereas the size of PINS project in Narmada Project at Jalore and Barmer are of smaller size of with 90 to 100 hectares. Under Narmada canal, about 2,35000 hectares area has been irrigated in Sanchore and Chittalwana (Jalore), Gudha malani and Dhorimanna (Barmer) districts. All areas of Jalore and Barmer districts have been benefitted through Narmada Canal where all irrigated areas are with PINS only. There is no flood irrigation allowed in the region which is main reason for the successful working of PINS project in these regions. Another reason for the success of PINS project in Sanchore area is that the groundwater level is very high and groundwater is salty. Thus, the farmers failed through tubewell irrigation in their field. As the only option, the farmers adopted canal PINS and succeeded in making agricultural prosperity.

Maharashtra: In Maharashtra state, the types of PINS projects are of three types - government PINS (100% government funded), cooperatives PINS (partially funded by government and managed by a group of farmers) and private PINS (owned by individual farmers). There are government PINS (govt PINS) and cooperative PINS (coop PINS) in Buldhana, Kolhapur, Sangli and Yavatmal districts, while private PINS (pvt PINS) are spread across many districts, with high penetration in districts like Nashik and Ahmednagar. In the state, and the sources of water for PINS are river, tube well, dug well, and storages by weirs, dams etc.

There are a large number of lift irrigation schemes in co-operative sector, particularly in the southern part of Western Maharashtra (101205 ha) in Krishna basin (i.e. on Krishna river and its tributaries). These lifts can be considered as PINS with flood irrigation. However, over the years, the lands under them are becoming saline/water-logged. For this reason, as well to save labour, fertilizers and water, initiatives have been taken through some schemes for converting the flood distribution systems into MIS. The list of 15 such schemes (from the micro irrigation manufacturing companies) was obtained and some of them were included in this project survey.

There are other 11 irrigation projects, under which flow/canal irrigation systems are not economical, as these projects have command mainly located in the hilly region. The total area under these 11 projects is 54100 ha. With the area under lifts on Krishna etc., the total ICA works out to (54100+ 101205) 155305 ha. Therefore, it is advised that if the financial assistance is made available to these lifts, they would get converted from PINS + Flow into PINS + MIS rapidly, as the trend is already set by 15 schemes converted.

Telangana: It is newly constituted state where there are no government PINS projects with MIS available in the state, alternatively the projects with MIS scheme are installed connected to the irrigation source of tube-wells/bore-wells in the state. From 2014 onwards, the MIP scheme (NMMI) was subsumed into National Mission for Sustainable Agriculture (NMSA) as one of the component as On-Farm Water Management (OFWM). Out of 17.12 lakh hectares of net irrigated area (irrigated with ground-water), only 5.73 lakh hectares are covered under micro-irrigation, leaving a balanced potential of 11.39 lakh hectares for micro-irrigation under PINS. In all the districts, the MIP project through MIS scheme connecting to tube-well irrigation is implemented. About 550212 numbers of micro-irrigation systems were installed with coverage of an area of 550212 hectares with the total number of beneficiaries being 296436.

The drip system of MIS is provided for the cotton crop with a total initial fixed cost of Rs. 106120 of which 10.612 is given as subsidy for BCs small/ marginal farmers and for others the subsidy is given to a maximum of Rs. 21,224. Moreover, the sprinkler irrigation system of MIS is provided for groundnut crop with a total fixed cost of Rs. 17880 of which Rs. 4,470 is given as subsidy for SC/ST, BCs small/ marginal and for others. MI project in Telangana is mainly based on well and tube-well irrigated areas.

Performance of PINS Programmes in Gujarat

It is observed that the tubewell PINS are popular in several districts in Gujarat whereas the canal PINS are not well adopted by the farmers. The majority of farmers (68.7%) had less than 1 ha area under tubewell PINS. About 95.3 percent of sample beneficiary farmers have adopted drip whereas the 10 percent of them adopted sprinkler. The total cost of drip and sprinkler systems was estimated to be Rs. 42950 and Rs. 30133 per household (hh) in the study areas. The major motivating factors for the

beneficiary farmers for adoption of PINS-MIS were to get assured amount of water for irrigation (79.3%), better and stable crop yield and farm income (78.0%), saving more water and to cover more area under irrigation (67.3%), facilitating judicious or efficient distribution of water among the water users (54.7%) and avoiding unnecessary conflicts with other farmers (28.7%).

The water saving due to judicious use of water (94.0%), increase in agricultural income (86.7%), getting water in right time (88.0%), proper distribution of water among farmers (62.7%), getting more information on how to use water judiciously (56.7%), electricity saving (54.0%) and improved maintenance of the system (26.7%) were the major benefits accrued by the beneficiary water users/ farmers.

The proportion of area under more remunerative Rabi crops was also found to be higher (28.7% of GCA) in case of beneficiary farmers as compared to non-beneficiary farmers. It was observed that, except few crops like groundnut, mung and cumin, beneficiary farmers had enjoyed better crop yields as compared to non-beneficiary farmers. The percentage change in yield under drip over flood and change in yield under sprinkler over flood has been spectacular with respect to some crops like castor (117.6% and 102.1%, respectively) and cotton (83.1%). Among Rabi crops, major benefits were observed in the case of wheat (by 83.3% and 108.4%, respectively), fennel (55.1%), rapeseed-mustard (59.9%), and tobacco (by 84.6%).

Some of the factors those helped in generating some benefits were better water management by WUA members (58.0%), better education and awareness of the farmer (43.3%), more area under PINS-MIS (34.0%) and more area during Rabi (37.3%) were the major ones. The results of Probit model indicated that more area under PINS-MIS, uninterrupted power regular supply, more depth of tubewell, sufficiency of water in PINS and group membership helped in realising the benefits like increase in yield and income, water and energy saving by the beneficiary farmers.

Among the major activities undertaken by different types of PINS TUAs, operation and maintenance of PINS project, deciding the timing of water release, judicious water distribution, collection of water rates, collection of per capita operation and maintenance cost were the major activities of Govt. TUAs.

The main source of income for these TUAs were annual maintenance fees collected whereas the major heads of expenditures were the expenditure on electricity bill, repairing expenses, salary expenses. Besides, in the case of PINS, the charges to Irrigation Department and some miscellaneous expenses were incurred by the WUA/TUAs.

The major benefits provided by the WUAs to its members were the arrival of water in time, proper distribution of water among farmers, more information on how to use water judiciously, saving of water, electricity and labour cost, improved maintenance of the system and fewer conflicts around water.

WUAs/TUAs also faced some constraints in the management of their associations. Among these constraints, the funds constraints, unavailability of required quantity of water, unavailability of proper maintenance and repair services and electricity problems are the major ones.

Performance of PINS Programme in Rajasthan

Since the sprinkler system is very useful on sandy topography in Rajasthan, it is very popular in the state. The average area covered by the farmers under sprinkler and drip method of irrigation was 3.63 ha and 0.02 ha respectively per households having access to those systems. The total cost of the sprinkler and drip systems was estimated to be Rs 265000 and Rs 60820 per household in the study areas. It was found the average subsidy amount received by the farmers was only 15 percent on sprinkler and 70 percent on drip. Jain Irrigation was the main agency in Rajasthan who had supplied MIS to the farmers under various subsidy norms.

