AGRICULTURAL SITUATION IN INDIA

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NOTE TO CONTRIBUTORS

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STATISTICAL TABLES

Abbreviations used

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

Plus (+) indicates surplus or increase.

Minus (–) indicates deficit or decrease.

We are pleased to inform that our monthly journal *Agricultural Situation in India* has been accredited by the National Academy of Agricultural Sciences (NAAS) and it has been given a score of 2.76 out of 6. The score is effective from January, 2016 onwards. The score may be seen in the following website: www.naasindia.org

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

Farm Sector News

Main Features of the Agriculture Budget 2016-17

The budget to make the farmers income double
Tremendous increase in agriculture and irrigation budget

This is a budget dedicated to villages, the poor and the farmers. A new dimension has been added to agricultural sector by fresh focus on progress and welfare of farmers. A tremendous enhancement has been made in the budget related to agriculture and irrigation.

Main focus of the budget is to revitalize the rural economy through the enhancement of employment opportunities for the rural sector and also to make the farmers income double.

The budgetary provision for Agriculture and Farmers Welfare Ministry for 2016-2017 is a sum of 35,984 crore rupees. Government aims to make the farmers income as double in the forthcoming five years.

Main Features of the Budget

Irrigation

Under the budgetary provisions, Pradhan Mantri Krishi Sinchai Yojana is to be implemented in mission mode and 28.5 lakh hectare area will be brought under irrigation for which a sum of rupees 5,717 crore has been earmarked for the year 2016-2017. The Ministry of Agriculture and Farmers Welfare has obtained 2,340 crore rupees in place of 1,550 crore rupees as compared to the year 2015-2016 and it is an enhancement of 51%. Besides, this year, through NABARD, it has been decided to create a fund of rupees 20,000 crore for irrigation and expeditious implementation of 89 irrigation projects lying incomplete for a long period under Macro And Mild Irrigation Scheme (AIBP) it will facilitate to irrigate an area of 80.6 lakh hectare. For this purpose, a sum of rupees 86,500 crore will be required in the forthcoming five years. Out of them, during the year 2016-2017, a sum of 12,517 crore rupees will be incurred by Ministry of Water Resources to operate 23 schemes. Alongwith, under MANREGA, in rainfed area, 5 lakh farm ponds and wells will also be arranged.

Incentives have been provided in the Agriculture budget for pulse production through a programme of less water incentive cropping Rs. 500 corers have been sanctioned under the National Food Security Mission to increase productivity and production of pulses. Rs. 900 corers have been allocated under the price stabilization fund for creating the buffer stock of pulses. The budget proposes to increase the scope of minimum support price operations for pulses for long terms through an increase in the decentralized procurement of pulses an also to take up online procurement through Food Corporation of India.

Krishi Development Scheme

Under Soil Health Card and Soil Health Management, a sum of 362 crore rupees has been allocated as compared to 142 crore rupees in the year 2015-2016 which is sole increase of 155%. The Agriculture Ministry is committed to fulfill its objective for distributing SoilHealth Card for all 14 crore farmers in the country by March, 2017. Alongwith 2000 model retail centres of fertilizers companies will be opened in the forthcoming three years. Also soil andseeds tests facilities will be provided. All the 643 agriculture Agro Science Centres,

Agricultural Universities and Institutes of ICAR in the country will be comprised of soil test facilities and mini labs. It has been decided to impart 80% subsidy for setting up 2000 mini labs for farmers' clusters.

To improve the organic value chain for North Eastern States, a sum of rupees 400 crore has been allocated in 2015-2016 for the forthcoming three years meant for the development of North Eastern States and organic value chains. This scheme has been initiated with the allocation of rupees 125 crore in 2015-2016 which will pave the way for the growth of Organic Agriculture Scheme. The remaining 275 crore rupees will meet the needs of the projects being conducted in the next year (2016-2017 and 2017-2018). Alongwith 10 lakh compost ditches will be prepared for organic manure under MANREGA.

Conventional agriculture development scheme for development of organic farming is important and it is a comprehensive organic farming scheme with the total allocation of Rs. 297 cr from the Central Government and it has increased 19 % from the allocation of Rs. 250 cr for the year 2015-16.

The Integrated Agriculture Marketing Scheme: Additional resources has been provided during the current budget for increasing the Rural storage. The allocation has been increased from Rs. 750 cr in 2015-16 to Rs. 788 cr in current year that is an increase of 5 %.

Under National Agriculture and Technology Mission (NMET), the Government is giving requisite importance

Source: www.pib.nic.in

for technology transfer by giving assistance in strengthening of Agriculture Extension Machinery of the State Governments. For this mission, the budgetary allocation in 2015-16 is Rs. 598 cr. Apart from this, Rs. 40 cr has been allocated for strengthening of agriculture information system.

Under National Food Security Mission, the government is committed to increasing the productivity of various crops and it may be seen from the budgetary allocation for food security of the country is Rs. 1700 cr. has been allocated in the current year as against Rs. 1137 cr. In 2015-16.

Under National Sustainable Agriculture Mission (NMSA), the government is committed to encourage sustainable agriculture from the budgetary allocation. In the year 2015-16 an allocation of Rs. 730 cr. was made, now it is Rs. 1062 cr. it is an increase of 45%.

Market Reforms through National Agriculture Market (NAM) – The government understand that marketing is very important in agriculture secter and the government is committed to the establishment of national agriculture market. Reforms have been made in APMC Act in 12 states and excluding Punjab. All the States have given concurrences. The government has launched the scheme on the 14th April, 2016 and till September, 2016, 200 markets will be covered and till March, 2017 another 200 markets will be covered. it is targeted to cover 585 APMC in country till March 2018.Credit flow has been increased to Rs. 9 lakh crore which was Rs. 8.5 lakh crore in the 2015-16.

In order to reduce the burden of debt payment on farmers, Rs. 15,000 crore has been provided in budget estimate in 2016-17 as interest assistance. The allocation under this head was Rs. 13,000 crore in 2015-16.

An allocation of Rs. 5500 crore has been made under PradhanMantriFasalBimaYojana which was Rs. 3185 crore in previous budget. There is an increase of about 73 % in this scheme.

National Agriculture Development Yojana – as against a provision of Rs. 3900 crore in 2015-16, this time Rs. 5400 crore has been provided in the budget of 2016-17, this amount to an increase of 38%.

A provision of Rs. 75 crore as central share has been made in the budget for the first time for National Agriculture Forestry Program. An amount of Rs. 1600 crore has been allocated for Animal Husbandry, Diary and Fisheries 2016-17 which was Rs. 1491 crore in 2015-16.

A total financial resources of Rs. 5387.95 crore was provided to DARE/ ICAR in the year 2015-16whereas in the year 2016-17 financial resources of Rs. 6309.89 crore has been made available with an increase of about 17 % compared to the last year which will give impetus to education, research and agricultural extension.

A competition of national level will be organized among 643 KVKs with a total award amount of Rs. 50 lakh for bringing reforms in the efficiency and performance of the KVKs.

Other Schemes For the Benefit of Village And Farmers

Under Pradhan Mantri Gramin Sadak Yojana, the allocation has been increased to Rs. 19,000 crore which is almost double from the amount released last year. By 2019, remaining Rs. 65000 eligible villages will be linked with the road.

Rs. 850 crore for 4 dairying projects, namely, Pasudhan Sanjivini, Nakul Swasthya Patra, 'E-Pashudhan Haat' and National Genomic Centre for indigenous breeds, has been allocated.

Every block affected from drought and natural calamities will work at special block under DeenDayalAntodaya Mission. In this scheme self- help ground will be constituted by the government and they will be imparted training in various disciplines. Further, cluster privileges team will be constituted under MNREGA which will ensure water conservation and management of natural resources. These districts will be given priority under Pradhan Mantri Krishi Sinchai Yojana.

Under the scheme "Shayam Prasad Mukherjee for development of infrastructure in villages", 300 rural urban clusters will be developed in which agriculture processing, agriculture market, godowns and warehouses will be constructed. Apart from this, cleanness campaign, water supply, solid and liquid water management, cementing of streets and drains, street lights, strengthening of educational institutions and the development of inter-rural link from other villages road, LPG gas connection and mobile health unit will be made available to the villages.

The Government extends to achieve 100% rural electrification by 01st May, 2018.

A new scheme, namely, Rastriya Gram Swaraj Abhiyan with an allocation of Rs. 655 crore has been launched in the budget.

In statutory support will be provided for the base platform so as to facilitate the access to the benefits by eligible persons.

A sum of rupees 38,500 crore has been allotted for MANREGA for the year 2016-2017.

Union Cabinet has sanctioned a "Stand Up India Scheme" for encouraging entrepreneurship among scheduled caste/ schedule tribe and women. For this purpose a sum of rupees 500 crore has been provided.

Under Prime Minister's "Skill Development Scheme", it has been aimed at to get entrepreneurship at the threshold of the youth. For these Programmes, a sum of 17000 crores rupees has been earmarked separately.

The Budget to Change the Destiny of Rural Background and Farmers in the Country—said by Shri Radha Mohan Singh

Union Agriculture and Farmers Welfare Minister Shri Radha Mohan Singh, while addressing a Press Conference, said that for the first time, there is a budget which is dedicated to villages, the poor and farmers. A new dimension has been initiated in agricultural sector for the progress and welfare of farmers. This time, a tremendous enhancement has been made in the budget related to agriculture and irrigation. No one had witnessed such a change earlier. Therefore, this budget will change the scenario of the country's villages, the poor and farmers and pave their way towards substantial development. Under the dynamic leadership of Prime Minister Shri Narendra Modi the budget meant for 2016-2017 submitted by Union Finance Minister Shri Arun Jaitley has proved that Modi Government is the Government for villages, the poor and farmers.

The Minister said that the country has witnessed the series of droughts in various parts of the country, keeping these circumstances in mind, it was the need of time to be focused on agriculture and villages and it is must for formidable rural economy of the country. This will result in the enhancement of employment opportunities on rural scenario but it will also make the farmers income as double. For the first time in the country, Modi Government has taken a concrete step for strengthening the economic condition of the farmers in the country.

Shri Singh said that Prime Minister Shri Narendra Modi had addressing the Members Of Parliament in Central Hall of Parliament, said that his Government will be dedicated for villages, the poor and farmers and whatever Modi Government had uttered he proved that in practice in its second budget. So, I, on behalf of the farmers of the country salute to the Prime Minister Shri Narendra Modi and Union Finance Minister Shri Arun Jaitley. A record enhancement has been seen in budget allocation keeping in view villages, farmers and agricultural development.

Animals are Often the Forgotten Victims of Disasters—said by Shri Radha Mohan Singh

Union Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh inaugurated the two-day workshop on 'Management of Animals in Emergencies' organised by National Institute of Disaster Management (NIDM).

Addressing the gathering, Shri Radha Mohan Singh said that the NIDM is playing pivotal role not only in disasters occurring in the country but also in our neighbouring countries like Nepal where massive earthquake struck impacting adjoining States in our country as well. The role of disaster management agencies in rescue and rehabilitation of several people during recent Chennai floods was highly appreciated, he added. The Minister said that it is important to note that animals are often the forgotten victims of disasters and thousands of animals suffer and perish each year.

Considering the importance of livestock in the economy of the nation and also lives of rural Population, Shri Radha Mohan Singh said that the management of livestock during disaster becomes imperative. He said that the NIDM along with organisation like Policy Prospective Foundation and World Animal Protection have been working together to address much needed issue of 'management of animals in emergencies'. For better policy support, measures to protect animals from disasters should also be included into the Disaster Management Act, he added.

Shri Radha Mohan Singh said that this workshop is going to identify the challenges and focus on the way forward to mitigate and prevent loss of livestock resources before, during and after disasters.

Following the inaugural, the Minister released the Disaster Management Plan for the Department of Animal Husbandry, Dairying & Fisheries and Government of India. The Plan has been developed to protect animals before, during and after disasters.

The two-day workshop included sessions to brief on subjects like Veterinary Emergency Preparedness Measures (Pre Disaster stage), Veterinary Emergency Response Measures (During Disaster stage), Veterinary Emergency Recovery Measures (Post Disaster stage), National Legislative & Institutional Perspectives and Animal Centred DRR measures.

Schemes for Agro Startups

Government of India is implementing schemes for Start-ups, including Agro Start-ups through Schemes such as 'Start-up India Scheme' of Department of Industrial Policy and Promotion (DIPP) and 'A Scheme for Promotion of Innovation, Entrepreneurship and Agro-Industry' (ASPIRE) scheme under Ministry of Micro, Small and Medium Enterprises (MSMEs).

Assessment of Demand and Supply of Agricultural Produces

The Working Group on Crop Husbandry Demand and Supply Projections, Agricultural Inputs and Agricultural Statistics constituted as a part of the formulation of the Twelfth Five Year Plan (2012-17) projected demand and supply for different agricultural crops till 2016-17.

The Working Group estimated demand and supply on the basis of various approaches of supply and demand projection methods. The relevant information on various aspects, such as prices, production, supply etc., of agricultural commodities is extensively disseminated to

farmers through agricultural extension services, Kisan Call Centres, farmers portal and m-Kisan portal under National e-Governance Plan in Agriculture (NeGP-A) to help in their farming/cropping decision which are profitable to them.

Government has taken a number of initiatives to improve quality of statistical inputs used for demand and supply projections through improved survey methodology on Household Consumer Expenditure Surveys of National Sample Survey Office as well as use of modern techniques/ technologies such as remote-sensing, etc., in Crop Cutting Experiments for assessment of yield/production, besides thorough scrutiny of data on production reported by State Governments.

Extending Support to Farmers in Case of Crop Failure

Farmers are indebted to both institutional and non-institutional sources of credit. However, borrowing from non-institutional sources is the major reason for debt-related farmers' distress which is one of the reported reasons for farmers' suicide in the country. In order to reduce the dependence of farmers on private money lenders for meeting their credit needs and for providing relief to the indebted farmers, Government has already taken several measures which include the following:Financial Institutions (Commercial Banks, Cooperative Banks and Regional Rural Banks) have been directed to provide short term crop loans and medium/ long term loan to farmers for various agricultural activities. Short term crop loan of upto Rs.3.00 lakh is provided to farmers at an interest rate of 7% per annum. Farmers, who promptly repay their crop loans as per the repayment schedule fixed by the banks, get the benefit of interest subvention of 3%. Thus, the effective interest rate for the short term crop loan is 4% per annum.

The limit of collateral free farm loan has been increased from Rs.50000 to Rs.100000.

Kisan Credit Card (KCC) Scheme, which enables the farmers to purchase agricultural inputs such as seeds, fertilizers, pesticides, etc. and to draw cash to satisfy their consumption needs. The KCC Scheme has since been simplified and converted into ATM enabled debit card (Rupay KCC- RKCC).

Reserve Bank of India has allowed State Level Bankers' Committee/ District Level Consultative Committees/ Banks to take a view on rescheduling of loans if the crop loss is 33% or more. Banks have been advised to allow maximum period of repayment of upto 2 years (including the moratorium period of 1 year) if the crop loss is between 33% and 50%. If the crop loss is 50% or more, the restructured period for repayment is extended to a maximum of 5 years (including the moratorium period of 1 year).

To provide financial support to the farmers in the event of failure of crops as a result of natural calamities, Government is implementing crop insurance schemes since 1985. At present, two Crop Insurance Schemes namely, National Agricultural Insurance Scheme (NAIS) and National Crop Insurance Schemes (NCIP) with three component schemes namely, Modified National Agricultural Insurance Scheme (MNAIS), Weather Based Crop Insurance Scheme (WBCIS) & Coconut Palm Insurance Scheme (CPIS) are under implementation in the country.

Horticulture Production Outpacing Production of Foodgrains

Despite the deficit monsoon, unseasonal rains and hailstorm in the major part of the country, the production of horticulture crops have outpaced the production of food grains since 2012-13 as may be seen in the table below:

Year	Production (In Million Tonnes)	
	Total Horticulture*	Total Foodgrains**
2012-13	268.85	257.13
2013-14	277.35	265.04
2014-15	280.99	252.02

Source: * Horticulture Statistics Division, DAC&FW
** Directorate of Economics and Statistics

There has been an increase of 1.3% in horticulture production and reduction of 4.9% in foodgrain production in 2014-15 as compared to 2013-14.

Buffer Stock of Pulses

It has been decided to create a buffer stock of pulses of 1.5 lakh tonnes to control fluctuation of prices of pulses. Government has engaged National Agricultural Cooperative Marketing Federation of India Limited (NAFED), Small Farmers Agri-business Consortium (SFAC) and Food Corporation of India (FCI) to procure pulses for buffer stock. The progress of procurement of pulses by these agencies so far is as under:-

(Quantity in quintals)

FCI	NAFED	SFAC	Total
2,01,046.36	2,17,603.25	83,809.51	5,02,459.12

Per Capita, Per Day Net Availability of Pulses

The per capita, per day net availability of pulses from 2012 to 2014 (latest available) are as under:

Year	Per Capita Net Availability of pulses (Gram per day)
2012	41.7
2013	43.3
2014(P)	47.2

(P): Provisional

In order to increase production of pulses in the country, Government of India has been implementing through State Governments, the National Food Security Mission (NFSM)-Pulses since 2007-08. Presently, around 50% of the funds under the umbrella scheme of NFSM are allocated for promoting cultivation of pulses. Since 2014-15, NFSM-Pulses is being implemented in 622 districts of 27 States including all districts of North-Eastern and hill States.

Further, since 2010-11 the Scheme "Bringing Green Revolution in Eastern India (BGREI)" is being implemented in Eastern States of Assam, Bihar, Odisha, Chhattisgarh, Jharkhand, West Bengal and Eastern Uttar Pradesh. To give a boost to their area and production, pulses have also been included under BGREI from 2015-16 as part of demonstrations under cropping systems based approach to target rice fallow areas.

In order to increase productivity of pulses, the Indian Council of Agricultural Research (ICAR) has undertaken research programmes in different pulses at commodity based research institutes. The research programmes include basic and strategic research related to crop improvement and production technologies in different pulse crops. For developing location-specific varieties/hybrids and suitable production technologies of pulses to improve their production and quality, the research findings are validated in relevant agro-ecologies by crop-specific All India Coordinated Research Projects (AICRPs), mostly situated in the State Agricultural Universities (SAUs).

To encourage farmers to grow more pulses by ensuring remunerative prices, the Minimum Support Prices (MSPs) of pulses have also been increased over the years. Further, for 2015-16, over and above MSPs, the Government has announced a bonus of Rs.200/- per quintal for kharif pulses and Rs.75/- per quintal for rabi pulses.

Reforms in Agricultural Marketing

To address the demands for marketing of increased and diversified agricultural marketable surplus, there is a need to strengthen the network of regulated markets and augment it with alternative marketing channels. As per the recommendation of the National Farmers Commission (2004), that a regulated market should be available to farmers within a radius of 5 Km (corresponding market area of about 80 square km.). However, presently, all-India average area served by a regulated market is 487.40 square km. The number of commodity specific markets with requisite infrastructure is also limited.

Agriculture Marketing is governed by the Agricultural Produce Marketing Committee (APMC) Acts, which are administered by respective State Governments. Some State Governments have ushered reforms in their marketing sector to meet the challenges.

In order to keep pace with the changing production pattern and growing marketable surplus, the Government advocates development of adequate number of markets equipped with modern infrastructure, with increased private sector participation and development of other marketing channels like direct marketing and contract farming etc. The Government is actively pursuing with States to amend their marketing laws to provide suitable legal framework and policy atmosphere to usher such developments. The reform agenda of the Government focuses on 7 vital areas for reforms. State-wise progress is given below.Further, as a part of reforms, Government announced a scheme for setting up of National Agriculture Market (NAM). Under NAM, a common e-market platform is to be deployed for on-line trading across the States/ Country. It is expected that NAM would address the marketing constraints of fragmentation, lack of transparency in bidding, poor price discovery, information asymmetry between sellers and buyers and provide farmers with a larger share of the consumer rupee.

Subsidy for Purchasing Combine Harvester

Under the Sub-Mission on Agricultural Mechanization being implemented by the Department of Agriculture, Cooperation & Farmers Welfare, subsidy @ 40% of the project cost limited to a maximum of Rs. 24 lakhs, whichever is less, is extended to the rural entrepreneurs, progressive farmer and self help groups for establishment of farm machinery banks for custom hiring comprising of various agricultural machinery & equipment including combine harvester.

Unified National Market for Agricultural Commodities

The Government has approved a scheme for setting up of National Agriculture Market (NAM) through Agri-Tech Infrastructure Fund (ATIF) on 01.07.2015 with a budget of Rs.200 crore and to be implemented during 2015-16 to 2017-18.

The scheme envisages implementation of the National Agricultural Market (NAM) by setting up of an appropriate common e-market platform that would be deployable in regulated wholesale markets in States/UTs desirous of joining the e-platform. Small Farmers Agribusiness Consortium (SFAC) will implement the national e-platform in 585 selected regulated markets and will cover 400 mandis in 2016-17 and 185 mandis in 2017-18. Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) will meet expenses on software and its customization for the States and provide it free of cost to the States and Union Territories (UTs). DAC&FW will also give grant as one time fixed cost subject to the ceiling of Rs.30.00 lakhs per Mandi (other than to the private mandis) for related equipment / infrastructure in 585 regulated mandis, for installation of the e-market platform. State Governments will propose the regulated markets which are to be integrated with NAM.

