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NOTE TO CONTRIBUTORS

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Abbreviations used

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

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General Survey of Agriculture

Trends in Foodgrain Prices

During the month of July, 2015 the All India Index Number of Wholesale Price (2004-05=100) of foodgrains increased by 0.98 percent from 244.6 in June, 2015 to 247.0 in July, 2015. The Wholesale Price Index (WPI) Number of cereals increased by 0.43 percent from 230.9 to 231.9 and WPI of pulses increased by 2.88 percent from 308.9 to 317.8 during the same period. The Wholesale Price Index Number of wheat increased by 1.19 percent from 210.4 to 212.9 while that of rice increased by 0.34 percent from 236.9 to 237.0 during the same period.

Weather, Rainfall and Reservoir Situation during August, 2015

Rainfall Situation

Cumulative Rainfall for the country as a whole during the period 1st June to 26th August, 2015 was 12% lower than Long Period Average (LPA). Rainfall (% departure from LPA) in the four broad geographical divisions of the country during the above period was lower by 20% in South Peninsula, 15% in Central India and 6% in East & North East India and North West India respectively. Out of 36 met sub-divisions, 21 met sub-divisions have received excess/normal rainfall and 15 met sub-divisions received deficient rainfall. Out of 613 districts, 88 districts (14%) received excess, 256 districts (42%) received normal, 244 districts (40%) received deficient and 26 districts (4%) received scanty rainfall during the above period.

4th Advance Estimates of Production of Foodgrains For 2014-15

The 4th Advance Estimates of production of major crops for 2014-15 have been released by the Department of Agriculture & Cooperation on 17.08.2015. The production of kharif crops during 2014-15 suffered due to bad monsoon. Unseasonal rains/hailstorm during Feb-March 2015 had significant impact on production of rabi crops. As a result of setback in kharif as well as rabi seasons, the production of most of the crops in the country has declined during 2014-15. As per 4th Advance Estimates, the production of major crops during 2014-15 is as under:

Total foodgrains production in the country is estimated at 252.68 million tonnes which is lower by 12.36 million tonnes than the last year's record foodgrains production of 265.04 million tonnes. Total production of rice is estimated at 104.80 million tonnes which is lower by 1.85 million tonnes than the last year's record production of 106.65 million tonnes. Production of wheat estimated at 88.94 million tonnes is lower by 6.91 million tonnes than the record production of 95.85 million tonnes achieved

during 2013-14. Total production of coarse cereals estimated at 41.75 million tonnes is also lower by 1.54 million tonnes than their production during 2013-14. Production of pulses estimated at 17.20 million tonnes is lower by 2.05 million tonnes than their production during the last year. With a decrease of 6.07 million tonnes over the last year, total production of oilseeds in the country is estimated at 26.68 million tonnes. Production of sugarcane is estimated at 359.33 million tonnes which is higher by 7.19 million tonnes as compared to last year. Total production of cotton estimated at 35.48 million bales (of 170 kgs. each) is marginally lower than last year but higher by 3.01 million bales than the average production of last 5 years. Production of jute & mesta is estimated at 11.45 million bales (of 180 kg. each) which are marginally lower than their production during the last year.

Water Storage in Major Reservoirs

Central Water Commission monitors 91 major reservoirs in the country which have a total live capacity of 157.80 BCM at Full Reservoir Level (FRL). Live storage in these reservoirs as on 27th August, 2015 has been 91.84 BCM as against 105.11 BCM on 27.08.2014 (last year) and 104.72 BCM of normal storage (average storage of the last 10 years). Current year's storage as on 27.08.2015 has been 13% lower than last year's and 12% higher than the normal storage.

Sowing Position during Kharif 2015

As per latest information available on sowing of crops, around 91.4% of the normal area under kharif crops has been sown upto 28.08.2015. Area sown under all kharif crops during current year has been 967.83 lakh hectare (ha.) at All India level as compared to 956.93 lakh ha. in the corresponding period of last year.