The major motivating factor for the beneficiary farmers for adoption of PINS-MIS was to get assured amount of water for irrigation. Other factors like better and stable crop yield and farm income, saving more water and to cover more area under irrigation, facilitating judicious or efficient distribution of water among the water users and avoiding unnecessary conflicts with other farmers were considered as important factor (though not most important factors) by the farmers.

Impacts of Adoption of PINS-MIS on Water Saving, Irrigated Area and Crop Yield and Farmers' Income

Among different benefits accrued by the beneficiary farmers by participating in WUA, the increase in area under irrigation (100%), increase in agricultural income (99.0%), water saving due to judicious use of water (97.5%), getting water in right time (88.0%), timely information on release of water from canal (82.5%), proper distribution of water among farmers (68.0%), getting more information on how to use water judiciously (56.7%) and electricity saving due to the use of shared pump sets attached with PINS (58.0%) were the major ones. The extent of water saving, electricity saving, increase in irrigated area and increase in farmers income due to the adoption of PINS-MIS was 39.2 percent, 39.4 percent, 58.5 percent and 44.7 percent, respectively.

About 55.5 percent farmers complained about not getting sufficient water throughout the year. Inadequate water availability in the canal, water theft by other farmers, less rainfall and land located in tail region were found to be some of the major reasons for inadequate water availability. Among water users, about 72.5 percent were used to pay the operation and maintenance cost of PINS project and water rates regularly, out of which the majority (43.5%) pay these fees annually to the office bearers of WUA.

As far as area and yield impacts are concerned, it was found that the average yields as well as area under majority of crops were higher in case of beneficiary compared to non-beneficiary households. Overall, 12.3 percent more area was cultivated by the beneficiary households. Among Rabi crops, the beneficiary farmers had enjoyed better crop yields as compared to non-beneficiary farmers in case of crops like gram, isabgul and cumin. Among summer crops, the beneficiary farmers got better crop yields as compared to non-beneficiary farmers (in case of crops like bajra and fodder crop).

The major problems faced by the farmers were insufficient electricity for operation of PINS (60%), inadequate water availability (37.5%), difficulty in getting a subsidy for MIS system (26%) and the problems related to operation and maintenance of the PINS-MIS system. The performance of promoting companies was found to be very poor in terms of supplying good quality components of MIS and timely services. The farmers suggested that the subsidy may be provided to set up a solar unit with PINS so that water can be provided to farmers when electricity is not available for irrigation. Farmers also emphasized that they should be given more subsidy on MIS, especially sprinkler systems since they purchase pipe and nozzle from the local market with fairly high price. The performance of promoting companies should be monitored with suitable Incentives/disincentives.

As regards the performance of WUAs is concerned, all the PINS systems were constructed on minor or sub-minor of Indira Gandhi Canal in Bikaner or Narmada Canal project in Jalore and Barmer. The average area covered under each PINS WUA was 246.8 ha per PINS and the average number of beneficiaries covered was 84. The size of PINS was much larger in Bikaner, followed by Barmer and Jalore. The entire cost on PINS equipments and installations was borne by the state Govt. The beneficiary farmers only had to pay for the operation and maintenance cost.

The major component of operation and maintenance cost on PINS was electricity charges and repairing/maintenance of canal PINS, accounting for about 46.24 percent and 35.8 percent of total operation and maintenance cost, respectively. The number of members of WUA was 84, out of which 39 members (46%) did not join the WUA. Those who did not join the WUA expressed various reasons for not joining the WUA. About 28.2 percent of them expressed that they are not able to put pipelines due to not getting a loan, since they don't have land. About 33.3 percent of them expressed that they stay in other chaks and they don't want to cultivate their land due to the long distance (average 70-75 km).

Among the major activities of WUA, operation & maintenance of PINS Project, deciding the timing of water release, judicious water distribution, collection of water rates, collection of per capita operation and maintenance cost and dispute settlements were the major activities of WUAs. The main sources of income for these WUAs were annual maintenance fees and annual electricity fees collected whereas the major heads of expenditures were the expenditure on electricity bill, repairing expenses, salary expenses.
The major benefits provided by the WUAs to its

members were arrival of water in time, proper distribution of water among farmers, more information on how to use water judiciously, saving of water, electricity and labour cost, improved maintenance of the system and fewer conflicts around water. The crop yield has improved significantly during post-WUA situation with about 81 percent WUAs reporting higher yield compared with pre-WUA situation. The average irrigated area has increased from 36.9 ha per WUA during pre-WUA situation to 228.2 ha during post-WUA situation, by more than 06 times, while the returns from agricultural production have increased by more 04 times during post WUA situation compared with pre-WUA situation.

As far as the sufficiency of irrigation water is concerned, only 23 percent of WUAs agreed that they are getting sufficient water throughout the year after the formation of WUA. Normally they get the canal water for about 5 months during Rabi while, during Kharif, they depend on rainfall. Some of them could be able to provide life saving irrigation during Kharif as well.

Performance of PINS Programmes in Maharashtra

The source of irrigation for all govt PINS was tanks/storages, for cooperative PINS sources were river and storages/tanks and for pvt PINS the sources were well and river in Maharashtra. Since, the govt PINS projects were around 100% funded by the government, there was no cost for the farmers. Regarding the coop PINS farmers, average expenditure was Rs. 47,200 on PINS project, and there was no considerable variation on the expenditure on PINS across the landholding class of farmers. About pvt PINS farmer, the expenditure on PINS project was Rs. 87325 and there was not much variation across the farmers' landholding class. These findings suggest that being a part of cooperative system could save PINS project cost by around 50%.

The reasons to adopt PINS were to get assured water, better yield and increase in area under irrigation. The pvt PINS adopter farmers were interested in personal benefits in comparison with the govt and coop PINS adopter. The main benefits of coop and govt PINS were an increase in area under irrigation by around 60%, farm income and water saving by more than 35%, and 35% saving in electricity.

The majority (80-96%) of the members of the coop PINS WUA were aware about the functioning, while the awareness among the govt PINS was comparatively very poor. All the coop PINS WUA members had paid O&M cost regularly. The important reasons for inadequate supply of water were the inadequate water availability and poor rainfall, moreover, for govt PINS inefficient functioning of the PINS system was also an additional reason.

The findings suggest that PINS helps to increase the area under cultivation during the summer season or under the perennial crops. It is also reported that the most preferred method of irrigation under PINS was drip irrigation over sprinkler and flood method. For most of the crops, the production was reported higher under the PINS farm than for the non PINS farm, this indicates that the PINS improves the productivity of most of the crops. The MIS increased yield for soybean, tur, cotton, groundnut, jowar, onion and sugarcane crops, while yield was decreased for udid, mung and wheat under MIS. For the majority of crops the yield under MIS was higher than the flood method, while there was not much difference between sprinkler and drip methods. Regarding the water saving under MIS, in principle there is water saving under MIS than flood. Apart from water saving the major benefits of PINS with MIS were, saving of land by avoiding field channels, reduction in frequency and maintenance cost of irrigation system, weeding cost, water logging and labor cost.