Integration of regulated markets with NAM requires certain pre-requisites in the State Agricultural Produce Marketing Committee (APMC) Acts, namely- (i) a single license to be valid across the State, (ii) single point levy of market fee and (iii) provision for electronic auction as a mode for price discovery. Only those States/UTs that have provided for these three pre-requisites will be eligible for assistance under the scheme.

Promotion of Soil Test Based Balanced and Judicious Use of Chemical Fertilizers, Bio-Fertilizers and Locally Available Organic Manures

The Government is promoting soil test based on balanced and judicious use of chemical fertilizers, bio-fertilizers and locally available organic manures like Farm Yard Manure, compost, Vermi Compost and Green manure to maintain soil health and its productivity.

'Soil Health Card' (SHC) scheme has been launched in February 2015 to assist State Governments to evaluate fertility in all 14 crore farm holdings and issue soil health cards to farmers regularly in a cycle of 2 years. Soil health cards provide information to farmers on nutrients status of their soil along with recommendations on appropriate dosage of nutrients to be applied for improving soil health and its fertility.

In order to reduce use of pesticides and chemical fertilizers in the country, Indian Council of Agricultural Research (ICAR) is recommending Integrated Pest Management (through a combination of agronomic, chemical and biological methods) and Integrated Nutrient Management (INM) envisaging conjunctive use of both inorganic and organic sources of nutrients. Besides, split application and placement of fertilizers, use of slow releasing N-fertilizers and nitrification inhibitors, inclusion of legumes in cropping system, adoption of Resource Conservation Technologies (RCTs) and fertigation are also being advocated. ICAR also imparts training, organizes Front Line Field Demonstrations to educate farmers on all these aspect.

Under the scheme 'Strengthening and Modernisation of Pest Management Approach in India, farmers are educated to adopt Integrated Pest Management (IPM) as cardinal principle and main plank of plant protection strategy in overall crop production programme. Under the ambit of (IPM) programme, the Government of India has established 31 Central IPM Centres which conduct Farmers Field Schools (FFSs) to educate farmers about mechanical, cultural and biological control measures including use of biopesticides against different crop pests and weeds and judicious use of chemical pesticides as a measure of last resort.

The Insecticides Act 1968 and the Rules framed there under mandate that pesticides are registered for use in agriculture in India only after a detailed evaluation of safety. Once registered, a pesticide is legally obligated to display and carry approved labels and leaflets containing critical information on safe use of pesticides for the benefit of farmers & extension functionaries etc. Application of pesticides in accordance with instructions on the label and leaflets is not likely to cause any harm to human health.

Fix a Uniform Price of Bt Cotton Seed across the Country for the Benefit of Farmers—said by Shri Radha Mohan Singh

Union Agriculture and Farmers Welfare Minister Shri Radha Mohan Singh said that "As there was no uniformity in pricing of Bt cotton seeds across the country, the central government has recently intervened and issued a Cotton Seed Price (Control) Order, 2015, to fix a uniform price of Bt cotton seed across the states in the country for the benefit of farmers,"

The Agriculture & Farmers Welfare Minister said that both the public and private sectors have a role in the supply of quality seeds, including Bt cotton, to farmers. The licensing of Bt cotton seeds by Mahyco Monsanto to 50 companies is an example of the private sector's role in the production and supply of such seeds.

Shri Singh said that "In order to safeguard the interests of the farming community, this department issued the Cotton Seed Price (Control) Order, 2015, under section 3 of the Essential Commodities Act, 1955, to regulate Bt cotton seed prices. "Some state governments had also passed legislations to ensure supply of Bt cotton seeds to farmers," Shri Singh added.

Agriculture & Farmers Welfare Minister also said that "based on the representations, this department also made a reference to the Competition Commission of India for investigation of dominance of MMBL and abuse of monopoly in Bt cotton technology so as to ensure competition in the market.

Shri Singh also said that as per the order, a nine-member committee was set up to recommend the maximum sale price of Bt cotton seeds after taking into consideration the seed value, licence fees including one-time and recurring royalty (trait value), trade margins and other taxes and government declared the maximum sale price of Bt. cotton seed packets (9450grams of Bt. Cotton plus 120 grams refugia) for the financial year 2016-17 for the whole of India.

Promotion of Micro Irrigation

The Micro Irrigation technologies (both Drip and Sprinkler) are quite popular amongst the farmers and adoption rate is also high.

The National Mission on Micro Irrigation programme in the country, State-wise including West Bengal, was subsumed under National Mission on Sustainable

Agriculture (NMSA) and implemented as "On farm Water Management" (OFWM) during 2014-15. The same is now being implemented as "Per Drop More Crop" component under PradhanMantriKrishiSinchyeeYojana (PMKSY) from 2015-16 onwards.

Various steps taken by Government for promotion of micro irrigation include (i) Training and awareness programmes, (ii) Awareness through print media and radio & TV talks, (iii) Organization of workshops, seminars and interactive meetings, (iv) Publicity creation through Exhibitions, Fairs and KisanMelas, (v) Publication of literature and (vi) Short duration films.

Intervention Made in Drought Affected Areas

Intervention made in drought affected areas:

(i) Implementation of Diesel Subsidy Scheme for protective irrigation of crops;

(ii) Enhancement of ceiling on seed subsidy to partially recompense the farmer for the additional expenditure incurred in resoling and/or purchasing appropriate varieties of seeds;

(iii) Implementation of interventions on perennial horticulture crops under Mission for Integrated Development of Horticulture (MIDH);

(iv) Implementation of Additional Fodder Development Programme (AFDP) as a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY).

Central Research Institute of Dryland Agriculture (CRIDA), in collaboration with State Agricultural Universities, has prepared contingency plans for 600 districts for implementing location specific interventions to sustain agriculture production in the eventuality of any extreme climatic events.

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been launched with the objective of extending the coverage of irrigation in a focused manner. Under PMKSY, focus has been given for: Creation of new water sources; Repair, restoration and renovation of defunct water sources; Construction of water harvesting structures, secondary & micro storage, ground water development and Enhancing potentials of traditional water bodies at village level.

Central Government has relaxed the norms under MGNREGA to provide additional employment of 50 days over and above the 100 days per household in the areas affected by natural calamities including drought for the current year.

Further, in order to protect farmers against crop failure due to natural calamities, pests & diseases, weather conditions, Government of India had introduced the National Crop Insurance Programme (NCIP) from Rabi 2013-14 season with component schemes of Modified National Agricultural Insurance Scheme (MNAIS), Weather Based Crop Insurance Scheme (WBCIS) and Coconut Palm Insurance Scheme (CPIS). In addition, National Agricultural Insurance Scheme (NAIS) which was to be withdrawn after implementation of NCIP from Rabi 2013-14, has been extended further. These schemes have been recently reviewed and a new scheme, namely, PradhanMantriFasalBimaYojana (PMFBY) has been approved for implementation from Kharif 2016 season.

News Report of ASSOCHAM stating that Wheat Production in the Country this year is Likely to be Lower is Factually Incorrect- said by Shri Radha Mohan Singh

Union Agriculture and farmers Welfare Minister, ShriRadha Mohan Singh saidsaid that "the news report of ASSOCHAM stating that wheat production in the country this year is likely to be lower by 1.5 crore tonne is factually incorrect. In 2015-16, wheat production in the country is estimated at 93.82 million tonnes (2nd Advance Estimate). The recent untimely rains and hailstorm in some parts of the country have caused some damage but, as per present assessment, production of wheat in the country would still be around 92-93 million tonne which is substantially higher than the wheat production of 86.53 million tonnes during 2014-15".

Shri Singh said that the present stock of wheat with the Food Corporation of India is higher than the stocking norms. Against the stocking norm of 7.6 million tonnes as on 1st April, 2016, the present stock of wheat in the central pool is 13.5 million tonne. During the last one year FCI has sold 7 million tonnes of wheat through open market operations. For the past some time, the market response to the tenders floated by FCI has been weak which implies that there is no shortage of wheat in the country at present.

Agriculture and Farmers' Welfare Minister informed that during the last one year international price of wheat have been subdued. In order to protect the interests of farmers, Government of India, imposed 25 per cent import duty on wheat. He further said that the harvesting of wheat has started. With a target of 30.5 million tonne, FCI has already started procurement activity.

Shri Singh also said that at this juncture, such incorrect information is being publicized with a view to compel government to reduce import duty on wheat. Lower import duty on wheat would lead to a fall in wheat price in the domestic market and farmers will incur heavy loss while traders will purchase from farmers at lowered price.

Prime Minister Inaugarates 'Krishi Unnati Mela': PM Confers Krishi Karman Awards

Hon'ble Prime Minister Shri Narendra Modi inaugurated **'***Krishi Unnati Mela***'**- the National Level Agriculture Fair-cum-Exhibition in New Delhi on 19th march, 2016. Hon'ble Prime Minister conferred Krishi

Karman Awards. He also visited the Theme Pavilion and addressed the farmers. 'KrishiUnnatiMela' was organized jointly by the Department of Agriculture, Ministry of Agriculture and Farmers Welfare, Government of India and Indian Agriculture Research Institute (IARI), Pusa, New Delhi at Indian Agriculture Research Institute from March 19-21, 2016.

On inauguration day, the prestigious National level 'Krishi Karman Awards' for the Best performing States of the year 2014-15 were presented to 8 State Governments, which were received by the Chief Minister of respective states. Besides this, 3 states were also be given commendation awards for total food grains production. These awards are instituted to facilitate the best performing States in food grains production. The objective of these awards is to encourage and motivate the states to enhance production and productivity of rice, wheat, pulses and coarse cereals and oilseeds.

Prime Minister also visited 'Theme Pavilion', one of the major attractions at the Krishi Unnati Mela, has showcased the entire scheme of things happening in the agriculture sector. The pavilion has 8 zones viz. agro-climatic variety in India; water as an input to agriculture; Soil Health; Technology theme showcasing important Government schemes; Animal Husbandry and Fisheries; Agri-rejuvenation, Agri- Technology; and Horticulture.

With the initiative of Hon'ble Prime Minister, a new scheme *PM Fasal Bima Yojana* has been approved for implementation across the country. An allocation of Rs. 5500 crore has been made in the Budget 2016-17 under PradhanMantriFasalBimaYojana which was Rs. 3185 crore in previous budget. There is an increase of about 73 % in this scheme.

Technical session on PradhanMantriFasalBimaYojana chaired by Secretary, department of Agriculture and Farmer's Welfare was also held on inaugural day. In the new scheme, short-comings in Crop Insurance Scheme have been removed. Salient Features of PM FasalBimaYojana were discussed are as follows:

- This is the biggest financial support till date by the Central Government in Crop Insurance, while farmers will now have to pay the lowest premium till date for availing Crop Insurance.
- The balance premium burden will be borne by the Government - even if it is more than 90% of the total premium.
- For food-grains, pulses and oilseeds, there will be one season – one rate for the farmer. Different rates for different crops for different districts have been removed. For Kharif: maximum 2% and for Rabi: maximum 1.5% premium is to be paid by farmers.
- Farmers will get full financial security – there will be no capping on the premium rates and no reduction in the sum insured.
- For the first time, inundation has been included in the category of localized risks.
- For the first time, risks of post harvest losses due to cyclone and unseasonal rainfall have been included for coverage across the country.
- For the first time, mobile and satellite technology will be used for correct estimation and quick payment of claims to farmers.
- Under this scheme, provisions have been made for creation of mass awareness and publicity through media so that the number of insured farmers can be increased from present 20% to 50% in the next 2-3 years.

Organic Farming Mandates Meeting the Complete Nutrient Requirement of the Crop Only Through Permitted Organic Inputs And Pest Management by Non-Chemical Methods- said by Shri Radha Mohan Singh

Union Agriculture and Farmers Welfare Minister, ShriRadha Mohan Singh addressed the National Symposium on Organic Farming for Farmers Prosperity, organized by CRIDA and NIRD, Hyderabad on 20th March, 2016. In his address,Shri Singh said that the Organic farming mandates meeting the complete nutrient requirement of the crop only through permitted organic inputs and pest management by non-chemical methods. However, in view of large requirements of food in terms of cereals, legumes, oil seed, fodder, fruit/vegetables, fibre etc. organic farming need be promoted in the niche areas.

Shri Singh said that at present, it appears that the only strategy to sustain food production on long term basis in the country is to adopt integrated nutrient management and integrated pest management to meet the ever growing demand for food, while organic farming practices can be adopted in isolated and niche areas to produce quality products and minimize the adverse effects on the environment. Future organic farming need to be linked with market avenues and export of organic products

Memorandum of Understanding between India and Lithuania for Cooperation in the Field of Agriculture

The Union Cabinet chaired by the Prime Minister ShriNarendraModi has given its approval for signing of a Memorandum of Understanding between India and Lithuania for cooperation in the field of agriculture.

The MoU provides for cooperation in the fields of agriculture production including horticulture, post-harvest management, organic farming, cold chain development and agro processing industry, animal husbandry, dairying and

aquaculture etc. The cooperation between the two countries shall be undertaken through biennial work plan to be drawn up mutually to give effect to the objectives of the instant MoU.

It is expected that the MoU would help in capacity building, knowledge exchange between scientists and technicians, exchange of genetic resources, development of appropriate technologies and farm practices for enhancing agriculture productivity at farmer's field.

Agriculture Ministry Issues Directives to the States to Check the Adverse Affect of White Fly on Cotton

Union Agriculture and Farmers Welfare Ministry has issued extensive directives to the States producing cotton to check the adverse affect of white fly on cotton. Ministry of Agriculture and Farmers Welfare has given these directives in view the likely menace to the crop of cotton in Punjab, Haryana and Rajasthan from white fly. White fly had inflicted tremendous damage to cotton last year in Punjab and Haryana.

To save crop of cotton from the likely menace of white fly, the Ministry of Agriculture and Farmers Welfare has taken various preventive measures. Elaborate assessment and analysis has been carried out about the loss inflicted last year. The sowing process of cotton is set in, in the beginning of April in the States of Punjab, Haryana and Rajasthan. Central Cotton Research Regional Centre, Sirsa (Haryana) has recently held a meeting in which officials of the Ministry of Agriculture, Scientists of Indian Council of Agricultural Research and senior officials of Departments of Agriculture from Punjab, Haryana and Rajasthan reviewed the preventive measures to check the menace of white fly.

After the review, the Government of India has forwarded extensive directives to the States of Punjab, Haryana and Rajasthan. The directives say that the sowing process may be carried out within the precincts of scheduled timeframe, only recommended seeds might be utilized, close watch might be kept on the movement of pests and timely sprinkling to check its spread. Indian Council of Agricultural Research has also provided a list of the pests resist seeds 4for the farmers. This year emphasis is being given on the timely sowing of cotton.

360 Additional Soil Test Labs to be set up during 2016-17

Soil Health Card (SHC) Scheme is an important scheme of the Government. It aims at promoting soil test based and balanced use of fertilizers, so that the farmer can realize higher yields at lower cost. Simultaneously, soil health can be sustained. Earlier soil health cards were being given to farmers. However, these were largely the initiatives of State Governments, implemented over varying periods of time. These initiatives were sporadic & random and therefore, did not cover all the farmers within a particular time cycle. The approach also was not comprehensive in term of procedure for collection of soil samples and standards for soil test. It was limit to, assisting the State Governments for Static Soil Testing Laboratories (SSTLs) and Mobile Soil Testing Laboratories (MSTLs). Earlier, Government of India has never provided any assistance to the State Governments to undertake collection of soil samples and their analysis. As seen a major threat towards deteriorating soil health, there has never been comprehensive 'Soil Health Card' Scheme of the magnitude that Government launched in the year 2014-15 to provide SHC to all 14 crore farmers once in a cycle of 2 years, on a continuous basis. Comprehensive testing of soil samples for 12 parameters including micronutrients is being carried out under the scheme. The first cycle of the scheme will be completed in 2 years (2015-16 & 2016-17) with an outlay of Rs 568.54 crore.

The target for the year 2015-16 is to collect 104 lakh soil samples and test them for issue of Soil Health Cards to farmers. More than 90 percent samples have been collected in states like Andhra Pradesh, Kerala, Meghalaya, Nagaland, Telangana, Sikkim, Gujarat, Bihar, Tripura, Tamil Nadu, Maharashtra, Punjab, Chhattisgarh, West Bengal and Himachal Pradesh.

Out of 90 lakh samples collected 60 lakh soil samples have been tested so far. Andhra Pradesh, Telangana, Gujarat, Meghalaya, Sikkim, Tamil Nadu, Maharashtra, Tripura and Kerala have taken soil analysis in a big way and completed the targets between 75% to 100%. States like Bihar, Punjab, Chhattisgarh, West Bengal, Jharkhand, Odisha, Uttarakhand, Rajasthan, Arunachal Pradesh, Madhya Pradesh, Jammu & Kashmir, Mizoram, Haryana, Manipur, Assam, Karnataka and Uttar Pradesh are lagging behind.

In 2016-17, 360 number of additional soil test laboratories will be made operational to test major and micro nutrients. This will increase the annual analyzing capacity of state laboratories from 1.78 crore to 2.14 crore.

General Survey of Agriculture

Trends in Foodgrain Prices

During the month of February, 2016, the All India Index Number of Wholesale Price (2004-05=100) of food grains decreased by1.15 percent from 260.1 in January, 2016 to 257.1 in February, 2016.

The Wholesale Price Index (WPI) Number of cereals decreased by 0.25 percent from 236.7 to236.1 and WPI of pulses decreased by 3.70 percent from 370.1 to 356.4 during the same period.

The Wholesale Price Index Number of Wheat increased by 0.85 percent from 223.5to 221.6 while that of Rice increased by 0.30 percent from 235.9 to 235.2 during the same period.

Rainfall Situation during March, 2016

Cumulative Pre-Monsoon Season (March to May) rainfall for the country as a whole during the period 01st March to 30th March, 2016 is equal to Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period was lower than LPA by 24% in East & North East India and 49% in South Peninsula and higher than LPA by 21% in North West India & 12% in Central India. Out of a total of 36 meteorological subdivisions, 18 subdivisions received excess/normal rainfall, 16 subdivisions received deficient/scanty rainfall and 02 subdivisions received no rain.

Water Storage in Major Reservoirs during March, 2016

Central Water Commission monitors 91 major reservoirs in the country which have a total live capacity of 155.80 Billion Cubic Metre (BCM) at Full Reservoir Level (FRL). Current live storage in these reservoirs as on 31st March, 2016 was 39.65 BCM as against 57.18 BCM on 31.03.2015 (last year) and 52.74 BCM of normal storage (average storage of last 10 years). Current year's storage is 69% of the last year's storage and 75% of the normal storage.

Economic Growth

As per the Advance Estimates released by Central Statistics Office on 8th February 2016, the growth rate of Gross Domestic Product (GDP) at constant (2011-12) prices for the year 2015-16 is estimated to be 7.6 per cent as compared to the growth of 7.2 per cent, 6.6 per cent,, and 5.6 per cent for 2014-15, 2013-14, and 2012-13 respectively (Table 1].

The growth in Gross Value Added (GVA) at constant (2011-12) basic prices for the year 2015-16 is estimated to be 7.3 per cent as compared to the growth of 7.1 per cent, 6.3 per cent, and 5.4 per cent respectively for 2014-15, 2013-14, and 2012-13. At the sectoral level, the growth rate of GVA at constant (2011-12) basic prices for agriculture & allied sectors, industry and services sectors for the year 2015-16 are estimated to be 1.1 per cent, 7.3 per cent, and 9.2 per cent respectively [Table 1].

According to the quarterly estimates, the growth in GDP in Q3 of 2015-16 [October-December] was 7.3 per cent, compared to the corresponding growth of 6.6 per cent in 2014-15. Growth during the first three quarters of 2015-16 (April-December) works out to be7.5 per cent as compared to the corresponding growth of 7.4 per cent in 2014-15 [Table 2].

The share of total final consumption in GDP at current prices in 2015-16 is estimated to have improved to 70.5 per cent from 68.5 per cent in 2014-15. Though the share of fixed investment rate (gross fixed capital formation to DGP) is expected to decline in 2015-16, its growth rate is estimated to improve to 5.3 per cent 2015-16 as compared to 4.9 per cent in 2014-15.

The saving rate (gross saving to GDP) for both the years 2014-15 and 2013-14 was 33.0 per cent as compared to 33.8 per cent in 2012-13. The investment rate (gross capital formation to GDP) in 2014-15 was 34.2 per cent, compared to 34.7 per cent and 38.6 per cent in 2013-14 and 2012-13 respectively.

Agriculture and Food Management

Rainfall: The cumulative rainfall received during the period 1st March - 16th March 2016 has been 19 per cent above normal. The actual rainfall received during this period has been 17.0mm as against the normal at 14.3 mm. Out of the total 36 meteorological subdivisions, 20 subdivisions received excess season rainfall, 4 subdivision received normal season rainfall and the remaining 12 subdivisions received deficient/scanty/no season rainfall.