As compared to normal kharif area, the area coverage during current kharif season is higher by 3.4 lakh ha. under urad, 1.6 lakh ha. under moong, 7.3 lakh ha. under soyabean, 1.9 lakh ha. Under sesamum and 1.5 lakh ha. under maize. Area coverage is lower by 4.6 lakh ha. Under jowar, 4.9 lakh ha. under bajra, 2.6 lakh ha. Under tur, 6.3 lakh ha. under groundnut, 1.1 lakh ha. under sunflower and 1.6 lakh ha. under cotton.

Economic Growth

As per the quarterly estimates of Gross Domestic Product (GDP) released by the Central Statistics Office (CSO) on 31st August, 2015 the growth rate of GDP at constant (2011-12) market prices for the first quarter (Q1) (April-June) of 2015-16 is estimated at 7.0 per cent as compared to the growth of 6.7 per cent in Q1, and 7.5 per cent in Q4 of 2014-15.

The growth of Gross Value Added (GVA) at constant (2011-12) basic prices for agriculture & allied sectors, industry sector and services sector are estimated at 1.9 per cent, 6.5 per cent and 8.9 per cent respectively in Q1 of 2015-16 as compared to the corresponding rates of 2.6 per cent, 7.7 per cent and 8.7 per cent respectively in Q1 of 2014-15 (Table 2).

The private final consumption expenditure as a percentage of GDP increased from 60.7 per cent in Q1 of 2014-15 to 61.3 per cent Q1 of 2015-16. Gross fixed capital formation (GFCF) as a percentage of GDP declined from 29.2 per cent in Q1 of 2014-15 to 27.8 per cent in Q1 of 2015-16.

The growth rate of Gross Domestic Product (GDP) at constant (2011-12) market prices was estimated at 7.3 per cent in 2014-15 (full year; provisional estimates), as compared to 6.9 per cent and 5.1 per cent in 2013-14 and 2012-13 respectively (Table 1).

There was a decline in the rate of gross domestic saving from 33.9 per cent of the GDP in 2011-12 to 31.8 per cent in 2012-13 and further to 30.6 per cent in 2013-14. This was caused mainly by the sharp decline in the rate of household physical savings.

Agriculture and Food Management

Rainfall

During the South West Monsoon season (1st June-23rd September) of 2015, the cumulative rainfall has been 12 per cent below normal. The actual rainfall received during the Monsoon season 2015, as on 23.09.2015, has been 747.9 mm as against the normal at 853.9 mm. Out of the total 36 meteorological sub-divisions, 1 sub-division received excess season rainfall, 19 sub-divisions received

normal season rainfall and the remaining 16 sub-divisions received deficient season rainfall.

All India Production of Foodgrains

As per the 1st advance estimates released by Ministry of Agriculture on 16.09.2015, production of kharif foodgrains during 2015-16 is estimated at 124.1 million tonnes compared to 120.3 million tonnes in 2014-15 (1st AE) (Table 3).

Procurement

Procurement of rice as on 15.09.2015 was 32.0 million tonnes during Kharif Marketing Season 2014-15 (which runs from October to September) and procurement of wheat as on 15.09.2015 was 28.1 million tonnes during Rabi Marketing Season 2015-16 (Which runs from April to March) (Table 4).

Off-take

Off-take of rice during the month of June, 2015 was 25.6 lakh tonnes. This comprises 20.8 lakh tonnes under TPDS/NESA (off-take against the allocation for the month of July, 2015) and 4.9 lakh tonnes under other schemes. In respect of wheat, total off-take was 20.3 lakh tonnes comprising 17.7 lakh tonnes under TPDS/NESA (off-take against the allocation for the month of July, 2015) and 2.6 lakh tonnes under other schemes.

Stocks

Stocks of foodgrains (rice and wheat) held by FCI as on September 1, 2015 were 50.8 million tonnes, compare to 57.3 million tonnes as on September 1, 2014 (Table 5).