There is a lack of awareness about ISO standards, training and testing facility for PINS and MIS. Therefore, there is a scope for providing these facilities for farmers at the block level. The main problems faced by the farmers were planning and installation of PINS with MIS, delay in receiving a subsidy for MIS, power to run PINS and MIS, quality of components and damage of MIS in the field from rodents.

Performance of PINS Programmes in Telangana

On an average the area under PINS -MIS was 1.11 hectares per hh. All the 200 sample farmers were having a drip system and only five farmers had a sprinkler system. On the whole, amount spent on MIS was Rs. 8,443 per hh.

There are three main reasons behind the adoption of PINS (MIS) programme. They are: (i)

to get assured amount of water for irrigation; (ii) to get better and stable crop yield and farm income and (iii) to save more water and to cover more area under irrigation. On an average, 40 farmers participated in a TUA. The percentage change in production realised by the beneficiaries over non-beneficiaries ranged from 30 percent in case of paddy to 100 percent in case of Redgram. All the crops under drip irrigation have achieved more per hectare production than the yield achieved under the other sources of irrigation. The output from probit model reveals that among the explanatory variables the marginal effect of operated area is positively associated with an increase in agricultural yield, income, water and energy saving but negatively associated with fertilizer and pesticide use. The positive association implies that due to the marginal effect of operated area, the yield, income, water and energies are saved to a significant level. On the other hand, the negative association signifies that the fertilizers and pesticides are being used more than the required doses.

Majority of the beneficiaries expressed the problem of power supply to MIS and a few farmers reported the problem of operation and maintenance. Majority of the farmers suggested that the MIS subsidy should be extended from 1 hectare limit to 3 hectares limit and reduction in input price also. Almost all farmers suggested the need for regular power supply.

The average life-span of PINS was about 7-8 years. On an average, the total annual operation and maintenance cost of PINS per TUA accounts for Rs. 8,000 of which 87.50 percent towards repairing and maintenance of tube-wells and 12.50 percent towards electrical charges. The inflow of income is due to the collection of annual maintenance fees, while the outflow of income is through expenditure on electricity bill and repairing expenses.

Due to formation of TUAs the farmers could realise three major benefits, viz., (i) timely release of water to their fields and Judicious use of water, (ii) improved maintenance of the system and (iii) more information on crops and technologies and thereby improved quality of groundwater due to less extraction compared to pre-TUA periods. About 66.67 percent of TUA members reported to have received sufficient water throughout the year. Nearly 33.33 percent of water users reported that the PINS system is not functioning properly and also due to improper management of PINS system, they received inadequate water to their farm plots.

Policy Implications: Gujarat

The water resources for irrigating more area have been a challenge for the country. It is desirable to utilize the available water resources more judiciously, so that the 'more crops per drop' slogan of the Govt can be realized and farmers' income can be doubled within the stipulated time period. Thus, PINS infrastructure with MIS is inevitable for the farmers since it saves the water and the collected water can be used for a further increase in area under irrigation. The present study has examined some aspects of working of PINS at different levels. During the survey, the sample farmers have also given some useful feedbacks which have been discussed earlier. Besides, some additional suggestions on different types of PINS those are drawn from the study are presented below.

Suggestions on Canal PINS

- Though the State Government has followed an innovative approach by developing and implementing the concept of PINS, the existing practices of farmers such as relying more on conventional flow method for irrigation did not change much due to some specific reasons. The farmers did not want to change the cropping pattern which was highly water intensive. Thus, it is necessary to discourage more water consuming cropping pattern, by encouraging suitable cropping pattern through some incentive structure.

- It was found that the farmers did not want to spend any amount on MIS since canal water was available to them almost free of cost. Thus, it is suggested to revise the water rates which are very less and strict rules and regulations should be enforced to check the illegal use of canal water and water theft.

- Farmers having land at favourable locations (canal vicinity) do not find it to be a lucrative proposition. One of the major factors that contributed to less adoption of canal PINS in the state was that, PINS Projects were located very close to minors or sub minors, from where farmers are able to get water in alternative ways. Thus, it is suggested to re-launch this canal PINS programme with required amendments

by locating these projects at far off places where farmers are struggling to get irrigation water. Though it involves little more investments in term of infrastructure expenditure, the adaptation and long-term sustainability would be surely achieved just like the success of PINS projects in Sanchore region in Rajasthan.

- The areas where PINS+MIS is techno-economically not feasible, normal/conventional flow irrigation as per present SSNNL policy may be allowed to continue.

- Majority of sample farmers were marginal with small land holdings who faced difficulties in getting bank loans due to incomplete land documents and other outstanding debts. The measures may be taken to provide affordable credit facilities to small and marginal farmers.

Suggestions on Tube well PINS:

- The study finds that maintenance and electricity cost for beneficiaries of tube well PINS is a major part of their expenses which is reasonably high, thus the subsidy may be given on electricity provided to farm plots.

- Drip system is damaged in some cases due to animal attack (pig, rat, squirrel, rabbit, blue bulls) and sometimes due to poor awareness of agricultural workers. Thus better quality systems should be provided. The fencing subsidy may be provided to encourage fencing by farmers.

- The quality of MIS components and services provided by some promoting companies were unsatisfactory; frequency of their visits was insufficient. Thus there is a need to take measures to regulate these promoting agencies supplying MIS to the farmers and check their adherence of standard norms on maintaining quality and providing proper and regular services for the repairing of the PINS-MIS within reasonable time limits. There is also a need to have more testing facilities for quality checking of equipments.

- Farmers are unaware, uneducated about use of PINS and MIS. So the required extension advisory services should be provided to the farmers, especially on maintenance and applicability of PINS-MIS for different crops. The training and awareness programmes should be regularly conducted to impart training to farmers on need, importance and use of MIS with PINS and also to promote fertigation and chemigation.

Suggestions on UGPL with PINS:

- Since underground pipeline system (UGPL) is used as PINS as well as for conventional irrigation, the new scheme has been well adopted by some farmers in Gujarat. However, there are some issues in implementation of UGPL in Sub-Minors. Farmers were not willing to pay 10 percent, their contribution, which was later on reduced to 2.5 percent. Farmers are continuously growing some crops and hence not willing to allow laying of UGPL. There is a need of strict adherence of Government guidelines so as to complete the implementation work in a time bound manner. Provisions should be made to pay required compensation for crop loss for laying of UGPL.

- Due to poor maintenance of field channels, the nearby lands are affected by water logging. Thus, it is suggested to arrange regular repairing and maintenance of minors and field channels, which are used by UGPL.

- Due to poor management culture in WUAs, the maintenance and distribution of water was badly affected in some cases. In so many cases, WUAs were not formed that affected to regulate the proper supply of water among water users. Thus, there is a need to strengthen existing WUAs and to form WUAs in a time-bound manner, where they are not available.

- The combination of UGPLs and PINS replacing Minors, Sub-Minors and FCs need to be systematically promoted to help saving land as well as water. The UGPL system with PINS should gradually focus on more adoption of MIS with appropriate financial incentives for effective management of irrigation water while taking care of farmers' preferences for different cropping pattern. The services of NGOs and model WUAs may be taken as motivators for more adoption of water saving technologies under UGPL with PINS.