All India Production of Foodgrains: As per the 2nd advance estimates released by Ministry of Agriculture on 15th February 2016, production of foodgrains during 2015-16 is estimated at 253-2 million tonnes compared to 252.0 million tonnes in 2014-15 (Table 3).

Procurement: procurement of rice as on 17th March 2016 was 29.2 million tones during kharif marketing season 2015-16 and procurement of wheat as on 17th March 2016 was 28.1 million tones during rabi marketing season 2015-16 (Table 4).

Off-take: Off-take of rice in January 2016 was 26.5 lakh tones. This comprises 23.6 lakh tones under TPDS/NFSA

(offtake against the allocation for the month of February, 2016) and 2.9 lakh tonnes under other schemes. The total off-take of wheat in January 2016 was 34.1 lakh tones comprising 18.2 lakhs tones under TPDS/NFSA (off take against the allocation for the month of February, 2016) and 15.9 lakh tones under other schemes. Cumulative off-take of foodgrains during 2015-16 (till January 2016) was 558.8 lakh tones (Table 5).

Stocks: Stocks of food-grains (rice and wheat) held by FCI as on March, 1, 2016 were 46.1 million tonnes, compared to 43.6 million tones as on March 1, 2015 (Table 6).

TABLES

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

Sector	Growth			Share in GVA		
	2013-14	2014-15	2015-16 (AE)	2013-14	2014-15	2015-16 (AE)
Agriculture, forestry & fishing	**4.2**	**-0.2**	**1.1**	**17.5**	**16.3**	**15.3**
Industry	**5.0**	**5.9**	**7.3**	**31.6**	**31.2**	**31.2**
Mining & quarrying	3.0	10.8	6.9	2.9	3.0	3.0
Manufacturing	5.6	5.5	9.5	17.4	17.1	17.5
Electrictiy, gas, water supply & other utility Services	4.7	8.0	5.9	2.2	2.2	2.2
Construction	4.6	4.4	3.7	9.0	8.8	8.5
Services	7.8	10.3	9.2	51.0	52.5	53.4
Trade, hotels, transport, Communication and services related to broadcasting	7.8	9.8	9.5	18.4	18.9	19.2
Financial, real estate & professional Services	10.1	10.6	10.3	20.3	21.0	21.5
Public administration, defence and Other Services	4.5	10.7	6.9	12.3	12.7	12.7
GVA at basic prices	**6.3**	**7.1**	**7.3**	**100.0**	**100.0**	**100.0**
GDP at market prices	**6.6**	**7.2**	**7.6**	...	...	...

Source: Central Statistics Office (CSO). AE: Advance Estimates

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

Sectors	2013-14				2014-15				2015-16		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Agriculture, forestry & fishing	2.8	3.3	5.7	4.3	2.3	2.8	-2.4	-1.7	1.6	2.0	-1.0
Industry	3.1	3.9	4.0	1.7	8.0	5.9	3.8	5.7	6.8	6.4	9.0
Mining & quarrying	2.2	-3.0	0.5	7.2	4.5	7.0	9.1	10.1	6.6	5.0	6.5
Manufacturing	-0.8	0.5	2.4	-0.7	7.9	5.8	1.7	6.6	7.3	9.0	12.6
Electrictiy, gas, water supply & other utility	-2.6	1.0	-1.5	0.4	10.2	8.8	8.8	4.4	4.0	7.5	6.0
Services											
Construction	13.3	14.6	9.9	5.2	5.0	5.3	4.9	2.6	6.0	1.2	4.0
Services	8.7	9.3	7.7	5.4	8.6	10.7	12.9	9.3	9.0	9.4	9.4
Trade, hotels, transport, Communication and services related to broadcasting	6.8	8.4	9.2	6.9	11.6	8.4	6.2	13.1	10.5	8.1	10.1
Financial, real estate & professional Services	9.8	14.0	9.1	6.9	8.5	12.7	12.1	9.0	9.3	11.6	9.9
Public administration, defence and Other Services	9.6	2.9	3.2	1.2	4.2	10.3	25.3	4.1	6.1	7.1	7.5
GVA at Basic prices	5.9	6.7	6.2	4.0	7.4	8.1	6.7	6.2	7.2	7.5	7.1
GDP at market prices	6.2	7.7	6.0	4.4	7.5	8.3	6.6	6.7	7.6	7.7	7.3

TABLE 3: PRODUCTION OF MAJOR AGRICULTURAL CROPS (2ND ADV. EST.)

Crops	Production (in Million Tonnes)			
	2012-13	2013-14	2014-15	2015-16 (2nd AE)
Total Foodgrains	**257.1**	**265.0**	**252.0**	**253.2**
Rice	105.2	106.7	105.5	103.6
Wheat	93.5	95.9	86.5	93.8
Total Coarse Cereals	40.0	43.3	42.9	38.4
Total Pulses	18.3	19.3	17.2	17.3
Total Oilseeds	30.9	32.8	27.5	26.3
Sugarcane	341.2	352.1	362.3	346.4
Cotton	34.2	35.9	34.8	30.7

Source: DES, DAC&FW, M/o Agriculture & Farmers Welfare, 2nd AE: Second Estimates

TABLE 4: PROCUREMENT OF CROPS IN MILLION TONNES

Crops	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Rice#	34.2	35.0	34.0	31.8	32.2	29.2$
Wheat@	22.5	28.3	38.2	25.1	28.0	28.1$
Total	**56.7**	**63.4**	**72.2**	**56.9**	**60.2**	**57.3**

Source: DFPD, M/o Consumer Affairs and Public Distribution;
Kharif Marketing Season (October-September),
@ Rabi Marketing Season (April-March),
$ Position as on 17.03.2016.

TABLE 5: OFF-TAKE OF FOOD GRAINS (MILLION TONNES)

Crops	2012-13	2013-14	2014-15	2015-16 (Till January)
Raice	32.6	29.2	30.7	28.9
Wheat	33.2	30.6	25.2	26.9
Total65.9	**59.8**	**55.9**	**55.8**	**(Rice & Wheat)**

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

TABLE 6: STOCKS OF FOOD GRAINS (MILLION TONNES)

	Crops	March 1, 2015	March 1, 2016
1.	Rice	15.2	19.4
2.	Unmilled Paddy#	13.2	14.6
3.	Converted Unmilled Paddy in Terms of Rice	8.8	9.8
4.	Wheat	19.5	16.9
5.	**Total (Rice & Wheat) (1+3+4)**	**43.6**	**46.1**

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

Articles

Watershed Approach for Sustainable Management of Natural Resources and Enhancing Rural Livelihood Security

HARI OM SHARMA*, SUNIL NAHATKAR**& DEEPAK RATHI***

Abstract

India is classified as water stressed country, because available water supply in the country is between 1000 and 1700 cubic meters per person per year (Harris and Roach, 2013). As a result of climate change on precipitation pattern, arid areas of the country are likely to become drier resulted in increasing the probability of drought. Only about 20% of rainfall is utilized and as much as two-thirds run off as floods. 10% increase in irrigation efficiency can bring additional 14 million ha area under assured irrigation. More than 90 percent of sorghum, pearl millets and pulses are grown in arid and semiarid areas (Khaper & Rao, 1987). Rainfed agriculture added about 44 per cent of total food production and 75 per cent of oilseeds and pulses production in India (Ranbabu,1987). The rainfed areas has substantial production potential which is not yet fully tapped, due to limited availability of water conservation and utilization of in-situ rain water and water harvesting, forms a basis for the rainfed agriculture (Swaminathan, 1987). New Pradhan Mantri Krishi Sinchai Yojana (PMKSY) aimed at ensuring access to water to every farm ("Har Khet Ko Pani") and improving water use efficiency ("Per Drop More Crop"). Pradhan Mantri Krishi Sinchayee Yojana ensures access to some means of protective irrigation to all agricultural farms in the country in order to produce 'per drop more crop' to bring desired rural prosperity. This can be achieved successfully through watershed approach,besides bringing synergy between different irrigation schemes especially in rainfed agro-ecosystem of the country.

The most limiting feature i.e. water availability can be improved through watershed technology. Watershed management can be defined as an integrated area development approach in rainfed/dry land areas of the country to promote rainfed/dryland farming system under multifarious,different and riskprone environment for sustainable production of bio mass for food, fodder, fuel, fiber and wood.

These are brought about by scientific utilization of land, water, plant and human resources in a geological area that drains at a common point in the natural drainage lines (Anonymous, 1993). Watershed is a natural drainage area of a river, tank, lake or a nala. In the watershed approach a watershed is used as a unit for efficient planning and management of natural and manmade resources and all interrelated factors such as physical, biological, technological, economic, social cultural and managerial considered together in a system of frame work (Singh, 1991). In a broad sense, it is an area having common drainage. The rainfall of the area within the ridge line can be harvested and drained out by a common drainage point. Thus, the watershed accomplishes both arable and the non-arable land management for its development irrespective of the administrative or ownership boundaries. There must be a comprehensive plan for use of land within integrated approach in both arable and non-arable land based on their capability, to result in higher productivity. The watershed programme endeavor to improve, optimize and sustain production and productivity of all categories of land. The specific object of the programme include, promotion of in situ soil and water conservation, optimum use of land to minimize risk in rainfed farming, increase productivity of land and provide higher returns to the farmers on a sustainable basis through adoption of better technology, cropping pattern and diversification of sources of income, proper management to non-arable land, improvement of ground water recharge and production on food, fodder, fuel, fiber, fruits and timber to maintain the ecological balance (Ramana, 1991). Most of the watershed projects in India are implemented with the twin objectives of soil and water conservation and enhancing the livelihood of rural poor (Sharma and Scott, 2005).

The major land mark in the evolution of watershed approach in India includes. (a) A centrally sponsored scheme of soil conservation in catchment of river valley projects in 1974. (b) 46 model watershed projects by Indian council of agricultural research in the dry land areas of the country launched in 1982, (c) world bank aided rainfed watershed development projects of Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra in early and mid-eighties(d)a national watershed development programme for rainfed agriculture by the union ministry of agriculture in 1988 (Singh, 1988), and (e) Integrated

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Watershed Development Programme has been under implementation since 1993-94. The future of Indian agriculture lies in rainfed farming because this type of farming constitutes majority of cultivated area in the country and it is from these areas that higher production will have to be expected. Despite the creation of huge irrigation potential at present, more than 55 per cent of the area in country is under rainfed condition.These further increase the importance of rainfed in decade to come. Concentration on these areas would help not only in removing regional disparities but would also insure greater stability of agriculture production and income. To meet out the increasing demand of the food grains, output from rainfed farming will have to be raised to about 69 per cent over the present level of 42 per cent. A proper strategy should be to utilized to present irrigation facilities to the fullest possible extent and concentrate on the better management methods for rainfed areas. The dry land farming technology involves crop rotation, adoption of varities and practices adjusted to moisture regime of agroclimatically homogenous region - more specifically, it consists of making the best use of limited water supply, storing in soil as much rain water as possible and growing suitable crops by methods that makes the best use of this moisture. Thus, our future planning for agriculture must give concentrated attention on development and transfer of techniques for rainfed farming and watershed development.

The various studies which were done so for in this particular field area are classified in to following sub heads.

Planning and Policies

The integrated watershed development approach can be formulated through participation of various committees related to project planning, implementation and sharing of benefits. The development work not only generates employment but also increase productivity of all the classes of land and hence, integrated approach has been accepted as a suitable model of growth for upliftment of backward area (Sandhu and Kumar, 1986). The identification of scientifically sound traditional practices area helpful to the scientist in technology blending programme and in generation of low cost location specific appropriate technology modified to suit the dryland farmers (Pandaria and Singh, 1990).The major programme initiated in the project includes contour bunding, submergence bunding, still trap bund, afforestation and digging of wells, which cause significant shift in land use pattern due to reduction in the area under barren, cultivable waste land and permanent fellow (Singh, 1991).The farm yard manures and the fertilizers are the major items of energy input factors under watershed programme while, human labor and bullock labor were identified as a major energy input factors in non-watershed villages (Rao, 1991).Participatory watershed development as experienced in Pimpalgaon Wagha village of Maharashtra is an approach that allows the creative potential and wisdom of the people to assert it as result to timely and appropriate exogenous inputs, thus leading to the unfolding of a "development dynamics" which creates possibilities for the change in the village (GTZ, 1995).The factors like increase in net sown area and gross sown area, area under assured irrigation (tube well and wells) and annual agricultural income will help in diversification of crops in the cropping pattern of the state of Madhya Pradesh (Nahatkar, 2008). Draft interim report of working sub group II of watershed plus policies for the development of rainfed areas, Ministry of Agriculture, GOI, 2006 suggested that there is a need for revisiting the investment need of watershed since the life of one programme can be no longer than 10-12 years (Deshpande, 2008). Further convergence of various rural development programmes in around the watershed could be ensured to promote holistic development of watersheds (Palanisami and Kumar, 2009).

Extension Strategies

Although, there is considerable potential to increase crop yield by fertilizer use for most of the dryland crops (Hebber and Shaspurkar, 1990) specially bajra, jowar, groundnut and safflower by mentioning optimum plant population (Verma et al. 1990). But it will not turn in to sustainable agriculture. To create awareness before execution of water management programme and enlist participation while planning and execution, the number of informal meetings, discussions be arranged with the farmers (Algumani, 1991). The training should be given to large number of farmers about improved dryland practices was significantly associated with extension participation. The extension agencies should implement the dryland practices on watershed basis (Bavalatti & Sunderswamy, 1990). High priority is needed for transfer of technology related to use of improved seed varieties, fertilizer application so that the yield of *barani* wheat can be doubled in MalwaRegion of Madhya Pradesh (Saxena et al, 1990). The information about cultural practices of crops, plant protection and new verities are needed by the tribal farmers of rainfed area (Singh, 1990). These tribal people need special training and education programmes. The extension agencies and mass media influences knowledge, attitude and adoption behavior of the farmers. Lack of proper communication pattern is the main reason for agricultural backwardness of the area. The need for management support for watershed development, credit supply, and infrastructural facilities for supply of seeds, fertilizers and the need for farmers' participation in training has been stressed (Krishirsagar and Ghotake, 1991).

Monitoring and Evaluation

The farm income of the dry land areas can further be increased by adoption of optimum crop plan in watershed areas (Tilekar et al. 1986). The watershed management development programme significantly increases the production and income of beneficiaries (Sandhu, 1988).

The increase income generated by soil and water conservation measures is rather low, compared to the quantum jump experienced when coupled with improved crop production techniques, but soil is a natural resources, such programme should therefore be heavily subsidised from the point of view of economics and ecology because the cost can go as high as Rs.4000/ha (Tarol, 1988).The implementation of the watershed development programme has considerably increased the socio-economic status, land productivity and annual income of the small and marginal farmers (Gowda and Jayaramaiah, 1990). The implementation of watershed development programme through reclamation of soil drained, soil and land development activity increase par ha gross income by 88 per cent (Alshi et al. 1991). The watershed development approach in Gukbarga, Karnataka increased crop yield by 80 to 100 per cent and double the income of farmer within three years (Biradar, 1991). The average yield of all crops is higher in command area of watershed project than in non-command areas. The intensity of labor use as well as productivity of labor in command area recorded a marked increase over the time (Ghose, 1991).

The watershed programme depicted following impacts (Singh, 1991).

- As a result of land development, the area under irrigation increased from 189 ha in 1984 to 1979 ha in 1990 without lowering the water levels.
- Increase in adoption of improved technology
- Increase use of fertilizers
- Increase in cropping intensity due to increased availability of water.
- Increase in productivity and production of crops and
- Increase in areas under oilseed and pulses.

The programme had a very favourable response in agriculture as well as dairy sectors by increasing employment opportunity. Improved agronomic practices which were the major part of the programme, led to increase in the gross income from agriculture crops from 44.85 to 73.70 per cent (Mahnot, et al. 1992). The watershed programme in addition to increasing labour employment also has led to increase in productivity of farm land up to Rs. 1829/ha. in the forestation and has also improved the fuel resources (Mishra, 1991).The intensity of cropping in treated watershed was higher by 13 to 20 per cent than those in the non-treated areas. More than 50 per cent of the farmers have adopted improved technology in command area (Nema, 1991). The watershed technology significantly raised water level in the area at the rate of 3.7 m per year after the implementation of the National Watershed Development Project in Bundhelkhand region of Uttar Pradesh which significantly increased the intensity of cropping (Singh &Thapaliyal, 1991). The productivity level, cost- benefit ratio, additional cost-benefit ratio and employment in crop production increased significantly in watershed area as compared to those in non-treated villages. Though, the productivity level of crops varied from year to year in watershed villages vis-à-vis non watershed villages (Raju et al. 1991). National watershed Development Project in rainfed agriculture in Himachal Pradesh lacked proper infrastructural facilities i.e. adequate staff, proper storage facilities, contingency etc. which hinder its working (Sikka et al, 1991).Total area of 77.12 ha was benefited by soil conservation measures. Out of this, 51.44 per cent of the area was due to bund terracing, 15.71 per cent due to bunding operation and 12.14 per cent due to pasture development measures. The cultivated area increased by 0.50 ha/farm and irrigated area 1.42 per ha per farm (Shrivastava, et al. 1991) in Mandsour district of Madhya Pradesh. About 25 per cent of beneficiaries have benefitted by land development work by way of increase in yield, irrigation potential and subsequent change in cropping pattern. The net irrigated area increased by about 5 per cent. Almost all the farmers reported that supply of seed and fertilizer under the programme could reduce the cost during the year. The increase in total income per household worked out to be 5.5 per cent (Norman, et al. 1991). The greatest efficiency gains in water use can be made in agriculture where traditional irrigation by flooding or channeling water by gravity is inefficient (60% of the water is lost by evaporation or infiltration), new techniques of micro irrigation by drip systems allow an efficiency of 95 % (Postel,1992). Agriculture and allied activities were found to be the major source of income and this was 17 per cent higher on watershed beneficiary farms as compared to non-beneficiary farms (Nahatkar et al, 2003). Implementation of watershed development projects has resulted in area expansion, increase in livestock production, and improvement in crop productivity (Babu et al, 2004).Sharma et al (2008) observed that the gross returns, farm business income, return to labour. net returns, benefit cost ratio, cropping intensity and per cent area irrigated to total land holdings were higher on sprinkler irrigated farms than on surface irrigated farms in typical rainfed areas of Rajasthan. The watershed-based development proramme has resulted in increased crop production, productivity, employment generation, and farm income and groundwater status, leading to overall rural prosperity in the area (Thomas et al 2009).

Thus, integrated watershed development approach improves farm productivity and it is relevant to the Indian economy, considering its substantial benefits, impact on living standard and employment in the vast dry area. The following need urgent attention in watershed areas for making efforts more effective.

1. For achieving the goal of bringing irrigation water to every farm, there is need to converge all ongoing efforts and to bridge the gaps through location specific micro-level interventions. This type of

policy intervention is urgently needed looking to the likely impact of climate change on agriculture.

2. The integrated approach for enhancing livelihood of the project area should be adopted through identification of income generating activities, its value chain and needed technological interventions accordingly.
3. The identification of the areas with considerable development potential as growth centers and the priorities needs to be fixed for its coverage under integrated watershed development project.
4. The selected local government (Panchyats) with technical support from the State government and non-governmental organizations should be initiated and should involve local people from the project planning and orientation.
5. There are some conspicuous grey areas in planning, implementation and evaluation of the projects. As such, no practice of performance, evaluation and monitoring in many areas exist. After completion of the project, effective follow up mechanism should be developed.
6. There is a need to improve the existing level of technology, especially for rainfed areas looking to threat of climate change, linkage between research, extension and farmer training, appreciation of farmers, transfer of technology, and the flow of credit needs to be strengthened. For instance there is absence of farm client oriented research for developing, adopting and evaluating technology. The technology transfer on the basis of top down approach does not seem to produce expected results since the farmers in India by and large are more influenced by their neighbours than the scientist and the extension personnel at district place. Further extension approach at present is generally specific crop oriented and not an integrated approach accomplished by rainfed agricultural technologies.
7. There should be proper coordination between implementing authorities as well as potential beneficiaries in increasing soil conservation, water harvesting structures, maintenance of these works and improving quality of these structures.
8. Finally, the problem relating to the development of Post-HarvestTechnology i.e. storage and marketing off arm product etc., and development and linkage in command area must be considered. This will help to ensure stability in return and thereby lead to sustained growth of output and employment.

Finally for sustainable development, management and utilization of natural resources in rainfed area/dry land area can be achieved successfully through watershed approach. This approach not only helps in sustainable management of natural resources but will also assist in enhancing rural livelihood security in India.