TABLE 1 : GROWTH OF GVA AT BASIC PRICES BY ECONOMIC ACTIVITY (AT 2011-12 PRICES) (in per cent)

| Sector | Growth | | | Share in GVA | | |
|--|------------|------------|-------------|--------------|--------------|--------------|
| | 2012-13 | 2013-14 | 2014-15(PE) | 2012-13 | 2013-14 | 2014-15(PE) |
| Agriculture, forestry & fishing | 1.2 | 3.7 | 0.2 | 17.7 | 17.2 | 16.1 |
| Industry | 2.4 | 4.5 | 6.1 | 32.3 | 31.7 | 31.4 |
| Mining & Quarrying | -0.2 | 5.4 | 2.4 | 3.0 | 3.0 | 2.9 |
| Manufacturing | 6.2 | 5.3 | 7.1 | 18.3 | 18.1 | 18.1 |
| Electricity, gas, water supply & other utility services | 4.0 | 4.8 | 7.9 | 2.4 | 2.3 | 2.3 |
| Construction | -4.3 | 2.5 | 4.8 | 8.6 | 8.3 | 8.1 |
| Services | 8.0 | 9.1 | 10.2 | 50.0 | 51.1 | 52.5 |
| Trade, hotels, transport, communication and services related to broadcasting | 9.6 | 11.1 | 10.7 | 18 | 18.8 | 19.4 |
| Financial, real estate & professional services | 8.8 | 7.9 | 11.5 | 19.5 | 19.7 | 20.5 |
| Public administration, defence and Other Services | 4.7 | 7.9 | 7.2 | 12.5 | 12.6 | 12.6 |
| GVA at basic prices | 4.9 | 6.6 | 7.2 | 100.0 | 100.0 | 100.0 |
| GDP at market prices | 5.1 | 6.9 | 7.3 | --- | --- | --- |

Source : Central Statistics Office (CSO). PE: Provisional Estimates.

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

| Sectors | 2013-14 | | | | 2014-15 | | | | 2015-16 |
|--|-------------|-------------|------------|------------|------------|-------------|-------------|-------------|------------|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 |
| Agriculture, forestry & fishing | 2.7 | 3.6 | 3.8 | 4.4 | 2.6 | 2.1 | -1.1 | -1.4 | 1.9 |
| Industry | 4.8 | 4.0 | 5.0 | 4.3 | 7.7 | 7.6 | 3.6 | 5.6 | 6.5 |
| Mining & quarrying | 0.8 | 4.5 | 4.2 | 11.5 | 4.3 | 1.4 | 1.5 | 2.3 | 4.0 |
| Manufacturing | 7.2 | 3.8 | 5.9 | 4.4 | 8.4 | 7.9 | 3.6 | 8.4 | 7.2 |
| Electricity, gas, water supply & other utility services | | | | | | 3.2 | | | |
| | 2.8 | 6.5 | 3.9 | 5.9 | 10.1 | 8.7 | 8.7 | 4.2 | 3.2 |
| Construction | 1.5 | 3.5 | 3.8 | 1.2 | 6.5 | 8.7 | 3.1 | 1.4 | 6.9 |
| Services | 10.2 | 10.6 | 9.1 | 6.4 | 8.7 | 10.4 | 12.5 | 9.2 | 8.9 |
| Trade, hotels, transport, Communication and services related to Broadcasting | 10.3 | 11.9 | 12.4 | 9.9 | 12.1 | 8.9 | 7.4 | 14.1 | 12.8 |
| Financial, real estate & Professional services | 7.7 | 11.9 | 5.7 | 5.5 | 9.3 | 13.5 | 13.3 | 10.2 | 8.9 |
| Public administration, defence and Other Services | 14.4 | 6.9 | 9.1 | 2.4 | 2.8 | 7.1 | 19.7 | 0.1 | 2.7 |
| GVA at basic prices | 7.2 | 7.5 | 6.6 | 5.3 | 7.4 | 8.4 | 6.8 | 6.1 | 7.1 |
| GDP at market prices | 7.0 | 7.5 | 6.4 | 6.7 | 6.7 | 8.4 | 6.6 | 7.5 | 7.0 |

Source: Central Statistics Office (CSO).