Policy Implications: Rajasthan

The ever-increasing difference between water availability and consumption is causing severe shortage of water in many fields. This is a growing concern all over the world but India is most vulnerable because of the growing demand and in-disciplined lifestyle. The water resources for irrigating more area have been a challenge for the country. It is desirable to utilize the available water resources more judiciously, so that the 'more crops per drop' slogan of the Govt can be realized and farmers' income can be doubled within the stipulated time period. Thus, PINS infrastructure with MIS is inevitable for the farmers since it saves the water and the collected water can be utilised for further increase in irrigation and farmers' income.

The study finds that PINS with MIS has been highly successful in Narmada Project in Sanchore and Indira Gandhi Nahar Project (IGNP) in Bikaner district. The impact of these PINS projects on water saving, irrigated area expansion, crop yield and farmers' income has been praiseworthy. At the same time, it is necessary to strengthen these projects further by considering the inputs provided by the different stakeholders so as to enhance the irrigation benefits. Some of the observations were made during the study which are summarised below.

- The average size of WUA in Rajasthan is usually high, sometimes covered about 900 ha under one PINS project with more than 200 beneficiary farmers. Very large size of WUA becomes very difficult to manage. Among these large number of water users, the equitable distribution of water also becomes very difficult. As a result, the tail end beneficiaries turned out to be non-beneficiaries in a real sense, since they don't get irrigation water. Thus, it is suggested to install more number of PINS and reduce the number of farmers per PINS-WUA, which would help in proper distribution of water among the farmers irrespective of location of plots in the command area of PINS.

- It was recommended to provide 15 sprinkler points to each outlet provided at the farmer's field. However, due to larger size of PINS command area and large number of beneficiaries, the number of outlets has not been provided in proportion to size of plots. A large size of plot with less number of outlets fails to discharge required amount of water to the crops in the entire plot. Moreover, sometimes, more number of sprinkler points was found in a smaller plot, while less number of sprinkler points in large plot size affected the irrigation provision. Thus, it is suggested to provide more outlet points in larger size plots, so that required number of sprinklers can be used.

- Moreover, same time is allotted to all plots irrespective of their location. However, due to lower pressure at tail end region, the tail end farmers did not get enough water compared to head region farmers.

- Due to the scarcity of irrigation water, some of the non-beneficiary farmers depend only on the rain water. Thus they demand to expand the coverage of PINS to their area. Thus, it is necessary to expand PINS coverage so as to ensure proper water distribution among the farmers.

- In some cases, due to close vicinity to canal, some farmers didn't install MIS in their farm plot, and they used to irrigate by flood method. Thus, the measures need to be taken to check water theft. More stringent policy should be implemented to check the same.

- In case of IGNP, it was observed that, on side of canal, PINS systems have been promoted, while on the other side, farmers are irrigating using flow method. It is necessary to discourage the flow irrigation and encourage the MIS with suitable incentives, so that more water scarce areas can be irrigated in Rajasthan.

- In some cases, the condition of minor canal was not in proper state. It is suggested to cement/ renovate the minors/sub-minors regularly for supplying water to PINS in better way which would expand their irrigation efficiency.

- It was observed that some promoting companies supplying the irrigation infrastructures and servicing are not functioning genuinely. As a result, the farmers are facing repeated troubles. Due to low quality of materials, frequent repair happens to be inevitable. On the other hand, much more time is being consumed for repairing and high charge is being imposed since the technician covers a long distance to reach the

farmer's village.

- There is urgent need to provide more number of servicing centres, at least one at taluka level. On the other hand, local people should be trained to cater the need of the farmers.

- Some instances were found, where there were a large number of incomplete diggies (mainly in Gudha malani, Barmer district) since the promoting agency left the scene in between without completing the work. Thus, it is suggested to examine the performance of these promoting companies and treat them with appropriate incentives/ disincentives.

- The farmers have expressed concern over less subsidy on sprinkler as it is evident that only about 15 percent subsidy has been realised by the farmers. It is suggested to relook at the subsidy policy of the government on MIS, particularly on sprinklers.

- As suggested by some promoting companies, submersible pump sets should be promoted, which can reduce the requirement of a separate pump house, reduce the maintenance requirement and are convenient to use.

- PINS programme in the command area of IGNP was started on pilot basis in Bikaner district since 2012-13. This project area was not covered fully in many areas due to some reasons, may be, the financial constraints. As a result, some diggies could not be made functional properly. Moreover, IGNP system is operating since last 20 years and farmers were habituated and benefited through flood irrigation till then. With the changed situation, farmers were worried about the technical problems related to PINS. Thus it is necessary to provide training and counselling to the needy farmers.

- During the first two years of installation of PINS and formation WUA, the WUA members and implementing agency/promoting companies work together. During this period, all maintenance cost are borne by the implementing agency/promoting companies. There is provision to provide proper training to WUAs to manage the PINS system. However, the quality of such training programme needs improvement. The promoting companies that work closely with the PINS system and the water users should be allowed to take part in training provided to the farmers.

- The cost of electricity has been a major share of the total cost of crop cultivation. Farmers often requested to provide more subsidy on electricity or to provide solar pump sets to lift the water. At some places, electricity infrastructures have been damaged since a long time, for which more than 500 hectares of land failed to be irrigated. In spite of repeated requests of the farmers, the electricity facilities could not be restored. Thus, it is suggested to take up the farmers' concern in a time bound manner. On the other hand, fully automated solar systems need to be promoted in order to meet the farmers need. At some places, the outlets were kept open, when not in use. This resulted in choking of outlet pipes during regular storms/ sand dunes in the state. Thus, it is suggested to provide outlet covers to keep it closed while not in use.

Policy Implications: Maharashtra

- It is realised that, if the financial assistance is made available to the lifts Schemes, they would get converted from PINS + Flow into PINS+MIS rapidly, as the trend is already set by 15 schemes in the state.

- The distribution systems of lift projects will also be converted into PINS+MIS, though not envisaged at the conceptual stages. There is an advantage for lifts, that on the way from pumps to the delivery point, there can be sufficient head available to use MIS by directly hooking up to the rising/pumping main.

- There is a large scope for PINS+MINS for (i)Co-operative lifts, (ii)lifts on Other Govt Projects with lift as distribution System, (iii)Govt. Lift irrigation projects themselves, (iv)individual lifts including lifts on Minor Irrigation Schemes, and in the long run of pipe distribution systems in place of flow irrigations.

- The costs of the drip systems were higher under coop and pvt PINS than the govt norms. Therefore, it is suggested that the cost norms for drip irrigation system may be revised so that the farmers can afford the drip irrigation system.

- Extension activities for increasing the awareness about efficient use of water under the MIS, water requirement of the crops as per the crops critical growth stages and season wise are recommended.

- There is a lack of awareness about ISO standards, training and testing facility for PINS and MIS. Therefore, there is a scope for providing these facilities for farmers at the block level.

- We observe that some sort of refreshers training etc. need to be arranged at different levels for WUA office-bearers, member farmers etc. Such training should been co-operative, new technologies in irrigation and agriculture-cultivation, processing, post harvesting issues. There is also a need of a body such as federation, which can put forth the issues faced by these WUAs.