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Soyabean Sector in Maharashtra: Bring Hope, Not Distress

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Abstract

The paper examines trends and pattern of growth of Soyabean over time and across districts of Maharashtra during 2000-01 to 2013-14.The analysis shows that the growth rates of area, production and productivity have slowed down in the post 2000 period and in most of the districts, productivity levels are much below the potential yield. Soybean, being a kharif crop, availability of water is extremely important for increasing its yield However, the area under irrigation in case of Soyabean is only 0.4 percent at the state level in the year 2010-11.Thus, area expansion in case of Soybean is not followed by expansion of area under irrigation. Production of the crop may get adversely affected in case of scanty rainfall ultimately affecting incomes of farmers.Assured irrigation,timely provision of quality seed and information regarding market prices and marketing channels are of utmost importance to enhance the yield of the crop for sustaining its growth and for protecting incomes of the farmers dependent on its cultivation.

Keywords: soyabean productivity, increasing yield, assured irrigation, growth, protecting farmers income.

Introduction

The successful implementation of seed- water – fertilizer technology in the 1960s lead to a remarkable increase in the yields of foodgrain crops such as wheat and rice. The need to spread this technology to other crops was felt in view of increasing demand for these crops. Oilseeds was one such class of crops, demand for which outpaced its supply and India had to import edible oil. The Technology Mission on Oilseeds (TMO) was launched in 1986 with the objective of increasing production of oilseeds. As a result, the oilseeds production increased and it was observed that after the launch TMO and during 1986-87 until 1996-97, oilseeds production performed much better than the cereals. The area under and production of oilseeds grew rapidly. This particular phenomenon was called 'yellow revolution' wherein the crop pattern showed changes - area under coarse cereals got replaced by oilseeds and pulses (Gulati and Kelly, 1999).India is now the fifth largest producer of oilseeds after USA (20 percent)followed by Brazil (17 percent), China (12 percent), Argentina (11 percent) and contributes 8 percent to the world production of oilseeds.

With increasing production of oilseeds, per capita availability of edible oils started increasing. It was 3.2 kg in 1960-61 increased to 9 kg in 1999-2000 and was 15.8 kg in 2012-13 (GoI, 2014a). However, it is observed that the consumption of edible oils has been growing faster than its production. Since 2000-01, production of oilseeds grew at the rate of 4.7 percent per annum, but edible oil consumption increased at the rate of 6.5 percent per annum (http://www.business-standard.com/article/press-releases/ , February 20, 2013). As a result, imports of edible oils have been playing an important role in increasing domestic availability and satisfying domestic demand. The share of imports in total domestic availability of edible oils is almost 50 percent. Edible oil is an important category in our import basket.It is observed that the share of agricultural imports in total merchandise imports was 3.2 percent in 2013-14. Out of this, the share of edible oils was 2.1 percent and during 2000-01 to 2012-13and it grew at the rate of 19.6 percent (GoIb, 2014).

Groundnut, Rapeseed-Mustard and Soybean are the major oilseeds that contribute (2013-14) around 80 percent to the area and more than 85 percent to the total oilseeds production in the Indian context. The share of Soybean in area and production of major oilseeds increased very rapidly after it was introduced in 1970s. In 2013-14, around 43 percent of the area and 36 percent of the production of major oilseeds at all India level was contributed by Soybean. Area and production of Soybean increased rapidly after 1988-89 almost for a decade. However, with the initiation of India's own programme of economic liberalisation and the Uruguay Round Agreement, major policy decision relating to edible oils was taken. These edible oils were put under open general license and the duty was lowered from 65 percent to 15 percent over a period of four years- from 1994 to 1998. Consequently, imports increased to the benefit of the consumers, prices of edible oils crashed leading to temporary period of decline in area and production. However, there was again a spurt in 2004-05. Area and production of Soybean have been increasing since then.

In view of the growing demand for edible oils and growing dependence on imports for satisfying domestic demand, it is important to increase production of oilseeds. As there are limits to area expansion, the production has to increase through yield increase. However, inter country comparison of yields show that as compared to major

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Soyabean producing countries like the U.S. and Brazil, yield of Soyabean at all India level is very low.

Soyabean is grown mainly in Madhya Pradesh and Maharashtra which currently (2013-14)contribute more than 80 percent to the total area and production.Madhya Pradesh, the highest producing state contributes around 52 percent to the total area and 45 percent to total production of Soybean. It is followed by Maharashtra which occupies around one third area under Soybean and contributes about 40 percent to its total production. It is however observed that per hectare yield in case of Maharashtra (1222 kg/ha) is higher than that in Madhya Pradesh (842 kg/ ha) in the year 2013-14. Thus,Maharashtra is a major Soybean producing state with higher productivity of this crop.Though it is a major oilseed of the state, the current level of its production has to be sustained and increased for the benefit of consumers as well as cultivators.In view of the above, therefore, the main objective of this paper is to examine trends and pattern of growth of Soybean over time and across districts of Maharashtra during 2000-01 to 2013-14. The paper discusses leading and lagging districts of Soybean and constraints facing this sector.The paper finally discusses policy implications. The study is based on secondary data obtained from the state government website (www.mahaagri.gov.in) and 'Agricultural Statistics at a Glance', DES,GoI. Section I presents an overview of the cropping pattern of Maharashtra and growing importance of the oilseed sector. Section II focuses on district wise performance of Soybean in the post 2000 period and the constraints faced. Section III discusses policy implications.

Section I

The Cropping Pattern of Maharashtra

Food grains occupy more than 50 percent of the area under cultivation in the state. However, gradually, the cropping pattern has been shifting towards non-food grain crops such as oilseeds. Table 1presents area under major crops of the state. It reveals that the share of food grains has declined from 69 percent to around 54 percent and that of total oilseeds has increased from 9 percent to 17 percent during1973-74 to 2011-12.

TABLE 1: Cropping Pattern in Maharashtra (In percent)

Crop	TE 1973-74	TE 1983-84	TE 1993-94	TE 2003-04	TE 2011-12	Percentage change (%)
Total foodgrains	68.87	66.75	65.23	56.09	52.25	-24.13
Groundnut	3.27	2.45	2.69	1.54	1.25	-61.77
Soybean	-	-	1.78	5.90	12.71	614.04
Total oilseeds	9.27	7.88	12.24	11.36	16.28	75.62
Cotton	13.57	12.72	12.48	12.94	16.69	22.99
Sugarcane	0.91	1.45	1.93	2.38	3.89	327.47

Note: Gross cropped area for the latest years was not available; hence cropping patter was calculated for TE 2011-12.

Source: Calculated from District wise Statistical Information relating to Agriculture, GOM, Season and Crop Reports, GoM, various issues and www.mahagri.gov.in

Whereas area under cotton has increased marginally, that under sugarcane has increased considerably from 0.9 percent to 3.86 percent. Today, food grains, oilseeds and cotton together contribute around 85 percent to the cropping pattern of the state. The growing importance of oilseed cultivation in Maharashtra's agriculture is clear from increasing trend in area under oilseeds which was around 15 lakh ha in 1970-71 and 44 lakh ha in 2013 -14 thus registering an increase of more than 150 percent.

The Oilseed Sector:

As has been discussed earlier, the derived demand for oilseeds has been increasing due to a very high and increasing demand for edible oils (which are highly substitutable) from consumers and from exporters of Soybean meal. The per capita consumption of all edible oils in India is 14.3 kg (2011) and is rising at the rate of 3-4 percent per annum (http://seaofindia.com/cdn/gallery/1424.pdf).

The major oilseed crop of Maharashtra was groundnut till mid-1980s. Since then, the farmers have started cultivating the non-conventional oilseed crop- Soybean. The area under this crop increased at a fast rate primarily in the north east region of the state where the climatic conditions were suitable for its cultivation.

Table 2 shows shares of major oilseeds in total area and production of oilseeds in Maharashtra after 1990s, when production of oilseeds other than groundnut started increasing. It is seen that share of all major oilseeds has declined and that of Soybean has increased from 7 percent of the total oilseed area and 10 percent of the oilseed production in 1991to89 percent of the total oilseed area and 92 percent of the total production in 2013-14.

TABLE 2: PERCENTAGE SHARE OF MAJOR EDIBLE OILSEEDS IN AREA AND PRODUCTION OF TOTAL OILSEEDS IN MAHARASHTRA

Oilseed	1990-91		2000-01		2010-11		2013-14	
	A	P	A	P	A	P	A	P
Groundnut	22.66	30.73	15.78	17.18	7.59	6.83	4.47	4.37
Soybean	7.27	10.12	44.61	63.13	75.23	85.36	89.47	92.71
Other oilseeds	70.07	59.15	39.61	19.69	17.18	7.81	6.06	2.92
Total oilseeds	100	100	100	100	100	100	100	100

Source: Same as in table 1.

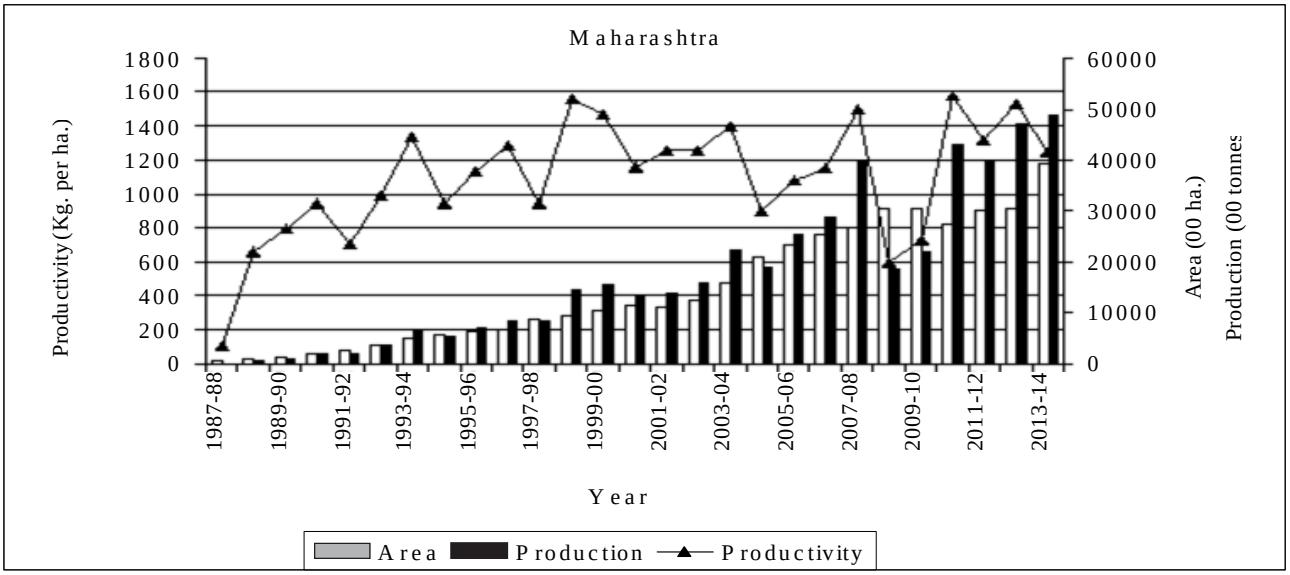
Shorter duration of the crop (i.e. 3 to 3.5 months- from July to August) enables cultivators to increase the cropping intensity and add to their income/profits, which is not possible for a kharif crop like cotton. One time harvest of the crop makes harvesting operation comparatively easier. Easy cultivation of the crop and benefits in terms of improvement in fertility also prompted farmers to undertake Soybean cultivation. Studies have found that the crop is very profitable as compared to other kharif crops like Cotton and Groundnut (Kajale, 2002: Kajale and Shroff 2013).These studies found that Soybean cultivation was very profitable due to its high share in total gross value of output and total net return and its potential to get onetime payment 3-3.5 months after the crop was sown. Thus, shorter duration of crop was the major reason for cultivating this crop. Soybean seems to have replaced area not only under other kharif oilseeds but also other kharif crops like Jowar, Rice etc. This phenomenon is noted by some studies (Khare, 1994; Gulati and Kelly, 1999.).

Section II

Area, Production and Productivity of Soyabean in Maharashtra

Figure 1 depicts the movement of area, production and productivity of Soybean in Maharashtra.

FIGURE 1: AREA, PRODUCTION AND PRODUCTIVITY OF SOYABEAN IN MAHARASHTRA



Source: Same as in table 1

It is observed that area under the crop increased by more than 4000percent and the production by more than 5000 percent during this period. It is the only crop which has registered a considerable area increase among all principal crops of the state during last two decades. It is observed however that yield of Soybean has been fluctuating from year to year. Nevertheless, it is higher than other major Soybean growing states of Madhya Pradesh and Rajasthan.

Area, Production and Productivity of Soybean in Various Districts

Table 3 shows shares ofdistricts in total state Soybean acreage and production during last 20 years. It is observed that Soybean is grown mainly in the north east region i.e. Vidarbha (Amravati and Nagpur divisions) and the central region i.e. Marathwada (Latur and Aurangabad divisions). Nagpur was the dominant district and the division in early 1990s.This was followed by Kolhapur and Amravati divisions. However, share of Nagpur and Kolhapur

divisions declined continuously and that of Amravati increased.

Share of Amaravati as well as Latur divisions has increased and their combined share in total Soybean area is more than 66 percent in TE 2014. On the other hand, combined share of Nagpur and Kolhapur divisions has come down from around 80 percent in TE 1993-94 to around 23 percent in 2013-14.

A similar pattern is observed as far as production of Soybean is concerned. The share of districts in Kolhapur and Nagpur divisions has been reducing over a period of time. Currently, districts in Amravati and Latur divisions are major Soybean districts and contribute around 70 percent to the state Soybean production.

TABLE 3: Share of Districts in Total State Soybean Acreage and Production (In percent)

Districts/Divisions	Share in State Acreage			Share in State Production		
	TE 1993-94	TE 2003-04	TE 2013-14	TE 1993-94	TE 2003-04	TE 2013-14
Konkan Dn.	0	0	0	0	0	0
Nasik	0.24	0.55	1.74	0.26	0.72	1.94
Dhule	0.21	0.14	0.36	0.22	0.17	0.40
Nandurbar	0	0.13	0.88	0	0.13	1.08
Jalgaon	0.26	0.26	0.48	0.24	0.42	0.65
Nasik Dn.	0.71	1.08	3.46	0.72	1.44	4.08
Ahmednagar	0.11	1.03	1.89	0.11	0.89	1.74
Pune	0.13	0.04	0.16	0.12	0.06	0.33
Solapur	0.13	0.04	0.17	0.15	0.03	0.26
Pune Dn.	0.37	1.11	2.21	0.38	0.99	2.34
Satara	1.01	1.13	1.37	0.92	1.59	1.85
Sangli	9.58	4.12	2.08	14.09	5.33	2.78
Kolhapur	7.56	4.86	1.59	13.95	6.99	2.97
Kolhapur Dn.	18.14	10.11	5.05	28.96	13.91	7.60
Aurangabad	0.51	0.23	0.28	0.59	0.24	0.23
Jalna	0.12	0.58	2.06	0.14	0.56	1.99
Beed	0.66	1.24	2.57	0.57	1.08	3.24
Aurangabad Dn.	1.29	2.05	4.91	1.3	1.87	5.46
Latur	0.47	3.74	8.75	0.52	3.02	13.40
Osmanabad	0.01	0.8	3.50	0.01	0.31	3.94
Nanded	0.17	3.28	6.06	0.18	3.4	6.12
Parbhani	0.34	2.15	4.21	0.36	2.52	3.99
Hingoli	0	4.43	4.87	0	5.2	5.23
Latur Dn.	0.99	14.4	27.39	1.07	14.45	32.68
Buldhana	1.23	6	8.98	1.51	6.76	9.93
Akola	1.1	2.26	4.99	1.18	2.1	5.03
Washim	0	7.28	7.25	0	7.64	6.66
Amravati	12.21	11.77	10.14	9.49	9.84	9.26
Yavatmal	1.99	6.28	7.75	2.09	6.6	6.53
Amravati Dn.	16.53	33.6	39.11	14.27	32.95	37.40
Wardha	12.92	11.7	5.58	12.16	11.39	3.56
Nagpur	35.87	15.67	7.41	29.56	13.39	3.83
Bhandara	3.77	0.63	0.22	2.7	0.61	0.10
Gondia	0	0.01	0.00	0	0	0.00
Chandrapur	9.35	9.46	4.49	8.83	8.83	2.81
Gadchiroli	0.05	0.19	0.17	0.06	0.17	0.13
Nagpur Dn.	61.97	37.65	17.87	53.31	34.39	10.44
Total Maharashtra	100	100	100.00	100	100	100.00

Source: Same as in table 1.

Table 4 shows the region wise share of the crop in the gross cropped area (GCA). It shows that the share of Soybean in the GCA is considerable in divisionsLatur (20 percent), Amravati (28 percent) and Nagpur (24 percent).The share is more than 30 percent for some of the districts such as Was him (40 percent), Wardha (37 percent) and Nagpur (38 percent).The importance of the crop in cropping pattern of the state is very clear.

TABLE 4: Division wise Share of Soyabean in GCA

(In percent)

	Division	Share of Soybean in GCA
1	Konkan	0.00
2	Nasik	3.86
3	Pune	1.80
4	Kolhapur	7.87
5	Aurangabad	4.89
6	Latur	20.16
7	Amravati	27.76
8	Nagpur	24.37
	State	13.03

Source: Same as in table 1

Soybean growing districts of the state were classified according to corresponding growth rates of area and production. Table 5 shows districts with significant growth rates of area and production.It is seen that in more than half of the total 34districts, the growth rate of area was significant during 1990s and was more than 20 percent.However, there has been a clear decline in growth rate of area in the post 2000 period in the corresponding districts. Overall growth rate for the state has declined from 19.31 percent to 9.57 percent.

It is observed that apart from some of the traditional Soybean growing districts in Vidarbha and Marathwada, districts in Nasik and Pune (which do not contribute to area and production of Soybean in a major ways) have been showing higher growth rate of area. Thus, it is observed that Soybean cultivation is spreading across all districts. The growth rate of districts which have high share in state Soybean acreage such as Amravati, Nagpur are found to be non-significant possibly because there are limits to area expansion in these regions. In many districts, which have lower share in soybean area, growth rates are relatively higher.

TABLE 5: Decade-wise Growth Rates of Area and Production of Soyabean

(In percent)

	Area				Production		
	District	1990-91to 1999-00	2000-01 to 2013-14		District	1990-91to 1999-00	2000-01 to 2013-14
1	Nashik	30.23	19.56	1	Nashik	29.24	19.82
2	Dhule	28.54	21.65	2	Dhule	25.26	25.75
3	Nandurbar	43.84	29.05	3	Jalgaon	37.42	16.91
4	Jalgaon	32.03	15.29	4	Satara	9.25	-
5	Ahmednagar	29.2	16.01	5	Beed	15.99	24.39
6	Pune	27.77	21.81	6	Parbhani	21.16	18.76
7	Solapur	25.85	25.73	7	Akola	15.3	19.41
8	Satara	11.43	10.33	8	Ahmednagar	-	16.92
9	Jalna	31.51	23.16	9	Pune	-	24.84
10	Beed	35.92	22.48	10	Solapur	-	29.98
11	Latur	45.31	24.31	11	Jalna	-	26.81
12	Osmanabad	37.96	29.42	12	Latur	-	32.85
13	Nanded	35.88	19.32	13	Osmanabad	-	39.44
14	Parbhani	26.04	18.11	14	Nanded	-	21.15
15	Hingoli	23.93	13.57	15	Hingoli	-	14.29
16	Buldhana	16.66	12.04	16	Buldhana	-	15.1
17	Akola	22.06	16.77	17	Aurangabad	-	11.24
18	Yavatmal	21.7	10.25	18	Nandurbar	-	32.27
19	Gadchiroli	16.88	-		Maharashtra	26.31	10.01
20	Aurangabad	11.76	-				
21	Washim	14.22	-				
	Maharashtra	19.31	9.57				

Note: 1. Significance at (a =0.05), 2. GR= growth rate 3.Districts for which GR was non-significant are not included in the table.

In case of production, growth rate is significant and positive in more number of districts in the latter decade as compared to the earlier decade. Districts which had non-significant growth in the earlier decade, experienced significant growth in the post 2000 decade. However,for the state as a whole, the rate of growth of production reduced to10 percent in the post 2000 period from 26 percent in the earlier decade.

Table 6 shows growth rate of productivity. It can be observed that the rate of growth has reduced in the post 2000 period as compared to the earlier decade in most of the districts. As a result, the state level growth rate has reduced to 0.41 percent in the latter decade.

TABLE 6: Decade wise District with Significant Growth of Yield under Soyabean (In percent)

	1990-91 to 2000-01			2000-01 to 2013-14	
1	Akola	5.77	1	Akola	2.26
2	Amaravati	9.03	2	Amaravati	3.16
3	Dhule	4.88	3	Dhule	3.37
4	Jalgaon	6.06	4	Jalgaon	1.41
5	Parbhani	7.99	5	Parbhani	0.55
6	Buldhana	3.06	6	Buldhana	2.73
7	Kolhapur	4.53	7	Kolhapur	3.57
8	Wardha	4.18	8	Nandurbar	2.49
9	Chandrapur	17.63	9	Pune	2.49
10	Sangli	3.81	11	Solapur	3.38
11	Yavatmal	8.15	12	Aurangabad	2.32
12	Bhandara	6.8	13	Jalna	2.96
13	Nashik	6.13	14	Beed	1.56
14	Satara	9.59	15	Latur	6.87
	Maharashtra	5.87	16	Osmanabad	7.73
			17	Nanded	1.53
			18	Hingoli	0.63
				Maharashtra	0.41

Source: Same as in table 1

Following table shows classification of districts according to the level of productivity. It also shows the corresponding growth rates of productivity.