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

| Crop | Production (in Million Tonnes) | | | |
|----------------------|--------------------------------|--------------------|---------------------|-----------------------|
| | 2012-13 (Final) | 2013-14 (Final) | 2014-15 (4th AE) | 2015-16\$ (1st AE) |
| Total Foodgrains | 257.1 | 265.0 | 252.7 | 124.1 |
| Rice | 105.2 | 106.7 | 104.8 | 90.6 |
| Wheat | 93.5 | 95.9 | 88.9 | - |
| Total Coarse Cereals | 40.0 | 43.3 | 41.8 | 27.9 |
| Total Pulses | 18.3 | 19.3 | 17.2 | 5.6 |
| Total Oilseeds | 30.9 | 32.8 | 26.7 | 19.9 |
| Sugarcane | 341.2 | 352.1 | 359.3 | 341.4 |
| Cotton | 34.2 | 35.9 | 35.5 | 33.5 |

\$Covers only Kharif Crops.

TABLE 4 : PROCUREMENT OF CROPS IN MILLION TONNES

| Crop | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|--------|---------|---------|---------|---------|---------|---------|
| Rice# | 34.2 | 35.0 | 34.0 | 31.8 | 31.7* | -- |
| Wheat@ | 22.5 | 28.3 | 38.2 | 25.1 | 28.0 | 28.1* |
| Total | 56.7 | 63.4 | 72.2 | 56.9 | 59.7 | 28.1 |

#Kharip Marketing Season (October-September), @ Rabi Marketing Season (April-March), *Position as on 03.08.2015.

TABLE 5 : OFF-TAKE AND STOCKS OF FOODGRAINS (Million Tonnes)

| Crops | Off-take | | | | Stocks | |
|---|----------|---------|---------|-----------------------|----------------------|----------------------|
| | 2012-13 | 2013-14 | 2014-15 | 2014-15 (Till May) | September 1, 2014 | September 1, 2015 |
| 1. Rice | 32.6 | 29.2 | 30.7 | 15.3 | 17.3 | 13.9 |
| 2. Unmilled Paddy# | | | | | 6.7 | 3.6 |
| 3. Converted Unmilled Paddy in terms of Rice | | | | 4.5 | 6.7 | 3.6 |
| 4. Wheat | 33.2 | 30.6 | 25.2 | 36.8 | 35.5 | 34.5 |
| Total (Rice & Wheat) (1+3+4) | 65.9 | 59.8 | 55.9 | 52.1 | 57.3 | 50.8 |

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

Farm Sector News

Kharif Crop Sowing Crosses 1026 Lakh Hectares

Areas of Pulse, Oilseeds, Sugarcane and Cotton Exceeds Normal Area

The total area sown under kharif crops as on 24th September, 2015 has reached to 1026.23 lakh hectares as compared to 1014.24 lakh hectare last year at the time.

Rice has been sown/transplanted in 374.09 lakh hectares, pulses in 113.45 lakh hectare (normal area 108.18 lakh hectares) coarse cereals in 183.16 lakh hectares, oilseeds in 183.16 lakh hectare (normal area 182.30 lakh hectares), sugarcane in 48.84 lakh hectares (normal area 48.37 lakh hectares) and cotton in 115.20 lakh hectare (normal area 115.02 lakh hectares).