- We feel that for Maharashtra, being a leading state in MIS, comprehensive testing facilities for MIS components need to be developed in the state Agricultural Universities.

Policy Implications: Telangana

- Though the PINS-MIS scheme is being implemented by private agencies, the subsidy is being provided by Telangana State Micro-Irrigation Project (TSMIP). Due to delay in the release of funds from Central Government the release of subsidy to farmers is accordingly delayed. As a result, the farmer could not receive the benefit in time and could not proceed further. Thus, it is requested to release the funds by Central Government in time.

- In recent years, the tanks in Telangana are being renovated through the programme of Mission Kakatiya. This renovation should be extended to all other tanks which in turn will be useful to irrigate more land in various parts of Telangana. Thus, the PINS-MIS programme be initiated through tank irrigation also.

- The amount of subsidy for all inputs and also to the machinery should be enhanced as the input prices has increased many fold.

- Awareness generation programme on PINS-MIS should be carried out more frequently with larger scale and such programmes being carried out by NGOs should be encouraged through incentives. More training programmes should be conducted and more frequently such training programmes (i.e., once in a month in every mandal head-quarters) should be carried out.

- Training programmes to farmers to create awareness about fertigation and chemigation must be conducted.

- The implementing agencies and department officials (TS-MIP) should ensure thorough checking of MIS systems before installations and should provide timely services for any maintenance related problems.

COMMODITY REVIEWS

Foodgrains

During the month of July, 2018, the Wholesale Price Index (Base 2011-12=100) of cereals and foodgrains increased by 0.89 percent and 1.21 percent, respectively, whereas the prices of pulses by increased 2.81 percent compared to June, 2018.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base Year 2011-2012=100)

Commodity	Weight (%)	WPI for the Month of July, 2018	WPI for the Month of June 2018	WPI A year ago	Percentage change during	
					A month	A year
1	2	3	4	5	6	7
Paddy	1.43	155.0	153.9	149.1	0.71	3.96
Wheat	1.028	144.9	143.1	136.3	1.26	6.31
Jowar	0.067	119.5	119.3	126.3	0.17	-5.38
Bajra	0.086	132.9	129.5	145.4	2.63	-8.60
Maize	0.189	121.6	121.6	129.2	0.00	-5.88
Barley	0.014	140.7	141.7	139.3	-0.71	1.01
Ragi	0.007	208.4	208.3	247.0	0.05	-15.63
Cereals	2.824	147.6	146.3	142.6	0.89	3.51
Pulses	0.639	120.8	117.5	145.6	2.81	-17.03
Foodgrains	3.465	142.7	141.0	143.2	1.21	-0.35

Source: Office of the Economic Adviser, DIPP.

The following Table indicates the State-wise trend of Wholesale Prices of cereals during the month of July, 2018.

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Rice	Rising	Karnataka		A.P.	West Bengal
		Panjab	Kerala	Jharkhand	Assam
		Uttar Pradesh		Tamil Nadu	Gujarat
		Delhi			
Wheat	Rising	Madhya Pradesh	Maharastra		Jharkhand
		Uttar Pradesh	Gujarat		Karnataka
		Rajasthan	West Bengal		
		Punjab			
Jowar	Rising	Maharashtra		Karnataka	Madhya Pradesh
		Gujarat		Uttar Pradesh	
		Rajasthan			

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Bajra	Rising	Gujarat	Uttar Pradesh	Tamil Nadu	Karnataka
		Rajasthan			Maharashtra
		Uttar Pradesh			
Maize	Rising	Rajasthan	Uttar Pradesh		
		Madhya Pradesh	Gujarat		
		Karnataka			

Procurement of Rice

1.06 million tonnes of rice (including paddy converted into rice) was procured during July, 2018 as against 1.24 million tonnes of Rice (including paddy converted into rice) procured during July, 2017.The total procurement of rice in the current marketing season, i.e., 2017-2018, up to 31.07.2018 stood at 36.35 million tonnes, as against 38.01 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 31.07.2018)		Corresponding Period of last Year 2016-17		Marketing Year (October-September) 2016-17		2015-16	
	Procurement	Percent to Total	Procurement	Percent to Total	Procurement	Percent to Total	Procurement	Percent to Total
1	2	3	4	5	6	7	8	9
Andhra Pradesh	3962	10.90	3714	9.77	3725	9.78	4326	12.65
Chhatisgarh	3254	8.95	4022	10.58	4022	10.56	3442	10.06
Haryana	3991	10.98	3583	9.43	3583	9.40	2861	8.36
Maharashtra	456	1.25	305	0.80	309	0.82	230	0.67
Punjab	11832	32.55	11052	29.08	11052	29.00	9350	27.33
Tamil Nadu	840	2.31	141	0.37	144	0.38	1191	3.48
Uttar Pradesh	2874	7.91	2354	6.19	2354	6.18	2910	8.50
Uttarakhand	38	0.10	705	1.85	706	1.85	598	1.75
Others	9104	25.04	12132	31.92	12210	32.04	9301	27.19
Total	36351	100.00	38008	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., 2018-2019 up to 05-07-2018, is 35.52 million tonnes against 30.66 million tonnes of wheat procured, during the corresponding period of last year. The details are given in the following Table:

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

State	Marketing Season 2018-19 (upto 05.07.2018)		Corresponding Period of last Year 2017-18		Marketing Year (April-March) 2017-18		2016-17	
	Procurement	Percent to Total	Procurement	Percent to Total	Procurement	Percent to Total	Procurement	Percent to Total
1	2	3	4	5	6	7	8	9
Haryana	8739	24.60	7432	20.92	7432	24.11	6722	29.32
Madhya Pradesh	7286	20.51	6724	18.93	6725	21.82	3990	17.40
Punjab	12691	35.73	11706	32.95	11706	37.98	10645	46.42
Rajasthan	1531	4.31	1226	3.45	1245	4.04	762	3.32
Uttar Pradesh	5087	14.32	3562	10.03	3699	12.00	802	3.50
Others	188	0.53	14	0.04	18	0.06	9	0.04
Total	35522	100.00	30664	100.00	30825	100.00	22930	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 138.1 in July, 2018 showing an increase of 0.6 percent over the previous month. However, it increased by 9.9 percent over the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of groundnut seed (2.5percent), rape and mustard seed (2.7 percent), cotton seed(1.4 percent), gingelly seed (sesamum) (1.5 percent) , sunflower(3.5 percent) increased over the previous month. However, the WPI of copra (-1.8 percent), niger seed (-6.7 percent) and safflower (-2.6 percent) and soyabean (-2 percent) decreased over the previous month.

Manufacture of Vegetable and Animal oils and Fats

The Wholesale Price Index (WPI) of vegetable and animal oils and fats as a group stood 120.3 in July, 2018 showing a decrease of 0.1 percent over the previous month. However, it increased by 13.60 percent over the corresponding months of the previous year. The WPI of mustard oil (3.8 percent), soyabean oil (0.3 percent), sunflower oil (0.1 percent), groundnut oil (1.2 percent) rapeseed oil (0.4 percent) and cottonseed oil (1.4 percent) increased over the previous month. The WPI of copra oil (-1.2 percent) decreased over the previous month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of fruits & vegetable as a group stood at 155.5 in July, 2018 showing an increase of 6.7 percent over the previous month and a decrease of 12 percent over the corresponding months of the previous year.