TABLE 7: District-wise Levels of Productivity of Soyabean in Maharashtra in TE 2013-14

(In Kg/ha)

<1000	1000-1500	1500-2000	2000-2500	2500
Wardha	Ahmednagar	Nasik	Solapur (3.38)	Pune (2.49)
Nagpur	Aurangabad (2.32)	Dhule (3.37)	Latur (6.87)	Kolhapur (3.57)
Bhandara	Jalna (2.96)	Nandurbar (2.49)	—	—
Gondia	Osmanabad (7.73)	Jalgaon (1.41)	—	—
Chandrapur	Nanded (1.53)	Satara	—	—
	Parbhani (0.55)	Sangli	—	—
	Hingoli (0.63)	Beed (1.56)	—	—
	Buldhana (2.73)	—	—	—
	Akola (2.26)	—	—	—
	Washim	—	—	—
—	Amravati (3.16)	—	—	—
—	Yavatmal	—	—	—
—	Gadchiroli	—	—	—
	Maharashtra (0.41)			

Note: Figures in the parenthesis are growth rates, only significant growth rates are mentioned.
Source: Same as in table 1

At all India level, productivity of Soybean for TE 2013-14 was very low - 1181.3kg. per hectare and a number of districts of Maharashtra were above the all India average. However, as compared to the productivity levels (Tn/ ha) in countries such as Brazil (2.9), Canada (2.9), U.S.A. (2.8) etc, productivity levels of most of the districts are very low. In 2013-14, in only four districts, productivity level was above 2000kg/ ha. In almost 18 districts, productivity was below 1500kg/ha.

The experimental yield of soybean in case of Maharashtra was 30 quintals per ha (GoM, 2011). Discussions with the government officials and scientists of the Agricultural Colleges revealed that the yield on irrigated land can go up to 28 quintals per hectare. We take this figure as the potential yield in case of Maharashtra. The actual yield at the state level was less than half of the potential yield i.e.12 quintals per ha. inTE 2013-14. Thus, if ideal conditions are provided to the crop, the yield can go upto the potential yield of soybean.Table 8 shows that majority of the Soybean growing districts are in the lower yield band (below 1500kg/ha) and occupy more than 80 percent of the area under the crop. The data shows that for maintaining and increasing production of Soybean, it is extremely essential to step up productivity in majority of the districts.

TABLE 8: Number of Districts and Area covered in Different Yield bands.

Yield band (Kg./ ha)	Number of districts covered	Area covered (%)
500-1000	5	23.8
1000-1500	10	58
1500-2000	3	11.4
2000-2500	2	3
2500 -3000	1	1.5

Source: CACP Report, GoI(2015), page 44.

Soybean is one of the major crops of the state occupying around 13 percent of the GCA. It occupies around 89 percent of the oilseed area and is an extremely profitable crop. It is observed that its net returns and the net returns relative to paddy are considerably higher than majority of the kharif crops during 2010-11 to 2012-13 (GoI, 2015).Considering its importance in the state acreage and its profitability, sustaining growth rate of production through productivity enhancement assumes importance for protecting incomes of farmers dependent on this crop in the kharif season and for avoiding distress situation.

The Constraints

The above analysis underlines the slowdown in the overall growth in case of Soybean. This definitely calls for implementation of policies for arresting the slowdown in the Soybean sector.

Since 1980s, the farmers in Maharashtra started cultivating soybean. As is mentioned above, due to the favourable climatic conditions and shorter duration of the crop, area under other kharif crops was diverted to Soybean. On the other hand, because of increasing demand for edible oils and their increasing prices in the domestic as well as international markets, area under Soybean and its production increased rapidly. However, the analysis reveals that in majority of the districts, yield levels are much lower than the potential yield.It is also observed that yield levels can rise under favourable conditions. Table 7 shows that only in 4 districts, the productivity is more than 2000 kg per ha. Soybean being a kharif crop, availability of water is extremely important for increasing yield of the crop. As per the data available (2010-11), only 4 percent of the total area under major oilseeds (kharif and rabi) in Maharashtra was irrigated as against 25 percent at all India level (GoI, 2014b). The area under irrigation in case of Soybean is only 0.4 percent at the state level in the year 2010-11 and is marginally less than that at the all India level which stands at 0.6 percent for 2010-11. The data relating to the earlier years shows that proportion of area under irrigation in case of Soybean has been declining in the post 2000 period in Maharashtra. It was 1.3 percent in the year 1999-000, 1 percent in 2004-05, 0.5 percent in 2005-06 and has now reduced to 0.4 percent in 2014. Thus, area expansion in case of soybean is not followed by expansion of area under irrigation. This is a cause for concern as the productivity and production of the crop may get adversely affected in case of scanty rainfall, ultimately affecting the incomes of the farmers. Availability of water appears to be one of the major reasons for productivity differentials. Productivity levels are higher for districts in Western Maharashtra which are better endowed with water resources in terms of irrigation. The available data (2002-03) shows that whereas the combined percentage of net area irrigated to net sown area was 27.8 percent for Pune and Kolhapur divisions, it was much lower for other regions.(GoM, 2013). This explains the productivity differentials between districts of western Maharashtra such as Kolhapur, Pune, Solapur and those in rest of Maharashtra.

Section III

Conclusions and PolicySuggestions

The district wise and state level analysis of the secondary data reveals the dominant position that the Soybean crop has come to occupy in the cropping pattern of the state. In TE 1993-94, only 1.78 percent of the GCA was under this crop, in 2011-12, it has increased to almost 13 percent of the GCA. The area and production of the crop have grown 600 times and 399 times respectively during 1984-85(1987-88 in case of production) and 2013-14. Almost 90 percent of the acreage under total oilseeds is contributed by Soybean. Studies have noted shift of area under kharif crops such as Jowar, Paddy, Groundnut as well as Cotton and Sugarcane over the years towards this crop. The growth rates of area under and production of Soybean indicate positive and significant growth in the post 2000 period in almost all the districts growing soybean. From the demand side, the increasing prices of Soybean and Soybean oil have provided incentive to the farmers for its cultivation. This highlights the relative profitability of the Soybean crop in Maharashtra.

However, the analysis also reveals that the growth rates of area and production – district wise as well as at the state level have slowed down in the post 2000 period. Growth rate of productivity also is very low in most of the districts in the post 2000 period. The major factor that seems to explain this is the lower extent of area under irrigation. It is a kharif crop and depends upon vagaries of nature. The available data shows that the area irrigated under Soybean was only 0.4 percent. In view of increasing demand for edible oil and increasing reliance on imports to satisfy the domestic demand, productivity enhancement through provision of assured irrigation would help in maintaining and increasing the current level of Soybean production. Other major constraints that are generally faced by the cultivators are the technological ones– relating to seed and the marketing constraints. Timely provision of quality seed and information regarding market prices and marketing channels are of utmost important to enhance yield of the crop as there are limits to area expansion.Thus,a strong extension machinery is needed to advise the farmers on various aspects of production and marketing. Districts which have higher productivity levels need to be studied in greater details so as to propagate /replicate farming practices and inputs used in these districts to other districts through credible extension services (GoI , 2015).

Sustaining growth of Soybean crop would help in sustaining incomes of the farmers dependent on its cultivation. Also, considering the forward linkages of Soybean seed sector with the industry, this would benefit not only for the farmers but also the consumers and the agricultural sector as a whole.

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Horticultural Crops in India- Growth, Instability and Decomposition Approach

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Abstract

Horticulture, the fastest growing sector within agriculture,presently contributes 30.4 per cent of agricultural GDP. The farmers have shifted from conventional crops to horticulture production and to floriculture in recent years but the concern is that whether production growth is at par with productivity growth and thus,in the following study, growth trend of area, production and productivity of fruits, vegetables and flowers was estimated. The riskiness in the production of horticultural crops was estimated using instability index. The contribution of area and productivity in the production growth was also estimated. The results revealed that the growth in production was mainly due to the growth in productivity area rather than production especially in flower production and this means stress on land in coming years. The instability analysis reveals that there is high riskiness in flower production as compared to Fruits and vegetable production. The contribution of area in productivity was high in all the three crops. The results show that available technologies are not adequate to push up the yield of these crops. Therefore, generation and dissemination of technologies is a matter of great challenge for researchers and extension agencies.

Keywords: Horticulture, Compound Growth Rate, Instability Index, Decomposition

Introduction

The horticulture sector encompasses a wide range of crops e.g., fruit crops, vegetable crops, ornamental crops etc. India, with its wide variability of climate and soil, is highly favorable for growing a large number of horticultural crops. It is the fastest growing sector within agriculture. It contributes in poverty alleviation,nutritional security and have ample scope for farmers to increase their income and be helpful in sustaining large number of agro-based industries which generate huge employment opportunities. Presently horticulture contributes 30.4 per cent (ICAR) of agricultural GDP. The national goal of achieving 4.0 per cent growth in agriculture can be achieved through major contribution from horticulture growth.

After the Green Revolution in mid-sixties, it became clear that horticulture, for which the Indian topography and agro climate are well suited, is the best option. India has emerged as the largest producer of mango, banana and cashew and second largest producer of fruits & vegetables in the world. The most significant development that happened in the last decade is that horticulture has moved from rural confines to commercial production and this changing scenario has encouraged private sector investment in production system management. The last decade has seen technological infusion like micro-irrigation, precision farming, greenhouse cultivation, and improved post harvest management impacting the development, but during the process various issues have emerged.

The horticultural sector has received considerable attention in recent years as it is recognized as a potentially important source of growth, employment generation and foreign exchange earnings. The emphasis being given to this sector is reflected by establishing National Horticulture Mission in 2004.The priority areas under the mission include horticultural research and development, improving post harvest management and promoting processing and marketing of horticultural crops. The special attention is devoted to the promotion of horticultural export through establishment of focal Agricultural Export zones (AEZs).Horticultural crops play a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labor intensive and as such they generate lot of employment opportunities for the rural population. Fruits and vegetables are also rich source of vitamins, minerals, proteins, and carbohydrates etc. which are essential in human nutrition. Hence, these are referred to as protective foods and assumed great importance as nutritional security of the people. Thus, cultivation of horticultural crops plays a vital role in the prosperity of a nation and is directly linked with the health and happiness of the people.

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The recent emphasis on horticulture in our country consequent to the recognition of the need for attaining nutrition security and for more profitable land use has brought about a significant change in the outlook of the growers. The need for great utilization of available wastelands against the background of dwindling water and energy resources has focused attention to dry land, to arid and semi-arid tracts and to horticultural; crops which have lesser demands on water and other inputs besides being 3 to 4 times more remunerative than field crops. The farmers have shifted from conventional crops to flower production but the concern is that whether production growth is at par with productivity growth or it is just due to area growth, which might not be sustainable in the long run. So the present study is undertaken with a view to analyze trend, growth and variability, of horticultural crops with the following specific objectives:

(i) To examine the growth rate in area, production and productivity of major horticultural crops.

(ii) To measure the instability in their area, production and productivity.

(iii) To estimate the relative contribution of area and productivity in their growth of production.

Methodology

Estimation of Growth Rates

Growth rates are worked out to examine the tendency of variable to increase, decrease or remain stagnant over a period of time. It also indicates the magnitude of the rate of change in the variable under consideration per unit of time.

The rate of change of 'Yt' per unit of time to express as a function of the magnitude of 'Yt' itself is usually termed as the Compound Growth Rate (CGR) which can be expressed mathematically as:

$$CGR = \left[\left(\frac{1}{Y_t}\right)\left(\frac{dY_t}{d_t}\right)\right] = \left[\left(\frac{Y_{t+1} - Y_t}{Y_t}\right)\right]$$

..... (i)

The above expression if multiplied by 100 gives the compound growth rate of 'Yt' in percentage term.

There are many alternative forms of growth function viz., linear exponential, modified exponential, Cobb-Douglas etc. which have been developed and used by the researcher.

The mathematical form of log-linear function (also known as exponential function) is as follows:

$Yt = Ae^{bt}$ ..... (2)

The log transformation of this function is as follows:

$LogeY_t = \log_e A + b_t$

Differentiating it with reference to 't' gives,

$$\left[\left(\frac{1}{Y_t}\right)\left(\frac{dY_t}{d_t}\right)\right] = b$$

Or,

$$\frac{dY_t}{d_t} = bY_t \qquad \text{..... (3)}$$

The formula for calculating Compound Growth Rate (CGR) from the log-linear equation can be derived as follows:

Let "Y_0" be the value of variable under study in the base period.

'Y_t' be the value of variable in time't'. 'Y' be the value of Compound Growth Rate (CGR) then using the compounding formula, We get,

$Y_t = Y_0 (1 + r)^t$.

Log - transformation of the above i.e.

$\text{Log } Y_t = \log Y_0 + t \log (1+r)$.

Assuming,

$\text{Log } Y_0 = \log A$.

$\text{Log } (1+r) = b$,

The same expression can be put as-

$\text{Log } Y_t = \log A + bt$

From the log-linear form, CGR can be worked out as follows:

By differentiating,

$$\frac{d(\log Yt)}{dt} = b$$

But, the estimate of 'b' in the log-linear function is in semi-log terms. Therefore, to convert it into the original form of Yt following transformation is done—

Since b = log (1+r)

Antilog (b) = 1 + r

r = (Antilog 'b') - 1

CGR in percentage = [(Antilog 'b') - 1] x 100

3.5.2 Measurement of Instability

Instability is the deviation from the trend and many of the researchers have used the coefficient of variation (CV %) as a tool of instability. An index of instability was computed for examining the nature and degree of instability in area, production and productivity of Horticultural crops at national level . Simple CV does not explain properly the trend component inherent in the time series data so the Instability Index suggested by Cuddy-Della Valle (1978) was used as a better measure of variability.

$$II = CV \times \sqrt{(1 - \bar{R}^2)}$$

$$CV = \frac{\sigma}{\bar{x}} \times 100$$

Where,

II = Instability index

$\bar{R}^2$ = Adjusted coefficient of determination

CV = Co-efficient of variation

σ = Standard deviation of the variable

$\bar{x}$ = Mean of the variable.

3.5.3 Decomposition of Analysis

To estimate the contribution of area, productivity and interaction of the two in total production, the following additive scheme of decomposition can be used:

$$1 = [(Y_0 \Delta A)/P] + [(A_0 \Delta Y)/P] + [(\Delta A \Delta Y)/P]$$

Where,

P = Change in production

A_0 = Area in base year

A_n = Area in current year

Y_0 = Yield in base year

Y_n = Yield in current year

ΔA = Change in area (An - A0)

ΔY = Change in yield ($Y_n - Y_0$).

The Data

The data on area, production and productivity of fruits, vegetables and flowers for the present study has been taken from the Indian Horticulture Database (2011) published by National Horticulture Board. The data pertains to the period 1991-1992 to 2009-2010.

Result and Discussion

Measuring the Growth Rates of Horticultural Crops viz. Fruits, Vegetables and Flowers

The growth in area, production and productivity of fruits, vegetables and flowers in India has been presented in Table 1. The area production and productivity of total fruits in India registered a positive growth rate, significant at 1per cent probability level. The growth in production was largely attributable to the growth in area (6.0 per cent per annum) and was supplemented by productivity growth of 0.90 per cent per annum implying that the increase in production of fruit crops was mainly due to the increase in its area rather than increase in productivity.

Area, Production and Productivity of Vegetables also recorded a significant and positive growth in study period (2001-2010). The growth in productivity of vegetables is half that of growth in its area. Growth rate of production was found much higher 6.3 per cent per annum and was mainly due to major contribution of growth in area.

The production and area of flowers in India recorded positive growth rate, and was higher than that of fruits and vegetables both, during the study period. Despite the high rate of area growth, the production did not show a significant growth because of the decline in its productivity.

The above results show that the increase in production of horticultural crops has largely been influenced by the increase in area but in long term this is not feasible as area can only be increased up to a certain level. Measures need to be taken to improve the productivity of the horticultural crops so that their production can be increased without putting a pressure on the land resource. Flower production has gained much importance in recent years and thus has interested horticulture growers who have increased the area under flower crop to increase the production but special attention needs to be given to its productivity if benefits are to be drawn in long run.

$$P = A_0(Y_n - Y_0) + Y_0(A_n - A_0) + \Delta A \Delta Y$$

Instability Analysis

Coefficient of variation (%)and Instability Index of area, production and productivity of the Horticultural crops were worked outand are presented in table 2.

It is revealed from the table that Instability index in area, production and productivity was observed to be highest in flowers.This shows that there is riskiness in its production. The instability in production was lowest in case of fruits showing that it is less risk prone. High instability in flower production might be due the reason that there is no specific market available for flowers, as it is not directly consumed, as compared with fruits and vegetables.

Decomposition Analysis

The analysis of the factors affecting the total production of the Horticultural crops Table 3 indicate the area effect is maximum in Flower crops (173 per cent) followed by Fruit crops (86.32 per cent) and minimum in Vegetables (59.44 per cent). The contribution of Productivity is negative in Flower crops (-37.38 per cent) whereas in the case of Vegetables and Fruits yield effect is positive but Fruit crop

shows very low yield effect. Flower crop shows negative interaction effect (-35.85 per cent), Flower and Vegetables show positive interaction effect respectively 4.62 and 10.17 per cent.

Summary and Conclusion

The horticultural sector has received considerable attention in recent years as it is recognized as a potentially important source of growth, employment generation and foreign exchange earnings. The above discussion highlighted the fact that the growth of area, production and productivity for horticultural crops in India were positive and statistically significant except flower crops. Negative growth in productivity of flower crop shows available technologies are not adequate to push up the yield of these crops. Therefore, generation and dissemination of technologies to push up the yield of these crops is a matter of great challenge for researchers and extension agencies in India. The coefficient of variation and Instability index for flower crops was more than 20 per cent and 10 per cent respectively indicating that, the more riskiness for cultivation of flower crops in India. Production is the combined effect of area and productivity, growth of production is majorly contributed by areas while in case of flowers productivity effect is negative. Therefore, keeping the area as constant the productivity of horticultural crops can be further increased by taking appropriate production technologies. Government intervention is also required to make stable markets available for flowers, which are being adopted by farmers recently and whose production has gained impetus, so that its profitable to farmers in long run.

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TABLE 1: Growth Rate in Area, Production and Productivity of Horticultural Crops

Particulars		Area	Production	Productivity
Fruits	F value	86.85	514.81	1.66
	R Square (%)	91.6	98.5	17.3
	CGR (%)	6.0	6.9	0.90
	Significant	*	*	**
Vegetables	F value	112.78	163.44	97.99
	R Square (%)	93.4	95.3	92.5
	CGR (%)	4.0	6.3	2.2
	Significant	*	*	*
Flowers	F value	39.89	39.21	0.89
	R Square (%)	83.3	83.1	10.1
	CGR (%)	9.5	7.3	-2.2
	Significant	NS	NS	NS

*1% Significance level **5% Significance level
NS- Not Significant CGR- Compound Growth Rate

TABLE 2: VARIABILITY IN AREA, PRODUCTION AND PRODUCTIVITY OF HORTICULTURAL CROPS IN INDIA

Particulars		Area	Production	Productivity
Fruits	SD	923	11686	682
	Mean	5306	58038	10916
	CV (%)	17.40	20.14	6.25
	Instability Index	5.36	2.63	6.03
Vegetables	SD	897	21587	1098
	Mean	7218	112723	15501
	CV (%)	12.43	19.15	7.08
	Instability Index	3.40	4.37	2.07
Flowers	SD	39	186	1613
	Mean	138	795	6017
	CV (%)	28.67	23.42	26.81
	Instability Index	12.43	10.24	26.97

TABLE 3: AREA EFFECT, YIELD EFFECT AND INTERACTION EFFECT ON PRODUCTION GROWTH OF HORTICULTURAL CROPS IN INDIA

S. No.	Description	Fruits	Vegetables	Flowers
1	Change in yield variance (%)	9.06	30.39	-37.38
2	Change in area variance (%)	86.32	59.44	173.34
3	Interaction between changes in mean area and mean yield (%)	4.62	10.17	-35.85

Advancements in Dairy Feed Industry- An Alternative Way to Overcome the Scarcity of Fodder in India

KASHISH* AND VIKRANT DHAWAN**

Abstract

The present study examined the feed and fodder status of dairy animals in India. The study evaluated that livestock population increased over the years with a growth rate of 2.80 per cent whereas,in spite of growth in livestock population, area under fodder crops has been decreasing over the years.The area under fodder crops which was 18.41, 4.41 and 11.47 million hectares for jowar, maize and bajra crops, respectively for the year 1960-61,has decreased to 2.68 and 8.39 million hectares for jowar and bajra crops, but in case of maize crop, there was little positive change during 2011-12 as area under maize increased to 7.27 million hectares with production of 15.86 million tonnes. The growth rate for area under maize crop was calculated to be 1.00 per cent whereas for jowar and bajra crops, there was negative growth rate of 3.68 and 0.63 per cent, respectively. The demand and supply gap also exists for green and dry fodder crops as according to an estimate, during 2025, the gap will tend to increase by 64.87% for green and 24.92% for dry fodder, respectively. Nutrient deficiency is being the major constraint which was observed in feed and fodder. The best substitutes to overcome these problems are silage and hay making, compounded cattle feed, densified block technology and wanda-feeding material etcwhich need to be adopted for healthy and long living life of dairy animals.