Potato

The Wholesale Price Index (WPI) of potato stood at 231.1 in July, 2018 showing an increase of 3.2 percent over the previous month. However, it increased by 74.3 percent over the previous year.

Onion

The Wholesale Price Index (WPI) of onion stood at 162.7 in July, 2018 showing an increase of 23.1 percent over the previous month and an increase of 38.8 percent over the previous year.

Condiments & Spices

The Wholesale Price Index (WPI) of condiments & spices (group) stood at 130.6 in July, 2018 showing an increase of 1.9 percent over the previous month and 9.2 percent over the previous year.

The Wholesale Price Index of chillies (Dry) increased by 4 percent and turmeric increased by 0 percent over the previous month whereas the Wholesale Price Index(WPI) of black pepper decreased by 4.3 percent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of raw cotton stood at 121.9 in July, 2018 showing an increase of 4.5 percent over the previous month and an increase of 10.1 percent over the previous year.

Raw Jute

The Wholesale Price Index (WPI) of raw jute stood at 171 in July, 2018 showing an increase of 2.5 percent over the previous month and increased by 8.2 percent over the previous year.

Wholesale Price Index of Commercial Crops

(Base Year : 2011-12=100)

Commodity	latest July, 2018	month June, 2018	year July, 2017	% Variation over the Month	% Variation over the Year
Oilseeds	138.1	137.3	125.7	0.6	9.9
Groundnut Seed	112.4	109.7	127.6	2.5	-11.9
Rape & Mustard Seed	140.8	137.1	131.0	2.7	7.5
Cotton Seed	138.5	136.6	143.5	1.4	-3.5
Copra (Coconut)	218.1	222.2	152.0	-1.8	43.5
Gingelly Seed (Sesamum)	130.0	128.1	113.2	1.5	14.8
Niger Seed	132.8	142.4	207.2	-6.7	-35.9
Safflower (Kardi Seed)	134.8	138.4	134.1	-2.6	0.5
Sunflower	104.8	101.3	96.8	3.5	8.3
Soyabean	150.1	153.2	121.6	-2.0	23.4
Manufacture of vegetable and animal oils and fats	120.3	120.4	105.9	-0.1	13.6
Mustard Oil	127.0	122.3	113.5	3.8	11.9
Soyabean Oil	111.9	111.6	103.1	0.3	8.5
Sunflower Oil	109.4	109.3	102.4	0.1	6.8
Groundnut Oil	104.5	103.3	109.9	1.2	-4.9
Rapeseed Oil	112.1	111.6	111.3	0.4	0.7
Copra Oil	180.6	182.8	153.1	-1.2	18.0
Cotton Seed Oil	112.0	110.4	100.1	1.4	11.9
Fruits & Vegetables	155.5	145.8	176.8	6.7	-12.0
Potato	231.1	223.9	132.6	3.2	74.3
Onion	162.7	132.2	117.2	23.1	38.8
Condiments & Spices	130.6	128.2	119.6	1.9	9.2
Black Pepper	127.2	132.9	159.5	-4.3	-20.3
Chillies (Dry)	135.3	130.1	102.7	4.0	31.7
Turmeric	124.2	124.2	110.5	0.0	12.4
Raw Cotton	121.9	116.7	110.7	4.5	10.1
Raw Jute	171.0	166.9	158.1	2.5	8.2

Statistical Tables
Wages

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

(In Rs.)

State	District	Centre	Moth & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	June, 18	8	500	NA	NA	NA	250	NA	NA	NA	NA
	Guntur	Tadikonda	June, 18	8	275	250	NA	NA	275	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	March, 18	8	600	266	475	NA	NA	NA	500	500	NA
Karnataka	Bangalore	Harisandra	Sep, 17	8	360	340	400	350	400	300	600	450	NA
	Tumkur	Gidlahali	Sep,17	8	250	200	250	200	250	NA	300	280	NA
Maharashtra	Bhandara	Adyal	Oct, 17	8	200	150	250	150	200	150	350	250	200
	Chandrapur	Ballarpur	July, 18	8	300	150	300	150	200	NA	250	250	150
Jharkhand	Ranchi	Gaitalsood	Nov, 17	8	230	230	230	230	230	230	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 WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Assam	Barpeta	Laharapara	Apr, 17	M	8	250	250	250	250	250	250	350	250	350
				W	8	NA	NA	200	200	200	NA	NA	NA	NA
Bihar	Muzaffarpur	Bhalui Rasul	June,17	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Shekhpura	Kutaut	June,17	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihava	March, 18	M	8	NA	NA	NA	160	180	175	300	200	200
				W	8	NA	NA	NA	150	160	150	NA	100	NA
Gujarat*	Rajkot	Rajkot	March,18	M	8	251	255	242	234	219	215	492	483	458
				W	8	NA	250	238	230	215	202	NA	NA	NA
	Dahod	Dahod	March,18	M	8	293	293	164	164	164	NA	371	321	286
				W	8	NA	250	164	164	164	NA	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 WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Haryana	Panipat	Ugarakheri	April, 18	M	8	400	400	400	400	400	NA	550	400	NA
				W	8	NA	300	300	350	300	NA	NA	NA	NA
Himachal Pradesh	Mandi	Mandi	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	May,18	M	4-8	960	800	NA	800	1023	NA	900	NA	NA
				W	4-8	NA	NA	650	650	650	NA	NA	NA	NA
	Palakkad	Elappally	May,18	M	4-8	NA	500	NA	500	500	NA	650	NA	NA
				W	4-8	NA	NA	300	300	300	NA	NA	NA	NA
Madhya Pradesh	Hoshangabad	Sangarkhera	March, 18	M	8	250	NA	250	250	250	150	400	400	NA
				W	8	NA	NA	250	250	200	150	NA	NA	`
	Satna	Kotar	March, 18	M	8	200	200	200	200	200	200	350	350	350
				W	8	NA	200	200	200	200	200	NA	NA	NA
	Shyopurkala	Vijaypur	March, 18	M	8	NA	300	300	300	NA	300	300	300	NA
				W	8	NA	300	300	300	NA	300	NA	NA	NA
Odisha	Bhadrak	Chandbali	Feb, 18	M	8	300	250	300	200	300	250	450	400	350
				W	8	NA	200	250	180	250	200	NA	NA	NA
	Ganjam	Aska	Feb, 18	M	8	300	250	250	250	350	250	500	400	350
				W	8	NA	200	200	NA	200	200	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	March, 18	M	8	480	480	480	500	400	NA	480	480	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	May, 18	M	8	500	NA	NA	NA	NA	500	700	500	NA
				W	8	NA	NA	NA	NA	NA	300	NA	NA	NA
	Jalore	Sarnau	May, 18	M	8	NA	NA	NA	NA	NA	NA	500	200	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu*	Thanjavur	Pulvarnatham	March, 18	M	8	NA	340	NA	341	364	NA	500	350	NA
				W	8	NA	NA	183	142	139	NA	NA	NA	NA
	Tirunelveli	Malayakulam	March, 18	M	8	NA	NA	NA	500	425	NA	NA	NA	NA
				W	8	NA	190	200	175	NA	NA	NA	NA	NA
Tripura	State Average		Oct, 17	M	8	361	323	311	317	304	306	359	324	275
				W	8	NA	256	256	252	253	280	NA	NA	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily WorkingHours	Ploughing	Sowing	Weeding	Harvesting	Other Agri Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Uttar Pradesh*	Meerut	Ganeshpur	April,18	M	8	300	300	250	250	250	NA	500	NA	NA
				W	8	NA	250	250	250	250	NA	NA	NA	NA
	Aurraiya	Aurraiya	April,18	M	8	170	175	185	250	171	NA	500	NA	.NA
				W	8	NA	NA	185	250	171	NA	NA	NA	NA
	Chandauli	Chandauli	April,18	M	8	NA	NA	NA	250	200	NA	400	NA	NA
				W	8	NA	NA	NA	250	200	NA	NA	NA	NA

M - Man
W - Woman
NA - Not Available
NR – Not Reported
* 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	Aug-18	Jul-18	Aug-17
Wheat	PBW 343	Quintal	Punjab	Amritsar	1800	1900	1650
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1780	1690	1540
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	2000	1900	1655
Jowar	-	Quintal	Maharashtra	Mumbai	2800	2600	2400
Gram	No III	Quintal	Madhya Pradesh	Sehore	3900	3870	5390
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1360	1250	1275
Gram Split	-	Quintal	Bihar	Patna	5510	5450	7000
Gram Split	-	Quintal	Maharashtra	Mumbai	5200	4700	6900
Arhar Split	-	Quintal	Bihar	Patna	5750	5850	7680
Arhar Split	-	Quintal	Maharashtra	Mumbai	5600	5600	5700
Arhar Split	-	Quintal	NCT of Delhi	Delhi	5450	5800	5450
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	5400	5300	6200
Gur	-	Quintal	Maharashtra	Mumbai	3800	4100	4000
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4600	4800	4200
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2800	2600	3200
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3800	3850	3700
Mustard Seed	Black	Quintal	West Bengal	Raniganj	4550	4550	4000
Mustard Seed	-	Quintal	West Bengal	Kolkata	4400	4700	4300
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4000	4100	4600
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	4200	4200	4350
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1450	1550	2000
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	2560	2560	2750
Castor Seed	-	Quintal	Andhra Pradesh	Hyderabad	4350	4400	4400
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	8800	7250	6000
Copra	FAQ	Quintal	Kerala	Alleppey	11550	11850	10150
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	5800	5600	5000
Groundnut	-	Quintal	Maharashtra	Mumbai	5750	5750	5200
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1350	1365	1355
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1450	1400	1375
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1330	1300	1280
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1825	1650	1800

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

Commodity	Variety	Unit	State	Centre	Aug-18	Jul-18	Aug-17
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1440	1450	1445
Castor Oil	-	15 Kg.	Andhra Pradesh	Hyderabad	1440	1440	1500
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1700	1650	1540
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2650	2450	2385
Coconut Oil	-	15 Kg.	Kerala	Cochin	2475	2520	2190
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	1820	1900	1855
Groundnut Cake	-	Quintal	Andhra Pradesh	Hyderabad	3071	2571	2786
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	5800	5700	5100
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	4900	5200	4300
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	4100	4000	3640
Jute Raw	W 5	Quintal	West Bengal	Kolkata	4100	4000	3690
Oranges	-	100 No	NCT of Delhi	Delhi	NA	NA	NA
Oranges	Big	100 No	Tamil Nadu	Chennai	600	600	
Banana	-	100 No.	NCT of Delhi	Delhi	375	375	400
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	683	683	610
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	92000	105000	100000
Almonds	-	Quintal	Maharashtra	Mumbai	73000	75000	65000
Walnuts	-	Quintal	Maharashtra	Mumbai	75000	72000	80000
Kishmish	-	Quintal	Maharashtra	Mumbai	19000	20000	12000
Peas Green	-	Quintal	Maharashtra	Mumbai	4300	4800	3250
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	1800	2200	3080
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2000	1500	2000
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1850	2100	1500
Potato	Red	Quintal	Bihar	Patna	1260	1300	820
Potato	Desi	Quintal	West Bengal	Kolkata	1400	1420	750
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalayam	2543	3413	2057
Onion	Pole	Quintal	Maharashtra	Nashik	750	1000	1800
Turmeric	Nadan	Quintal	Kerala	Cochin	12000	12000	14000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	11300	11100	8300
Chillies	-	Quintal	Bihar	Patna	10400	11000	11600

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

Commodity	Variety	Unit	State	Centre	Aug-18	Jul-18	Aug-17
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	37500	31750	45500
Ginger	Dry	Quintal	Kerala	Cochin	19500	16000	13500
Cardamom	Major	Quintal	NCT of Delhi	Delhi	83000	82000	119000
Cardamom	Small	Quintal	West Bengal	Kolkata	120000	115000	135000
Milk	Buffalo	100 Liters	West Bengal	Kolkata	5200	5200	5000
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	70000	70000	53360
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	46300	46500	46000
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	39000	39000	39000
Fish	Rohu	Quintal	NCT of Delhi	Delhi	13500	12000	13500
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	45000	55000	34500
Eggs	Madras	1000 No.	West Bengal	Kolkata	4000	5333	4350
Tea	-	Quintal	Bihar	Patna	21300	21300	21300
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	39000	39000	36000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	23000	23000	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	13500	13500	19000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	3650	3500	3350
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2000	1700	2600
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	13200	13200	13300
Rubber	-	Quintal	Kerala	Kottayam	12200	11500	11400
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	57500	56000	32700