Keywords: Densified Feed Block, dairying, feed and fodder and livestock.

Introduction

India is predominantly an agricultural country and nearly three-fourth of the population depends on agriculture, livestock and allied sectors for livelihood. Nearly 70 percent of country's population lives in rural areas. Livestock is also an important asset for them which provide employment to millions of rural people. Rapid growth of livestock sector is therefore most desirable not only to sustain steady agriculture growth but also to reduce rural poverty especially when a majority of land holders are less than 2 hectares and about 30 percent of rural households are landless. Before green revolution animal was the main source of draft power due to economic factors and necessities of the new technology (Sidhu and Grewal, 1991 and Sidhu and Singh, 2004).The demand of milk was 114.93 million tonnes in 2011 and will tend to increase to 181.95 million tonnes in 2030 at a growth rate of 7 per cent (Sekhon*et al* 2012). Milk production helps the farmers to engage the semi-employed family labour more efficiently during slack period of crop production. Additionally, it generates employment for landless labourers also. It also improves the socio-economic profile of dairy farmers(Gangasagare and karanjkar, 2009 and Kashish and Dhawan, 2015). Though a positive relationship between land ownership and dairy farming existed but dominance of small holders (< 2 ha) in commercial dairying (Brithal 2008 and Sharma *et al* 2003), still prevails. Majority of milk producers are small holders and contribute more than 70 per cent to total milk production in India (Dries *et al* 2004, Minten *et al* 2007 and Maertens *et al* 2007).

Fodder is an agricultural term for animal feed and fodder crops are those plants that are raised to feed livestock animals (Datta, 2013). With increasing animal population, the demand for feed and fodder is increasing year by year but the area under fodder crop was decreasing tremendously. So, with the decreasing area under fodder crop, the cattle feed demand was increasing over the year.According to annual report of Department of Animal Husbandry, Dairying (DAHD) 2013-14, the demand for dry fodder was 416 million tonnes, but the availability was only 253 million tonnes with a gap of 40 per cent and the demand of green fodder was 222 million tonnes and availability was only 143 million tonnes with a gap of 36 per cent.

Data and Methodology

The present study was based on secondary data. The data on livestock population, area under fodder crop, demand and availability of feed and fodder etc from 1980-81 to 2012-13 was collected from various issues of Statistical Abstracts of Punjab, Annual reports of Department of Animal Husbandry and Dairying (DAHD), Government of India, Ministry of Agriculture, New Delhi and Indiastat.com.

The growth rates were calculated for the data related to livestock population, demand and availability of green fodder and dry fodder and area and production of different fodder crops in India.

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Results and Discussion

Livestock Population in India

Though animal serves a number of purposes but their utility has been undergoing a steady transformation driven by the changing food consumption pattern. Livestock, as a draught power, has declined considerably due to mechanization of agricultural operations. Livestock population in India was presented in Table 1.The livestock population consists of cattles, buffaloes, sheep, goat and poultry etc. The cattle population in India was 198.88 million during 1997 census which decreased to 185.20 million during 2003 census and then increased to 190.9 million during 2012 census with an overall growth rate of - 0.31 per cent per annum from 1997 to 2012. The sheep population consists of 57.49, 61.50 and 65.10 million during 1997, 2003 and 2012 census, respectively.

TABLE 1: LIVESTOCK POPULATION IN INDIA

Sr. No.	Species	Livestock census (Million No.)				Growth rate (%age)
		1997	2003	2007	2012	(1997 to 2012)
1.	Cattle	198.88	185.2	199.1	190.9	-0.31
2.	Buffalo	89.92	97.9	105.3	108.7	1.39
3.	Sheep	57.49	61.5	71.6	65.1	0.77
4.	Goat	122.72	124.4	140.5	135.2	0.61
5.	Poultry	347.61	489.0	648.9	729.2	5.03
	Total	816.62	958.0	1165.4	1229.1	2.80

Source: 19th livestock census Report, 2012.

Table 1 show that an overall growth rate for sheep, goat and poultry consists of 0.77, 0.61 and 5.03 per cent per annum, respectively. The data clearly indicates that the cattle population was considerably decreasing over the years. The buffalo's population in India was 89.92 million during 1997 census, which increased to 97.90 million during 2003 census and then showed a huge increase to 108.7 million during 2012 census with an overall annual growth rate of 1.39 per cent per annum from 1997 to 2012.

Feed and Fodder Status in India

An uninterrupted availability of fodder is a pre-requisite for improving the productivity of livestock and to make livestock production cost efficient. It is impossible to achieve the targeted growth of livestock sector in the coming years without adequate supply of quality feed and fodder. Grazing in pastures, commonly fallow lands and harvested grasses are the main fodder source of small ruminants like sheep and goat as well as large ruminants to a limited extent. Mostly landless farmers, who do not have sufficient land to grow fodder for their animals, generally take their animals for grazing.

The supply of and demand for feed and fodder was presented in Table 2. The table was clearly indicating that there exist a gap between demand and supply of fodder. In 1995, the supply of green fodder and dry fodder was 379.30 and 421 million MT against demand for 947 and 526 million MT, respectively, with a deficit gap of 59.95 per cent in green fodder and in dry fodder, the deficit gap was 19.95 per cent. Later on, during the year 2000, the supply of green and dry fodder increased to 384.50 and 428 million MT and demand was 988 and 549 million MT, respectively. The demand deficit gap for green fodder, was 61.10 per cent and for dry fodder it was 21.93 per cent. In 2015, the demand and supply deficit gap would be 63.50 and 23.56 per cent for green and dry fodder. In 2025, the demand and supply deficit gap will be increased by 759 million MT for green and 162 million MT for dry fodder.

Low digestibility in improving utilization, scarcity of protein are other major constraints of cattle feed (Patel RK, 1993). The availability and requirement of crude protein (CP) and total digestible nutrients (TDN) from concentrates was presented in Table 3. During 2000, the availability of CP was only 30.81 MT against requirement of 44.49 MT with deficit of 30.75% and if we talk about the availability of TDN in concentrates, which was 242.42 MT against requirement of 321.29 MT with net deficit of 24.55%. During 2015, there is net deficit of CP and TDN was 28.44% and 24.04%. In 2025, the availability and requirement gap will increase with deficit of 25.38% for CP and 23.14% for TDN from concentrates. The available

TABLE 2: DEMAND AND AVAILABILITY OF GREEN AND DRY FODDER IN INDIA

(Million MT)

Sr. No.	Year	Supply		Demand		Deficit as % demand (actual demand)	
		Green	Dry	Green	Dry	Green	Dry
1.	1995	379.30	421	947	526	59.95 (568)	19.95 (105)
2.	2000	384.50	428	988	549	61.10 (604)	21.93 (121)
3.	2005	389.90	443	1025	569	61.96 (635)	22.08 (126)
4.	2010	395.20	451	1061	589	62.76 (666)	23.46 (138)
5.	2015	400.60	466	1097	609	63.50 (696)	23.56 (143)
6.	2020	405.90	473	1134	630	64.21 (728)	24.81 (157)
7.	2025	411.30	488	1170	650	64.87 (759)	24.92 (162)
	Growth Rate (%age) (1995 to 2025)	0.23	0.54	0.76	0.69	0.23	0.77

Source: Report of the working group on Animal Husbandry and dairying for the Eleventh five year plan (2007-2012), Planning Commission, Government of India

TABLE 3: Projected Availability, Requirements and Deficit of CP and TDN (Million Tonnes) Including CP and TDN from Concentrates

Year	Requirement		Availability		Deficit (%)	
	CP	TDN	CP	TDN	CP	TDN
2000	44.49	321.29	30.81	242.42	30.75	24.55
2005	46.12	333.11	32.62	253.62	29.27	23.86
2010	47.76	344.93	34.18	262.02	28.44	24.04
2015	49.39	356.73	35.98	273.24	27.15	23.41
2020	51.04	368.61	37.50	281.23	26.52	23.70
2025	52.68	380.49	39.31	292.45	25.38	23.14
Growth Rate (%age) (2000 to 2025)	0.65	0.74	0.92	0.83	-0.82	-0.27

Source: Handbook of Agriculture CP- Crude Protein TDN- Total Digestible Nutrients.

forages are poor in quality, and lack prooper energy, protein and minerals.To compensate for the low productivity of the livestock, farmers maintain a large herd of animals, which adds to the pressure on land and fodder resources.

Area and Production of Different Fodder Crops in India

At this stage, there is a need to focus more on research of development of forage varieties which are high yielding, more pest- resistant and have better nutritive value. The inadequate production and availability of quality seed yielding varieties of fodder crops is also acting as one of the major constraints in enhancing fodder production. Owing to increasing pressure of population on land and higher benefit-cost ratio, currently Indian farmers focusing more on growing food grains, oilseeds and cash crops, as a result production of fodder remains highly neglected. The current priorities given by farmers to food grains, oilseeds and cash crops are likely to worsen supply position of fodder. There are several reports and studies showing demand and supply position of feed and fodder in the country.

Area, production and yield of different fodder crops were presented in Table 4. During year 1980-81, the area under jowar crop was 18.41 million hectare which it decreased to 9.86 million hectare for year 2000-01. During 2011-12, it again decreased to 2.68 million hectare with production of 3.00 million tonnes. The growth rate was -3.68, -2.32 and 1.49 for area, production and yield of jowar crop, respectively from year 1960-6 to 2011-12. The area under bajra crop was 11.47 million hectares with production of 3.28 million tonnes for the year 1960-61. Area decreased from 9.83 to 8.39 million hectares and production increased from 6.76 to 9.15 million tonnes from 2000-01 to 2011-12.

TABLE 4: Area, Production and Yield of Different Fodder Crops in India

Year	Jowar			Maize			Bajra		
	A	P	Y	A	P	Y	A	P	Y
1960-61	18.41	9.81	533	4.41	4.08	926	11.47	3.28	286
1970-71	17.37	8.11	466	5.85	7.49	1279	12.91	8.03	622
1980-81	15.81	10.43	660	6.01	6.96	1159	11.66	5.34	458
1990-91	14.36	11.68	814	5.90	8.96	1518	10.48	6.89	658
2000-01	9.86	7.53	764	6.61	12.04	1822	9.83	6.76	688
2010-11	7.06	6.74	956	8.49	21.28	2507	9.43	10.08	1069
2011-12	2.68	3.00	1117	7.27	15.86	2181	8.39	9.15	1091
Growth rate(%)	-3.68	-2.32	1.49	1.00	2.70	1.68	-0.63	2.05	2.70

Source: Directorate of Economic and Statistics, Department of agriculture and cooperation
Area (A)-Million hectares, Production (P)- Million Tonnes, Yield (Y)- Kg/Ha

The overall (i. e., from1960-61 to 2011-12) growthrate was -0.63, 2.05 and 2.70 per cent for area, production and yield of bajra crop respectively. The area under maize crop was increasing over the years during the study period. The fact is that government was more emphasizing on crop diversification. However, cropping pattern in Punjab has not witnessed any drastic changes and remained highly favorable towards wheat-paddy monoculture, which has produced ecological problems in the form of loss of soil fertility, water table depletion etc (Sharma and Mohan, 2013).The overall (1960-61 to 2011-12) growth rate was 1.00, 2.70 and 1.68 for area, production and yield of maize crop respectively.

Advances in Animal Feed Industry

As data is clearly indicating that the area under fodder crop is decreasing year by year, there is need to focus to examine which substitute should we adopt to overcome the unavailability of fodder. Some researchers have developed techniques and methods to overcome the deficiency of fodder during lean season.

Silage Making

For making silage, generally fodder crops like maize, sorghum, bajra and guinea grass which are rich in sugarand carbohydrates and low in protein possess excellent qualities for conserving as silage. Silage is generally used during the lean season of fodder to overcome the availability of fodder. For making silage, harvested crop is generally stored in silo trench under anaerobic conditions for 45 days. The benefits of silage are as following:

i) It helps to provide a balanced feed during lean period of fodder availability.

ii) It also reduces the labour cost because cutting and bringing fodder involves maximum labour utilization.

iii) It also reduces the input cost without effecting milk production.

iv) Good silage also reduces the toxic contents in green fodder.

Compounded Cattle Feed

India has recently emerged as one of the largest and fastest growing compound cattle feed markets in the world. The feed industry is growing at CAGR of 8 per cent with poultry, cattle and aqua feed sector emerging as major growth drivers and also in the dairy industry robust growth number are registered. The requirement of cattle feed has gone up to 67 million tonnes and India is world's largest milk producer. Compounded feed is balanced feed for animals and gives carbohydrates, proteins, fats, minerals and vitamins. If farmer is feeding raw materials like cottonseed cake and bran's, many times it's not balanced in all nutrients and there exists uncertainty about how much quantity to be added for different raw materials to make it balanced feed. In compounded cattle feed generally raw materials like rice bran extraction, rice bran, Cottonseed cake, mustard cake, mustard extraction, soybean extraction, bye pass fat, maize and molasses are mixed in equal ratio to meet minimum fat requirement from 2.5-5.0 per cent and protein requirement 20-24 per cent. The benefits of compounded cattle feed are

i) Each and every raw material was fixed in equal ratio and increases feed intake.

ii) Higher nutrient density (reduce bulkiness of feed).

iii) Reduction in dustiness of feed and uniformity in production

iv) Destruction of pathogenic micro-organism.

v) Increased digestibility of certain nutrients due to cooking effect.

DensifiedFeed Block (DFB) Technology

The growing feed shortage in region is pushing the feed cost higher and higher, so that most of the resource poor small holders, who constitute majority of livestock farmers in the tropical region, are unable to supply good quality feeds and balanced nutrient to their animals. There is little hope to increase area under fodder production or to regenerate the degraded pasture land through intensive management. To provide balanced feed and to overcome the shortage of feed and fodder new technology, there is Densified Feed Block (DFB) Technology, a novel approach, which provides a good opportunity to feed manufacturers and entrepreneurs to remove regional disparities in feed availability and supplying balanced feed to dairy animals. In DFB, two major components are roughage and concentrates, added in different ratios depending upon the stage of lactation and level of production. In roughages, mainly crop residues like wheat straw, paddy straw, mustard straw and gram straw are generally used as a roughage component.In concentrates, mainly cakes like mustard cake, canola cake, cottonseed cake etc are used as a concentrates because these cakes contain crude protein in a higher percentage. Minerals and nutrients can also be used in these blocks because these minerals provide energy and protect animals from diseases. The benefits of Densified feed block technology are

i) It provides balanced ration to ruminants because during its preparation, every material was mixed in fixed proportion which is beneficial to ruminants.

ii) It is easier to transport and cover less space because densification of straw based feed under mechanical pressure reduces it bulk compared to loose straw.

iii) It is a time and labour saving technique which reduces labour expenditure from 30-40 per cent and mostly 1-2 hours require for cutting of fodder.

Wanda-Feeding Material

The Punjab Livestock and Dairy Development Board(PLDDB) has developed a new, low-cost cattle

feeding material, namely,wanda, made from maize cobs. According to PLDDB officials, the maize cobs meal is suitable for all kinds of domestic animals,are far cheaper than other meals. It carries all nutritional values including protein and one kilogram of it can give animals 4000 calories energy. Maize cobs, some varieties of corn and dry and green stalks of maize are used as animal feeding material along with wheat straw, rice bran, cakes and molasses etc.

Constraints in Forage Production

i) Non-availability of critical inputs such as good quality seeds required for cultivating traditional fodder crops is another problem. Thus the area under fodder cultivation has remained stagnant for a long period due to increasing pressure of human population. It is estimated that only 4.4% of the total cropped area is devoted to fodder production (Hedge, 2006).

ii) Livestock population of animals was increasing over the years so there exist a gap between demand and supply of fodder.To fill this gap, population of unproductive animal should be decreased. It is a fact that considerable fodder resources are wasted during maintenance of an excessive number of poorly fed and low yielding animals, which contributed to the process of pasture destruction.

iii) Uncontrolled grazing has led to decline in biomass availability. Excessive and continuous grazing has severely damaged these lands.

Suggestions

i) There is no agency to collect accurate data on fodder crops production and productivity because without statistical data, it is impossible to determine the availability and requirement of fodder crop in India for dairy animals.

ii) There is need for producing HYVs of fodder crops to meet the demand of fodder.

iii) Extension services should reach at the door step of farmers to impart knowledge about fodder crops and proper scientific way of storage of fodder for a lean season.

iv) Farmers are not aware about technical concepts of feed and fodder i.e., nutrient content, quality and quantity of feed and which animal requires which type of feed,so the Government should deploy fodder specialist scientists to arrange farmers training camps at villages so that they may aware about raw material (used for preparation of cattle feed and silage making etc).

Conclusion

It was concluded from the study that area under fodder crop was decreasing over the years, besides decrease in area, livestock population was increasing over the years, so there exists demand and supply gap of green fodder and dry fodder. To fill this gap, there is need to enhance the production of fodder crops through release of new HYV's of fodder crops. From above another conclusion that can be derived that there also exists a gap between nutrient requirement and availability in concentrates. To overcome these nutrient availability problems some substitute measures have relatively greater importance. The Substitutes are like silage and hay making, compounded cattle feed, Densified Feed Block (DFB) technology etc. Compounded cattle feed generally used by majority of farmers because of easy availability and requires less labour but the main problem is that due to increasing demand of cattle feed, there is too much duplicacy in the market and some feed processing industries do not produce cattle feed as per specifications given by ISI and mix high percentage of urea in the feed. So, extension services should reach at the door step of farmers so that they can be made aware of percentage and composition of nutrient requirement in feed and their hazardous effects on dairy animals. Also, to meet the present and future demand for milk and other animal origin, sustainable feeding of the animals is the need of the hour.

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AGRO-ECONOMIC RESEARCH

Baseline Data on Area, Production and Productivity of Horticulture Crops in North-East and Himalayan States—A Study in Assam

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Introduction

Horticulture, which has gained commercial tone in the recent years, is an important component of agriculture, having significant role in the economy of the country. India's varied agro-climatic conditions allow it to produce a wide variety of horticultural crops such as fruits & vegetables, tuber crops, plantation crops, flowers, spices & condiments *etc*. The horticultural crops put together cover approximately 11.35% of the total cropped area (192.20 million hectares) with an annual production of about 114 million tonne, making an overall contribution of more than 18% in terms of the gross agricultural output of the country in 2010-11 (P). Following successful launching & implementation of various development programmes, there has been tremendous progress in the production of fruits and vegetables in terms of both quality and quantity.

Horticulture in Assam

Assam is endowed with diverse agro-climatic conditions, which permit cultivation of wide range of horticultural crops. It accommodates various fruits, vegetables, flowers, spieces, medicinal and aromatic plants, nut crops, tuber crops and also plantation crops. Horticulture crops cover an area of 5.75 lakh hectares which account for 14.04 per cent of the total cultivable area of 40.99 lakh hectares in the state in the year 2011-12. There has been a significant increase in area and production of horticultural crops in Assam during the last two decades. It is observed that although the area and production of fruit crops increased during the period of 2004-05 to 2011-12 by 19.12 per cent and 22.70 per cent respectively, the increase in productivity was almost negligible (4.40%). In case of vegetables, the area increased by 16.17 per cent, production by 20.76 per cent and productivity by 5.54 per cent during the period. In case of tuber crops, the increase in area, production and productivity was 6.67 per cent, 13.10 per cent and 6.43 per cent respectively while, for spices, the increase was 15.31 per cent, 16.94 per cent and 2.09 per cent against area, production and productivity, respectively.

Scope of the Study

Horticultural sector can play a pivotal role in diversifying agriculture in terms of increasing production and productivity; providing food assortments, nutrition, income and employment. Despite impressive development in horticultural sector in recent years, there is a general feeling that data-base of horticultural crops is not comprehensive and reliable in the country. The situation is still worse in case of North-East (NE) region and Himalayan states (11 states). Besides, there is no systematic data on some of the major and minor horticultural crops in these states. To fill this gap, it is necessary to identify the methodology followed in collection of horticultural statistics, identify problems faced in data collection of horticultural crops by various agencies and take some remedial measures in order to made data on horticultural sector more scientific and factual. The present study makes an attempt in this very direction with a focus on NE and Himalayan states. The study intends to collect baseline data on area, production and yield of horticultural crops for some selected villages and from the state agencies responsible for collection of such data and then do the verification with the concerned households through primary survey to identify the discrepancies, if any. This will help to highlight the changes required at the policy level for improvement of the data collection process for horticultural commodities. This will also help the policy makers in the Centre and States to chalk out effective programmes for further development of the sector.