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR 2018

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
CARDAMOM	Guatmala Bold Green	U.K.	-	Dollar/MT	18500	19500	19500	19500	19500	19500	19500	19500
				Rs./Qtl	117642	126477	126887	130065	132483	133653	133887	138294
CASHEW KERNELS	Spot U.K. 320s	U.K.	-	Dollar/MT	11535	11346	11368	10823	10038	10252	10157	10229
				Rs./Qtl	73351	73593	73973	72187	68198	70265	69739	72542
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands	-	Dollar/MT	1612	1652	1602	1567	1566	1526	1621	1621
				Rs./Qtl	10251	10716	10427	10451	10638	10456	11128	11494
CHILLIES	Birds eye 2005 crop	Africa	-	Dollar/MT	5800	4800	4800	4800	4800	4800	4800	4800
				Rs./Qtl	36882	31133	31234	32016	32611	32899	32957	34042
CLOVES	Singapore	Madagascar	-	Dollar/MT	7900	8100	7750	7750	7900	8100	8800	7700
				Rs./Qtl	50236	52537	50429	51693	53673	55517	60421	54608
COCONUT OIL	Crude Phillipine/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	1365	1260	1095	1115	1080	910	890	900
				Rs./Qtl	8680	8172	7125	7437	7338	6237	6111	6383
COPRA	Phillipines cif Rotterdam	Phillipine	-	Dollar/MT	769	716	681	672	670	611	610	607
				Rs./Qtl	4890	4644	4431	4479	4552	4188	4185	4305
CORRIANDER		India	-	Dollar/MT	1650	1650	1650	1650	1650	1650	1650	1650
				Rs./Qtl	10492	10702	10737	11006	11210	11309	11329	11702
CUMMIN SEED		India	-	Dollar/MT	3300	3300	3000	3000	3000	3000	3400	3400
				Rs./Qtl	20985	21404	19521	20010	20382	20562	23344	24113
MAIZE		U.S.A.	Chicago	C/56 lbs	355	367	386	390	390	353	337	341
				Rs./Qtl	887	935	987	1022	1041	951	909	950
OATS		CANADA	Winnipeg	Dollar/MT	340	327	291	286	294	318	334	326
				Rs./Qtl	2164	2123	1895	1905	1995	2180	2296	2310
PALM KERNAL OIL	Crude Malaysia/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	1255	1140	1030	970	960	870	890	945
				Rs./Qtl	7981	7394	6702	6470	6522	5963	6111	6702
PALM OIL	Crude Malaysian/ Sumatra, cif Rotterdam	Netherlands	-	Dollar/MT	685	663	680	665	630	650	600	560
				Rs./Qtl	4356	4297	4425	4436	4280	4455	4120	3972
PEPPER (Black)	Sarawak Black lable	Malaysia	-	Dollar/MT	5000	5000	4800	4800	4800	4400	4400	3600
				Rs./Qtl	31795	32430	31234	32016	32611	30158	30210	25531
RAPESEED	Canola	CANADA	Winnipeg	Can Dollar/ MT	485	511	516	533	532	524	493	495
				Rs./Qtl	2500	2610	2602	2765	2792	2719	2590	2694
	UK delivered rapeseed, delivered Erith(buyer)	U.K.	-	Pound/MT	275	276	272	288	289	290	301	318
				Rs./Qtl	2482	2500	2484	2657	2619	2614	2708	2857

3. WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR 2018-*CONTD.*

Commodity	Variety	Country	Centre	Unit	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
RAPESEED OIL	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/MT	669	697	652	665	676	695	695	695
				Rs./Qtl	6039	6313	5954	6135	6127	6265	6254	6402
SOYABEAN MEAL	UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk	U.K.	-	Pound/MT	305	337	339	363	355	321	330	326
				Rs./Qtl	2753	3053	3096	3349	3217	2893	2969	3003
SOYABEAN OIL		U.S.A.	-	C/lbs	33	32	32	30	31	29	28	28
				Rs./Qtl	4625	4574	4589	4410	4642	4381	4237	4377
	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/MT	651	657	647	630	640	635	635	635
				Rs./Qtl	5877	5951	5908	5812	5800	5724	5714	5850
SOYABEANS		U.S.A.	-	C/60 lbs	941	1032	1041	1045	995	868	830	854
				Rs./Qtl	2196	2457	2486	2558	2481	2183	2091	2223
	US NO.2 yellow	Netherlands	Chicago	Dollar/MT	385	423	426	444	432	380	381	354
				Rs./Qtl	2451	2744	2772	2958	2932	2602	2614	2511
SUNFLOWER SEED OIL	Refined bleached and deodorised ex-tanks,broker price	U.K.	-	Pound/MT	724	727	723	735	747	722	724	724
				Rs./Qtl	6536	6585	6602	6780	6770	6508	6515	6669
Wheat		U.S.A.	Chicago	C/60 lbs	435	451	486	496	490	480	483	508
					1015	1074	1161	1214	1222	1207	1217	1322

Source: - Public Ledger

FOREIAN EXCHANAE RATES

Currency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
CanDollar	51.57	51.11	50.48	51.84	52.51	51.92	52.55	54.43
UKPound	90.27	90.58	91.32	92.25	90.63	90.14	89.98	92.12
USDollar	63.59	64.86	65.07	66.7	67.94	68.54	68.66	70.92

Crop Production

Sowing and Harvesting Operations Normally in Progress During the Month of October, 2018

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Paddy, Jowar, Maize, Tobacco, Groundnut, Mesta And Linseed.	Paddy, Ragi, Groundnut, Seasmum and Ginger.
Assam	Paddy, Gram, Pulses, Potato and Linseed.	Paddy and Mesta.
Bihar	Wheat, Barley, Gram, Rapeseed & Mustard, Linseed and Potato	Paddy, Jowar, Bajra,Maize, Ragi and Sesamum.
Gujarat	Paddy, Gram, Pulses and Potato.	Paddy, Jowar, Groundnut, Bajra and Cotton.
Himachal Pradesh	Wheat, Barley, Gram, Rapeseed & Mustard and Linseed.	Paddy, Bajra, Maize, Pulses, Potato and Groundnut
Jammu & Kashmir	Wheat, Barley, Rapeseed & mustard and Onion.	Paddy, Bajra, Maize, Small Millets Pulses, Potato and Chillies.
Karnataka	Jowar, Potato, Tobacco, Linseed, Sweet Potato and Onion.	Kharif, Jowar, Ragi, Small Millets, Chillies and Groundnut
Kerala	Paddy, Pulses and Sesamum	Paddy, Sweet Potato and lemongrass.
Madhya Pradesh	Wheat, Barley, Gram, Jowar, Rabi Pulses, Potato, Chillies, Rapeseed & Mustard and Onion.	Paddy, Ragi, Kharif Pulses Potato, Ginger, Chillies and Groundnut.
Maharashtra	Wheat, Gram, Jowar, Barley and Pulses.	Kharif Paddy, Jowar, Bajra, Maize, Groundnut and Sesamum.
Manipur	Wheat Potato and Rapeseed & Mustard.	Sugarcane and late Paddy.
Orissa	Wheat, Jowar, Gram, Rapeseed & Mustard and Linseed.	Paddy, Kharif, Jowar and Sesamum.
Punjab	Wheat and Gram.	Paddy, Cotton, Pulses and Early Sugarcane.
Rajasthan	Wheat, Barley, Rapeseed & Mustard and Linseed.	Jowar, Bajra, Maize, Cotton and Sannhemp.
Tamil Nadu	Paddy, Jowar, Groundnut, Small Millets,	Kharif Paddy, Jowar, Maize, Cotton, Tapiocam Mesta and Ginger.
Tripura	Pulses and Potato.	Til.

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING OCTOBER, 2018-*CONTD.*

State	Sowing	Harvesting
(1)	(2)	(3)
Uttar Pradesh	Wheat, Barley, Gram, Linseed and Rapeseed & Mustard	Paddy, Jowar, Bajra, Sesamum and Groundnut.
West Bengal	Wheat, Barley, Rapeseed & Mustard, Tobacco, Chillies, Til, Potato and Pulses.	Paddy, Jute and Red Chillies.
Delhi	Wheat, Barley and Pulses.	Paddy Jowar, Bajra, Maize and Sugarcane.

(K)--Kharif (R)--- Rabi

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Note to Contributors

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N.Q. — Not Quoted.

N.T. — No Transactions.

N.S. — No Supply/No Stock.

R. — Revised.

M.C. — Market Closed.

N.R. — Not Reported.

Neg. — Negligible.

Kg. — Kilogram.

Q. — Quintal.

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