Objectives of the Study

The broad objectives of the study are

1. To collect data on area, production and yield of horticultural crops and compare these with the baseline data collected by the Department of Horticulture, Revenue Department and Directorate of Economics and Statistics.
2. To identify the horticultural crops on which proper statistics is not being compiled at present among the selected states.
3. To study the problems encountered by the grass-root officials while collecting the horticultural data.
4. To identify the problems in estimation of horticultural crops and to suggest policy measures.

Methodology and Data Source of the Study

The study was confined to the state of Assam. Both secondary and primary data were collected to achieve the objectives specified above. A set of structured questionnaire was prepared to collect information related to area,

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production and yield of horticultural crops from the officials at district/block/village level. The state agencies involved in collection of data on horticultural crops include Department of Horticulture/Agriculture and Directorate of Economics and Statistics, Government of Assam. Additional information was collected from the departmental officials on methodology adopted, verification process carried out in collection of horticultural data and problems encountered by them in compilation of horticultural statistics. Information on area, production and yield of horticultural crops/crop groups were collected from the concerned state agencies for the selected village(s) and household(s).

Based on the sample design, one district with highest area under fruits and another district with highest area under vegetables were selected. Followed by this, two more districts were selected, growing highest area under other horticultural crop categories *e.g*., spices and plantation crops. Thus, altogether four districts were selected for this study. From each selected district, one block was selected based on the highest area under the respective crop group categories. From each selected block, one village having highest area under that category was selected for complete enumeration. Thus, four villages from four blocks in four districts were selected for the primary survey.

Accordingly, Jadavpur village under Mandia block in Barpeta district was selected for spices, Satekona village under Bongaon block in Kamrup district for fruits, Sensowa village under Khagarijan block in Nagaon district for plantation crops and Bhumuraguri village under Gabharu block in Sonitpur district was selected for vegetable crops for complete enumeration. For this purpose, a household level schedule was prepared for the sample farmers.

During the primary survey, all the households of the sample villages were covered. The field survey provided the household area, production and yield of horticultural crops grown in the village during the reference year together with village wise aggregate data. Thereafter, a verification exercise was carried out to match the household as well as village data with the data provided by the state agencies.

The secondary data for the village/household level was collected from the state agencies.

Area, Production and Productivity of Horticultural Crops Grown by the Sample Farmers

It was observed that, in Jadavpur village, fruit crops covered 0.19 hectares of area and only banana was grown. They produced 23.13 qtl. of banana with the yield rate of 12,325 kg/ha.

In Satekona village, out of the total fruit crop area of 34.82 hectares, 79.44 per cent (27.66 hectares) were allocated for cultivation of orange (Mandarin) and the rest 20.54 per cent (7.16 hectares) were allocated for cultivation of pineapple. The estimated production and yield of pineapple was 1,321.95 qtl. and 18,463 kg/ha in *kharif* season and 293.77 qtl. and 4,103 kh/ha in *rabi* season. Production and yield of orange was found at 4,501.31 qtl. and 16,275 kg/ha., respectively.

In Sensowa village, only banana cultivation was found in 0.35 hectare of un-irrigated land. The production and productivity was found 35.41 qtl. and 10,245 kg/ha respectively.

In Bhumuraguri village, both Assam lemon and banana were grown by the farmers in un irrigated dry land. Of the total 1.22 hectares of land, 0.73 hectare was allocated to Assam lemon and 0.49 hectare for banana cultivation. The production and productivity of Assam lemon was 48.12 qtl. and 6,587 kg/ha and that of banana was 46.81 qtl. and 9,538 kg/ha respectively.

Combining all the sample villages together, a total of 36.57 hectares of area was devoted for cultivation of fruit crops comprising 1.03 hectares of banana, 27.66 hectares of orange, 7.16 hectares of pineapple and 0.73 hectares of Assam lemon.

It was observed that almost all the *kharif, rabi* and summer vegetables were grown by the sample farmers. In Jadavpur village of Barpeta district, of the total land of 28.00 hectares used for vegetable crops, 12.00 hectares were irrigated and 16.00 hectares were dry land. In un-irrigated areas, pointed gourd and ridge gourd were grown in *kharif* season while potato and brinjal were grown in *rabi* season. In the village, there was no report of growing summer and annual crops in any season. The production and productivity in irrigated area was found to be 2,085.25 qtl. and 17,377 kg/ha. while, in rainfed area it was found at 1,561.50 qtl. and 9,759 kg/ha, respectively.

In Satekona village of Kamrup district, the unirrigated areas were utilized for cultivating ridge gourd, snake gourd and bitter gourd during the *kharif* season. In summer season, the farmers grew red pumpkin and arum in 0.85 hectare and 1.50 hectare, respectively. The overall production and productivity was estimated at 404.80 qtl. and 8016 kg/ha., respectively. The production and productivity of potato was found at 45.73 qtl. and 6825 kg/ha and in case of brinjal, the respective figures were 72.29 qtl. and 23,320 kg/ha.

In Senchowa village of Nagaon district, no vegetable area was allocated for kharif, summer and annual crops. In rabi season potato and brinjal were grown in 0.67 hectare and 0.31 hectare of irrigated area, respectively.

In Bhumuraguri village of Sonitpur district, the farmers grew almost all the vegetables in all the seasons. In fact, it is the most vegetables producing district of Assam. In kharif season, water pumpkin and white gourd were grown. Potato, tomato, brinjal, onion, green chillies, sweet potato, cabbage, cauliflower, pea, radish, carrot, capsicum and other leafy

vegetables were grown in rabi season, and in summer season, brinjal, long beans, lady's finger, red pumpkin, cucumber, kunduli etc. were grown by major sample growers. Combining all the vegetable crops, the production and productivity was worked out at 20,569.94 qtl. and 16,070 kg/ha., respectively.

In case of spices cultivation, all the crops were grown in un-irrigated land in all the sample villages. In Jadavpur village, the farmers produced 802.29 qtl. of spices with the yield rate of 3,387 kg/ha.

In Satekona village, the farmers grew only black pepper in 0.20 hectare of area and produced 3.08 qtl. with 1,538 kg/ha. of yield rate.

In Senchowa village, ginger, turmeric and black pepper were grown as annual crops with a total production of 146.65 qtls. The yield rate was estimated at 3,770 kg/ha.

In Bhumuraguri village, 7.69 hectares of land wer allocated to grow coriander, garlic, ginger and turmeric. Combining all the crops, the production and productivity was found at 190.47 qtl. and 2,477 kg/ha., respectively.

In case of garden/plantation crops, Senchowa village occupied maximum area followed by Satekona village, Jadavpur village and Bhumuraguri village.

Major Problems of Horticultural Crops

Though the state of Assam has high potential for the development of horticultural crops, it is yet to become a commercial venture. Factors hindering the horticultural development in the state are as follows:

1. Poor Cultivation Practices and Low Yield

General neglect and non-adoption of scientific cultivation practices are the major constraints for poor return from most of the horticultural crops in the state. Despite conducive environment, the productivity and growth of most of the horticultural crops are lower than the all India average.

2. Lack of Quality Planting Material

The disease free, true to type genuine planting material is absolutely lacking in case of a number of horticultural crops. It is imperative to generate disease free & healthy planting materials & screening of planting materials before its distribution is of utmost importance.

3. Lack of Marketing Facilities

Due to lack of organized marketing structure, the farmers are getting low return as compared to their counterparts in other states of India. The middlemen usually amass a large chunk of profit at the expenses of the farmers. Due to perishable nature of the products and absence of adequate market support, the farmers sell their produce at a throw away prices to the middleman without even getting the opportunity to display them. Transportation and storage are perhaps the most serious constraints in the horticultural development of this region.

4. Scarcity of Trained Manpower and Extension Support

Dearth of trained manpower and inadequate extension support can be considered yet another set of pressing problem in the way of horticultural development in this part of the country. In the states like Punjab, Himachal Pradesh, Haryana, etc., where the extension services are reported to be very efficient, the pace of progress is also seen to be quite impressive.

5. Long Gestation Period

Since horticultural crops, more specifically, plantation crops have long gestation period and initial cost of establishment of orchard or plantation is high, it becomes almost impossible for the marginal/ small farmers to go for such ventures without long-term credits from financial institutions.

6. Problems of Processing

The processing industry can help to a certain extent in mitigating the problem of proper disposal of perishable commodities. In the state of Assam, the storage facilities are inadequate and only available; few processing units exist but are not functioning up to the desired capacity and this is deemed to be one of the weakest areas in the entire region.

7. Inadequate Investment on Research

Investments on research in horticulture have always remained low when compared to the large number of crops it covers. As a result, many more researchers issues remain unattended to for years together. There is an urgent need to increase the level of investment on research front.

8. Absence of Adequate Insurance Coverage

Risk management in horticultural crops is almost non-existent although the crops like onion and potato are covered under the National Agriculture Insurance Scheme. There is a need to cover the risk in case of other horticultural crops as well, perhaps on the basis of potential production coverage instead of average yield. This would encourage higher investment to achieve higher productivity.

Other bottlenecks of horticultural development in the region are as follows: -

i. Inadequate thrust on conservation and exploitation of horticultural germplasm.

ii. High rainfall, soil erosion and high rate of leaching of nutrients.

iii. Heavy infestation of weeds, insect-pests and diseases.

iv. Lack of funds and financial support from Government to purchase, of equality seeds/planting materials & other inputs.

v. Lack of awareness /needed information.

Future Prospect

Assam is traditionally a horticultural state due to its unique agro-climatic conditions which permit growing of a wide range of horticultural crops. Although, Assam has enormous potential for development of horticulture, the state is yet to harness the potentiality. In a flood prone state like Assam where productivity of major crops like rice is not stable, increase in production of horticultural crops can minimize the shock of crop failure and provide monetary security to the farmers. There is ample scope of increasing the area under sweet potato, Assam lemon, guava, jackfruit and banana. The scheme of Technology Mission for Integrated Development of Horticulture in Assam is in operation since 2001-02 with overwhelming response from the farmers. In spite of infrastructural problems, the state has started achieving the desired targets in case of fruits, flowers and other commercial crops. Strengthening production base, quality improvement, better price to growers, market access, value addition have become imperative and the Department of Agriculture is trying to touch upon all these issues under the Mission. Assam is expected to become a major player in emerging South East Asian markets in view of its close proximity to those global markets as projected in the latest round of ASEAN & SAARC deliberations. The state has to utilize its competitive and comparative advantages through commercialization and make horticulture highly rewarding. It is expected that the comprehensive approach through Horticulture Technology Mission will help to transform the entire gamut of horticulture in Assam in the next few years.

Difference Between the Two Estimates (Survey Data vis-a-vis Agency Data)

It was observed that multiple agencies are involved in horticulture base line data collection/generation process in Assam. But no systematic and accurate estimate of area and production of different horticultural crops are available. The estimates made by various agencies also vary considerably. Each agency has its own methodology, often resulting in variations in the data besides problem of revisions and time-lag. Further, only a few crops could be compared in this study due to non availability of data from the agencies' end.

It was observed that there was a considerable gap in area, production and productivity of almost all the crops. But no difference was found in area under guava and papaya in Senchowa village and cauliflower, pea, carrot and onion in Bhumuraguri village. In case of production, the data were almost same in chilly in Jadavpur village, black pepper in Satekona village, pineapple in Senchowa village and pumpkin and green chilies in I3humuraguri village. On yield rate, small gap was noticed in chilly and turmeric in Jadavpur and Senchol,va village, black pepper and areca nut in Satekona village and green chilies, mango, radish and carrot in Bhumuraguri village. But there was a vast gap between survey and agency data in the area of orange in Satekona village, production of coconut in all the sample villages and betel vine in Senchowa village. On productivity, large gap was noticed in Banana in Jadavpur village, coconut and orange in Satekona village, papaya, betel vine and pineapple in Senchowa village and ginger, jackfruit and onion in Bhumuraguri village. For other crops, slight difference was observed on area, production and yield rate between agency and survey data. The main reason for the gap between the two estimates may be due to survey done in different seasons by the concerned agencies. Further, in case of fruits and plantation crops, bearing stages vary with different types and different varieties and most of the times, eye estimation and farmers' responses were taken in to account. Also, the areas under vegetables and fruit crops grown in backyard/ kitchen garden of the houses were not considered by the Govt. Departments. Although the Government officials are required to undertake interim crop inspection between the two major seasons, namely, kharif and rabi, this does not appear to be done regularly. Even if short duration crops like vegetables, flowers, mushroom, etc. are covered during the crop inspection, they are not listed separately in the final crop abstract but clubbed together under "other crops". Thus; there is an urgent need to take necessary action to cover all the crops grown in all the seasons for all types of land with standardized methodologies.

Difficulties Encountered by the Agencies while Compiling Horticulture Data

As reported, the main difficulty faced by the agencies involved in collection of data was lack of updated ‘Chitha' book in the villages, which was supposed to be maintained by the Revenue Department. Consequently, the persons engaged in base line data collection process face lot of problems in applying uniform statistical methodologies. Another problem was lack of cooperation from farmer's family especially in crop cutting for some selected crops, like arecanut, coconut etc. Under this situation, the officials had to keep the record of production by eye estimation only. Moreover, some of the sample farmers very often demanded free inputs in order to supply the required information, which usually put the data collecting officials in great difficulty.

Policy Implication

Based on the findings of the study and the problems identified at the grass root level, the followings are suggested for improvement of base line data in horticulture in Assam:

1. The Horticulture Department in Assam should have its own network throughout the state with a well

supported statistical cell for collection, monitoring and estimation of horticultural data. Presently it is working under the shadow of the State Agriculture Department

2. There should be a set of prescribed format for individual farmers covering all aspects of horticulture to facilitate the process of data collection by different agencies.
3. A strong mechanism should be in place to have better coordination among the agencies like a National Sample Survey Organisation (NSSO), and other Govt. Departments.
4. For collection of base line data, the concerned agencies may involve the local farmer(s) or Panchayat representative(s) for better result.
5. There is need to train the officials on scientific data collection/management.
6. Awareness programme may also be conducted to educate the farmers on importance of book-keeping.
7. More funds are to be sanctioned/ released to the departments to meet the increasing expenses to cover village survey and collection of data.

Conclusion

Availability of reliable data is crucial for determining the status of ongoing horticultural development programmes and for taking up new programmes and policies for improvement of the sector. It is essential for estimating the growth, for carrying out analysis to assess the demand and supply trend, to identify problems and constraints, for evolving adaptive policies and exploring growth prospects. In fact, availability of reliable data can also prevent misdirection of policy objectives and misplacement of priorities. In other words, creation of a comprehensive horticulture database is a must for effective planning and monitoring & new policy preparation to promote horticultural production in the state. Availability of proper data will also help in devising appropriate strategies to exploit the huge export potential of the region.

Therefore, there is an urgent need for generating reliable base-line horticulture data, particularly at district level, classified by different components. The agenicies involved in generating the data should work in close coordination so that complete and accurate data can be obtained avoiding all sorts of duplication. And in the process, it vill be useful to involve the farmers or Panchayat members to get better and accurate results. State-wise, there should be a nodal agency to handle all kinds of data generated by different agencies/Departments, which can be held responsible for systematically & regularly maintaining those valuable data. There can be a Data Consortium as well with representation from all concerned agencies/ departments.

For the instant study, there were data gaps and other limitations as well. And it is difficult for an outside agency (like AERC) to undertake complete enumeration of the population at village/ tehsil/ subdivision level in order to collect the household data. For a baseline study of such magnitude, the Government may consider revamping the existing machineries with standard methodologies & continued support in terms of policy and funding.

COMMODITY REVIEWS

Foodgrains

During the month of February,2016 the Wholesale Price Index (Base 2004-05=100) of pulses decreased by 3.70%, cereals decreased by 0.25% &foodgrains decreased by 1.15% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base: 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of February 2016	WPI for the Month of January 2016	WPI A year ago	Percentage change during	
					A month	A Year
1	2	3	4	5	6	7
Rice	1.793	235.2	235.9	239.1	-0.3	-1.63
Wheat	1.116	221.6	223.5	215.6	-0.85	2.78
Jowar	0.096	275.9	277.9	288.3	-0.72	-4.30
Bajra	0.115	285.1	278.9	240.0	2.22	18.79
Maize	0.217	263.9	261.6	243.4	0.88	8.42
Barley	0.017	252.4	243.8	241.6	3.53	4.47
Ragi	0.019	339.5	335.6	322.6	1.16	5.24
Cereals	3.373	236.1	236.7	233.5	-0.25	1.11
Pulses	0.717	356.4	370.1	256.7	-3.70	38.84
Foodgrains	4.09	257.1	260.1	237.6	-1.15	8.21

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

The following Table indicates the State-wise trend of Wholesale Prices of Cereals during the month of February, 2016.

Commodity	Main Trend	Rising	Falling	Mixed	Steady
Rice	Rising	Haryana Jharkhand U.P.	A.P. Gujarat	Karnataka	Kerala
Wheat	Rising	Haryana Maharashtra U.P.		Gujarat Rajasthan	Karnataka M.P.
Jowar	Rising	Gujarat Karnataka Maharashtra	A.P.	Rajasthan	
Bajra	Mixed	Rajasthan		Gujarat Maharashtra	
Maize	Rising	Karnataka Rajasthan	U.P.		

Procurement of Rice

4.16 million tonnes of Rice (including paddy converted into rice) was procured during February 2016 as against 4.63 million tonnes of rice (including paddy converted into rice) procured during February 2015. The total procurement of Rice in the current marketing season i.e 2015-2016, up to 29.02.2016 stood at 28.01 million tonnes, as against 23.21 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 2015-16 (upto 29.02.2016)		Corresponding Period of last Year 2014-15		Marketing Year (October-September)			
					2014-15		2013-14	
	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5	6	7	8	9
Andhra Pradesh	2678	9.56	1524	6.57	3591	11.17	3722	11.76
Chhatisgarh	3972	14.18	3354	14.45	3423	10.64	4290	13.56
Haryana	2860	10.21	2015	8.68	2015	6.27	2406	7.60
Maharashtra	129	0.46	116	0.50	199	0.62	161	0.51
Punjab	9350	33.37	7781	33.52	7786	24.21	8106	25.62
Tamil Nadu	627	2.24	602	2.59	1049	3.26	684	2.16
Uttar Pradesh	2652	9.47	1424	6.13	1698	5.28	1127	3.56
Uttarakhand	597	2.13	429	1.85	465	1.45	463	1.46
Others	5153	18.39	5967	25.70	11936	37.11	10678	33.75
Total	28018	100.00	23212	100.00	32162	100.00	31637	100.00

Source: Department of Food & Public Distribution.

Procurement of Wheat

The total procurement of wheat in the current marketing season i.e 2015-2016 up to July, 2015 is 28.09 million tonnes against a total of 27.17 million tonnes of wheat procured during last year. The details are given in the following table :

PROCUREMENT OF WHEAT

(In Thousand Tonnes)

State	Marketing Season 2015-16 (upto 13.07.2015)		Corresponding Period of last Year 2014-15		Marketing Year (April-March)			
					2014-15		2013-14	
	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total	Procurement	Percentage to Total
1	2	3	4	5	6	7	8	9
Haryana	6778	24.13	6414	23.61	6495	23.20	5873	23.41
Madhya Pradesh	7309	26.02	7188	26.46	7094	25.34	6355	25.33
Punjab	10344	36.83	10775	39.66	11641	41.58	10897	43.43
Rajasthan	1300	4.63	2155	7.93	2159	7.71	1268	5.06
Uttar Pradesh	2267	8.07	628	2.31	599	2.14	683	2.72
Others	90	0.32	6	0.02	6	0.02	16	0.06
Total	28088	100.00	27166	100.00	27994	100.00	25092	100.00

Source: Department of Food & Public Distribution.

Commercial Crops

Oilseeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 210.0 in February, 2016 showing a decrease of 2.5% over the previous month. However, it is higher by 3.7 % over the previous year. The WPI of sunflower seed increased by 0.7 % over the previous month. The WPI of gingelly seed decreased by 6.1%, niger seed by 5.8%, rape & mustard seed by 5.4 %, copra by 2.3%, groundnut seed 2.2 % and soyabean by 0.4% over the previous month. The WPI of safflower seed and cotton seed remained unchanged over the month.The Wholesale Price Index (WPI) of edible oils as a group stood at 150.2 in February, 2016 showing an increase of 0.4% and 3.2% over the previous month and year, respectively. The WPI of gingelly oil increased by 3.1 %, sunflower oil by 1.1 % and soyabean oil by 0.3% over the previous month. The WPI of mustard & rapeseed oil decreased by 2.9 %, cotton seed by 0.5 %, copra oil by 0.3 % and groundnut oil by 0.3 % over the previous month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of fruits & vegetable as a group stood at 229.0 in February, 2016 showing a decrease of 11.1% and 2.5% over the previous month and year, respectively.

Potato

The Wholesale Price Index (WPI) of potato stood at 152.2 in February, 2016 showing an increase of 0.5 % over the previous month. However, it shows a decrease of 6.3 % over the previous year

Onion

The Wholesale Price Index (WPI) of onion stood at 299.4 in February, 2016 showing a decrease of 14.1% and 13.2% over the previous month and year, respectively.

Condiments & Spices

The Wholesale Price Index (WPI) of condiments & spices (group) stood at 357.2 in February, 2016 showing a decrease of 1.7% over the previous month. However, it shows an increase of 13.6% over the previous year. The WPI of black pepper (1.1 %) and turmeric (1.7 %) decreased over the previous month. However, chillies (dry) shows an increase of 3.5 % over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of raw cotton stood at 184.6 in February, 2016 showing a decrease of 3.1 % over the previous month. However, it shows an increase of 4.1 % over the previous year

Raw Jute

The Wholesale Price Index (WPI) of raw jute stood at 493.8 in February, 2016 showing an increase of 2.2% and 60.3% over the previous month and year, respectively.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

Commodity	Latest	Month	Year	% Variation Over	
	February, 2016	January, 2016	February, 2015	Month	Year
OIL SEEDS	210.0	215.3	202.6	-2.5	3.7
Groundnut Seed	236.9	242.2	215.0	-2.2	10.2
Rape & Mustard Seed	229.8	242.9	201.8	-5.4	13.9
Cotton Seed	211.5	211.4	154.0	0.0	37.3
Copra (Coconut)	125.0	128.0	176.8	-2.3	-29.3
Gingelly Seed (Sesamum)	276.8	294.9	392.9	-6.1	-29.5
Niger Seed	356.8	378.8	222.6	-5.8	60.3
Safflower (Kardi Seed)	148.4	148.4	127.4	0.0	16.5
Sunflower	199.3	197.9	180.0	0.7	10.7
Soyabean	207.8	208.7	199.4	-0.4	4.2

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS-*contd*.

Commodity	Latest February, 2016	Month January, 2016	Year February, 2015	% Variation Over Month	% Variation Over Year
EDIBLE OILS	150.2	149.6	145.6	0.4	3.2
Groundnut Oil	191.7	192.2	178.5	-0.3	7.4
Cotton Seed Oil	196.9	197.8	172.8	-0.5	13.9
Mustard & Rapeseed Oil	183.3	188.7	163.2	-2.9	12.3
Soyabean Oil	150.8	150.4	153.2	0.3	-1.6
Copra Oil	144.0	144.5	153.5	-0.3	-6.2
Sunflower Oil	135.1	133.6	125.8	1.1	7.4
Gingelly Oil	165.0	160.0	172.7	3.1	-4.5
FRUITS & VEGETABLES	229.0	257.5	234.9	-11.1	-2.5
Potato	152.2	151.5	162.4	0.5	-6.3
Onion	299.4	348.4	345.0	-14.1	-13.2
CONDIMENTS & SPICES	357.2	363.3	314.3	-1.7	13.6
Black Pepper	702.4	710.0	725.1	-1.1	-3.1
Chillies(Dry)	408.5	394.7	314.5	3.5	29.9
Turmeric	262.1	266.6	255.2	-1.7	2.7
Raw Cotton	184.6	190.5	177.3	-3.1	4.1
Raw Jute	493.8	483.2	308.0	2.2	60.3

STATISTICAL TABLES

Wages

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

(In Rs.)

State	District	Centre	Month & Year	Daily Normal Working Hours	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
											Carpenter	Black Smith	Cobbler
					M	W	M	W	M	W	M	M	M
Andhra Pradesh	Krishna	Ghantasala	Aug,15	8	267	175	300	NA	250	200	NA	NA	NA
	Guntur	Tadikonda	Aug,15	8	275	200	275	NA	225	NA	NA	NA	NA
Telangana	Ranga Reddy	Arutala	Sep,15	8	300	233	NA	NA	NA	NA	NA	NA	NA
Karnataka	Bangalore	Harisandra	Aug,15	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tumkur	Gidlahali	Aug,15	8	168	160	180	180	180	180	180	180	180
Maharashtra	Nagpur	Mauda	Sep, 14	8	100	80	NA	NA	NA	NA	NA	NA	NA
	Ahmednagar	Akole	Sep, 14	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand	Ranchi	Gaitalsood	March,14	8	120	120	100	100	75	75	200	200	NA

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

(In Rs.)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri-Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Assam	Barpeta	Laharapara	June,15	M	8	250	250	250	250	250	200	300	300	250
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Muzaffarpur	BhaluiRasul	June,14	M	8	310	210	210	260	250	210	350	360	310
				W	8	NA	NA	NA	250	210	NA	NA	NA	NA
	Shekhpura	Kutaut	June,14	M	8	220	NA	NA	NA	220	NA	280	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh	Dhamtari	Sihava	Dec,15	M	8	NA	170	NA	120	150	100	250	150	100
				W	8	NA	160	NA	100	100	100	200	100	100
Gujarat*	Rajkot	Rajkot	Sep, 15	M	8	215	205	163	180	150	188	450	450	360
				W	8	NA	175	150	175	135	117	NA	NA	NA
	Dahod	Dahod	Sep,15	M	8	180	160	160	160	130	NA	260	210	210
				W	8	NA	160	160	160	130	NA	NA	NA	NA
Haryana	Panipat	Ugarakheri	Oct,15	M	8	400	400	400	400	400	NA	NA	NA	NA
				W	8	NA	NA	300	300	300	NA	NA	NA	NA
Himachal Pradesh	Mandi	Mandi	Dec,13	M	8	NA	162	162	162	162	NA	260	240	240
				W	8	NA	162	162	162	162	NA	650	NA	NA
Kerala	Kozhikode	Koduvally	July,15	M	4-8	1230	660	NA	660	957	NA	760	NA	NA
				W	4-8	NA	NA	460	510	510	NA	NA	NA	NA
	Palakkad	Elappally	July,15	M	4-8	500	500	NA	NA	467	NA	600	NA	NA
				W	4-8	NA	NA	300	NA	300	NA	NA	NA	NA
Madhya Pradesh	Hoshangabad	Sangarkhera	Sep,15	M	8	100	130	130	NA	100	100	500	500	NA
				W	8	NA	130	130	NA	100	NA	NA	NA	NA
	Satna	Kotar	Sep,15	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Shyopurkala	Vijaypur	Sep,15	M	8	NA	300	NA	300	NA	250	300	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

(in Rs)

State	District	Centre	Month & Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri-Labour	Herdsman	Skilled Labours		
												Carpenter	Black Smith	Cobbler
Odisha	Bhadrak	Chandbali	Dec,15	M	8	200	200	200	250	250	250	300	300	200
				W	8	NA	150	180	200	200	200	NA	NA	NA
	Ganjam	Aska	Dec,15	M	8	300	200	200	250	200	200	400	400	400
				W	8	NA	100	150	150	100	100	NA	NA	NA
Punjab	Ludhiyana	Pakhowal	July,14	M	8	300	300	300	NA	365	NA	395	395	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan	Barmer	Kuseep	Aug,15	M	8	NA	NA	300	NA	NA	300	700	500	NA
				W	8	NA	NA	200	NA	NA	200	NA	NA	NA
Tamil Nadu*	Jalore	Sarnau	Aug,15	M	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
				W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Thanjavur	Pulvarnatham	Dec,15	M	8	400	354	NA	375	348	NA	NA	NA	NA
				W	8	NA	NA	124	130	121	NA	NA	NA	NA
	Tirunelveli	Malayakulam	Dec,15	M	8	NA	350	350	250	488	NA	NA	NA	NA
				W	8	NA	NA	159	174	358	NA	NA	NA	NA
Tripura	State Average		Apr, 14	M	8	287	262	264	277	261	270	305	212	285
				W	8	NA	197	201	209	197	200	NA	NA	NA
Uttar Pradesh*	Meerut	Ganeshpur	Nov,15	M	8	280	268	262	NA	262	NA	375	NA	NA
				W	8	NA	200	206	NA	206	NA	NA	NA	NA
	Aurraiya	Aurraiya	Nov,15	M	8	150	150	150	NA	160	NA	336	NA	.NA
				W	8	NA	NA	NA	NA	160	NA	364	NA	NA
	Chandauli	Chandauli	Nov,15	M	8	NA	NA	NA	200	200	NA	350	NA	NA
				W	8	NA	NA	NA	200	200	NA	NA	NA	NA

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

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

(Average wholesale Prices in Rs.)

Commodity	Variety	Unit	State	Centre	2014-15	2013-14	Crop Year
Wheat	PBW 343	Quintal	Punjab	Amritsar	1501	1486	May-April
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1522	1530	May-April
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1602	1633	May-April
Jowar	-	Quintal	Maharashtra	Mumbai	2360	2542	May-April
Gram	No III	Quintal	Madhya Pradesh	Sehore	2740	2942	May-April
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1335	1358	May-April
Gram Split	-	Quintal	Bihar	Patna	4507	4733	May-April
Gram Split	-	Quintal	Maharashtra	Mumbai	4025	5325	May-April
Arhar Split	-	Quintal	Bihar	Patna	6948	6524	May-April
Arhar Split	-	Quintal	Maharashtra	Mumbai	6963	6725	May-April
Arhar Split	-	Quintal	NCT of Delhi	Delhi	6175	6312	May-April
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	7767	6425	May-April
Gur	-	Quintal	Maharashtra	Mumbai	3238	3675	Nov-Oct
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4096	4260	Nov-Oct
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2320	2541	Nov-Oct
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3275	3248	Apr-Mar
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3638	3746	Apr-Mar
Mustard Seed	-	Quintal	West Bengal	Kolkata	3925	3783	Apr-Mar
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4158	4123	Apr-Mar
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	3832	3601	Apr-Mar
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1521	1700	Apr-Mar
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	1985	1550	Apr-Mar
Castor Seed	-	Quintal	Andhra Pradesh	Hyderabad	3740	3308	Apr-Mar
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	13559	7990	Nov-Oct
Copra	FAQ	Quintal	Kerala	Alleppey	8717	9367	Nov-Oct
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	4500	4290	Nov-Oct
Groundnut	-	Quintal	Maharashtra	Mumbai	5875	5867	Nov-Oct
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1202	1203	Apr-Mar
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1254	1210	Apr-Mar
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	1434	1179	Nov-Oct
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1566	1271	Nov-Oct
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1438	1291	Apr-Mar
Castor Oil	-	15 Kg.	Andhra Pradesh	Hyderabad	1247	1238	Nov-Oct
Sesamum Oil	-	15 Kg.	NCT of Delhi	Delhi	1831	1790	Nov-Oct
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2256	2628	Nov-Oct
Coconut Oil	-	15 Kg.	Kerala	Cochin	1784	2107	Jan-Dec
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	1778	1753	Apr-Mar
Groundnut Cake	-	Quintal	Andhra Pradesh	Hyderabad	3473	2992	Nov-Oct
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	3867	4421	Sept-Aug
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	3436	3886	Sept-Aug
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	3180	2806	July-June
Jute Raw	W 5	Quintal	West Bengal	Kolkata	3128	2757	July-June

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

Commodity	Variety	Unit	State	Centre	2014-15	2013-14	Crop Year
Oranges	-	100 No	NCT of Delhi	Delhi	523	505	Jan-Dec
Oranges	Big	100 No	Tamil Nadu	Chennai	448	563	Jan-Dec
Oranges	Nagpuri	100 No	West Bengal	Kolkata	740	507	Jan-Dec
Banana	-	100 No.	NCT of Delhi	Delhi	338	337	Jan-Dec
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	498	468	Jan-Dec
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	68167	57000	Jan-Dec
Almonds	-	Quintal	Maharashtra	Mumbai	77917	63667	Jan-Dec
Walnuts	-	Quintal	Maharashtra	Mumbai	72000	65250	Jan-Dec
Kishmish	-	Quintal	Maharashtra	Mumbai	22792	16250	Jan-Dec
Peas Green	-	Quintal	Maharashtra	Mumbai	4117	4600	Jan-Dec
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1660	1380	Jan-Dec
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2350	2292	Jan-Dec
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1883	1598	Jan-Dec
Potatoes	Red	Quintal	Bihar	Patna	780	1465	Jan-Dec
Potatoes	Desi	Quintal	West Bengal	Kolkata	679	1403	Jan-Dec
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	1830	3091	Jan-Dec
Onions	Pole	Quintal	Maharashtra	Nashik	2054	1175	Jan-Dec
Turmeric	Nadan	Quintal	Kerala	Cochin	12292	10417	Jan-Dec
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	8208	9375	Jan-Dec
Chillies	-	Quintal	Bihar	Patna	9325	9024	Jan-Dec
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	60542	61833	Jan-Dec
Ginger	Dry	Quintal	Kerala	Cochin	21583	26375	Jan-Dec
Cardamom	Major	Quintal	NCT of Delhi	Delhi	119667	131417	Jan-Dec
Cardamom	Small	Quintal	West Bengal	Kolkata	109583	109667	Jan-Dec
Milk	Cow	100 Liters	NCT of Delhi	Delhi			Jan-Dec
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	Jan-Dec
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	30335	29682	Jan-Dec
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	44750	35417	Jan-Dec
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	34944	32724	Jan-Dec
Fish	Rohu	Quintal	NCT of Delhi	Delhi	8567	9958	Jan-Dec
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	33642	32075	Jan-Dec
Eggs	Madras	1000 No.	West Bengal	Kolkata	4004	4150	Jan-Dec
Tea	-	Quintal	Bihar	Patna	21063	20738	Jan-Dec
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	33583*	17667	Jan-Dec
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	30283	28000	Jan-Dec
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	14192	14750	Jan-Dec
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	4663	4266	Jan-Dec
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	3534	3466	Jan-Dec
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	3900	3858	Jan-Dec
Rubber	-	Quintal	Kerala	Kottayam	10346	12483	Jan-Dec
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	30846	29725	Jan-Dec

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets during Year 2016

Commodity	Variety	Country	Centre	Unit	JAN	FEB
CARDAMOM	Guatmala Bold Green	U.K.	-	Dollar/MT	9000.00	9000.00
				Rs./Qtl	61281.00	61542.00
CASHEW KERNELS	Spot U.K. 320s	U.K.	-	Dollar/lbs	8350.09	8143.20
				Rs./Qtl	56855.76	55683.20
CASTOR OIL	Any Origin ex tank Rotterdam	Netherlands	-	Dollar/MT	1374.00	1244.70
				Rs./Qtl	9355.57	8511.26
CHILLIES	Birds eye 2005 crop	Africa	-	Dollar/MT	4100.00	4100.00
				Rs./Qtl	27916.90	28035.80
CLOVES	Singapore	Madagascar	-	Dollar/MT	8650.00	8650.00
				Rs./Qtl	58897.85	59148.70
COCONUT OIL	Crude Phillipine/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	1155.00	1255.00
				Rs./Qtl	7864.40	8581.69
COPRA	Phillipines cif Rotterdam	Phillipine	-	Dollar/MT	687.50	714.50
				Rs./Qtl	4681.19	4885.75
CORRIANDER		India	-	Dollar/MT	2000.00	2000.00
				Rs./Qtl	13618.00	13676.00
CUMMIN SEED		India	-	Dollar/MT	2200.00	2200.00
				Rs./Qtl	14979.80	15043.60
GROUNDNUT OIL	Crude Any Origin cif Rotterdam	U.K.	-	Dollar/MT	1200.00	1200.00
				Rs./Qtl	8170.80	8205.60
MAIZE		U.S.A.	Chicago	C/56 lbs	369.25	359.75
				Rs./Qtl	988.09	966.77
OATS		Canada	Winnipeg	Dollar/MT	283.14	250.42
				Rs./Qtl	1927.90	1712.37
PALM KERNAL OIL	Crude Malaysia/ Indonesia, cif Rotterdam	Netherlands	-	Dollar/MT	890.00	1030.00
				Rs./Qtl	6060.01	7043.14
PALM OIL	Crude Malaysian/ Sumatra, cif Rotterdam	Netherlands	-	Dollar/MT	575.00	637.50
				Rs./Qtl	3915.18	4359.23
PEPPER (Black)	Sarawak Black lable	Malaysia	-	Dollar/MT	10000.00	10000.00
				Rs./Qtl	68090.00	68380.00
	Canola	CANADA	Winnipeg	Can Dollar/MT	481.20	460.70
				Rs./Qtl	2334.78	2298.89
RAPESEED	UK delivered rapeseed, delivered Erith(buyer)	U.K.	-	Pound/MT	247.00	247.00
				Rs./Qtl	2415.66	2352.43
RAPESEED OIL	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	660.00	614.00
				Rs./Qtl	6454.80	5847.74
SOYABEAN MEAL	UK produced 49% oil & protein ('hi-pro') ex-mill seaforth UK bulk	U.K.	-	Pound/MT	248.00	255.00
				Rs./Qtl	2425.44	2428.62
SOYABEAN OIL		U.S.A.	-	C/lbs	30.87	30.92
				Rs./Qtl	4632.67	4659.94
	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	618.00	639.00
				Rs./Qtl	6044.04	6085.84
SOYABEANS		U.S.A.	-	C/60 lbs	883.00	867.50
				Rs./Qtl	2206.53	2177.03
	US NO.2 yellow	Netherlands	Chicago	Dollar/MT	377.20	372.90
				Rs./Qtl	2568.35	2549.89
SUNFLOWER SEED OIL	Refined bleached and deodorised ex-tanks, broker price	U.K.	-	Pound/MT	674.00	720.00
				Rs./Qtl	6591.72	6857.28
Wheat		U.S.A.	Chicago	C/60 lbs	476.50	442.75
				Rs./Qtl	1190.73	1111.10

Source: Public Ledger.

	Currency	JAN	FEB
Foreign Exchange Rates	CanDollar	48.52	49.90
	UKPound	97.80	99.17
	USDollar	68.09	68.47

Crop Production

4. Sowing and Harvesting Operations Normally in Progress During May, 2016

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Autumn Rice, Sugarcane, Groundnut	Summer Rice, Onion.
Assam	Winter Rice, Maize, Tur (R), Cotton.	Summer Potato (Hills).
Bihar	Autumn Rice, Jute, Mesta. Castoresed.	Summer Rice, Wheat, Barley, Gram. Linseed.
Gujarat	Sugarcane, Ginger, Turmeric.	Onion
Himachal Pradesh	Maize, Ragi, Small Millets (K), Summer Potato (Hills), Sugarcane, Ginger, Chillies (Dry), Tobacco, Sesamum, Cotton, Turmeric.	Wheat, Barley, Gram, Other Rabi Pulses, Linseed, Onion.
Jammu & Kashmir	Autumn Rice, Jowar (K), Maize, Ragi, Small, Millets (K), Mung (K), Tur (K), Other Tobacco, Sannhemp.	Wheat, Barley, Small Millets (R) Tur (K). Sesamum, Rapeseed and Mustard, Linseed. Onion.
Karnataka	Autumn Rice, Jowar (K), Maize, Ragi, Urad (K), Mung (K), Summer Potato (Hills), Tobacco, Castorseed, Sesamum, Cotton, Sweet Potato, Turmeric, Sannhemp, Onion, Tapioca.	Summer Rice, Ragi (R), Winter Potato (Plain), Tapioca.
Kerala	Autumn Rice, Ragi, Small Millets (K), Tur (K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Turmeric, Tapioca (Early).	Summer Rice, Other Rabi Pulses. Tapioca (Late).
Madhya Pradesh	Sugarcane, Ginger, Chillies (Dry), Turmeric.	Winter Potato (Plains), Onion.
Maharashtra	Termeric.	—
Manipur	Autumn Rice, Groundnut, Castorseed, Cotton, Turmeric.	—
Orissa	Autumn Rice, Sugarcane, Chillies (Dry), Jute.	Summer Rice, Cotton, Chillies (Dry).
Punjab and Haryana	Autumn Rice, Summer Rice, Ragi, Small Millets (K), Tur (K), Summer Potato (Hills) Chillies (Dry), Cotton, Sweet Potato.	Wheat, Barley, Winter Potato (Plains) Summer Potato, Tabacco,Onion.
Rajsthan	Sugarcane	Wheat, Small Millets (R), Tabacco.
Tamil Nadu	Autumn Rice, Bajra, Summer Potato, Sugarcane, Chillies (Dry), Groundnut, Turmeric, Sannhemp. Tapioca	Summer Rice, Jowar (R), Winter Potato (Hills), Sugarcane, Chillies (Dry). Sesamum, Onion.
Tripura	Autumn Rice, Maize, Sugarcane, Ginger, Chillies (Dry), Seasmum, Cotton, Jute, Mesta.	—
Uttar Pradesh	Autumn Rice, Tur (K), Chillies (Dry), Groundnut, Cotton, Jute, Mesta, Linseed.	Summer Rice, Wheat, Barley, Sugarcane, Tabacco, Rapeseed and Mustard, Sannhemp, Onion.
West Bengal	Autumn Rice, Winter Rice, Tur (K), Ginger, Chillies (Dry), Jute, Mesta.	Summer Rice Chillies (Dry). Sesamum.
Delhi	Jowar (K), Onion.	

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