The details of the area covered so far and that covered during last year this time given al follows:

| Crop | (Lakh hectare) | |
|----------------|----------------------|----------------------|
| | Area sown in 2015-16 | Area sown in 2014-15 |
| Rice | 374.09 | 373.86 |
| Pulses | 113.45 | 101.83 |
| Coarse Cereals | 183.16 | 178.44 |
| Oilseeds | 183.68 | 177.49 |
| Sugarcane | 48.84 | 48.74 |
| Jute & Mesta | 7.80 | 8.13 |
| Cotton | 115.20 | 125.75 |
| Total | 1026.23 | 1014.24 |

1st Advance Production Estimates of Major Kharif Crops during 2015-16

The 1st Advance Estimates of production of major kharif crops for 2015-16 have been released by the Department of Agriculture, Cooperation and Farmers Welfare here today. As per 1st Advance Estimates, the estimated production of major crops during kharif 2015-16 is as under:

| | |
|----------------|--|
| Foodgrains | -124.05 million tonnes |
| Rice | -90.61 million tonnes |
| Coarse Cereals | -27.88 million tonnes |
| Maize | -15.51 million tonnes |
| Pulses | -5.56 million tonnes |
| Tur | -2.61 million tonnes |
| Urad | -1.37 million tonnes |
| Oilseeds | -19.89 million tonnes |
| Soyabean | -11.83 million tonnes |
| Groundnut | -15.11 million tonnes |
| Castorseed | -1.94 million tonnes |
| Cotton | -33.51 million bales (of 170 kg each) |
| Sugarcane | -341.43 million tonnes |

The cumulative rainfall during the current monsoon season has been deficient by 15% *i.e.* higher than rainfall deficit of 12% in 2014-15. However, on account of timely onset of monsoon as well as Government's multiple interventions with contingency plans, timely advisories and regular monitoring of seed and fertilizer availability, estimated production of most of the crops during current kharif season has been higher in comparison to the 1st Advance Estimated for 2014-15. These are preliminary estimates and would undergo revision based on further feedback received from the States.

As per 1st Advance Estimates for 2015-16, total production of kharif foodgrains is estimated at 124.05 million tonnes which is higher by 3.78 million tonnes as compared to production of 120.27 million tonnes of foodgrains estimated as per 1st Advance Estimates for 2014-15.

Production of kharif rice estimated at 90.61 million tonnes is higher by 2.59 million tonnes estimated as per 1st Advance Estimates for 2014-15 and also higher by 0.98 million tonnes than its 5 years' average production.

As per 1st Advance Estimates for 2015-16, total production of kharif coarse cereals is estimated at 27.88 million tonnes which is higher by 0.83 million tonnes as compared to production of 27.05 million tonnes of kharif coarse cereals estimated as per 1st Advance Estimates for 2014-15. However, the production estimate for maize is marginally lower this year as compared to the 1st Advance Estimates for 2014-15.

Increase in area under urad and moong has led to increase in production of kharif pulses estimated at 5.56 million tonnes as against their production of 5.20 million tonnes as per 1st Advance Estimates for 2014-15.

Rs. 410 Crore Allocated to Frequently Drought Affected and over Exploited and Notified Ground Water Blocks

In the recent years, there has been a change in the rainfall pattern in the country. Number of rainfall events have been reduced which has resulted in longer dry spells. In many parts of the country, it has become a perennial problem of longer dry spells resulting in drought and drought like situation. In addition to the issue of scarcity of rain, there are few areas in the country where not only rainfall is limited but also due to over exploitation of ground water beyond rechargeable limit, has resulted in rapid depletion of ground water table. Central Ground Water Board (CGWB) through dynamic assessment of ground water has identified 1071 blocks/talukas under over exploited category which needs immediate special attention for water conservation and ground water recharge. CGWB has also notified about 150 blocks/talukas as most vulnerable areas suggesting regulated and cautions use of ground water. These blocks witness serious scarcity of water and are vulnerable even

to sustain drinking water requirement unless addressed for ground water recharge and its regulated use. It has also been observed that 219 districts in the country have been frequently affected by drought in the recent past. These areas are witnessing regular agrarian crisis and the farmers are in the state of distressed condition, requiring special attention and support for a durable and sustainable solution. All these have affected agriculture very adversely on ground and farmers in particular.

Realizing the gravity of situation, under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Government of India made an effort for the first time to identify the most vulnerable areas that require immediate attention for water conservation, harvesting and ground water recharge. The perennially drought affected districts along with the over exploited and notified blocks by CGWB have been considered for special treatment to improve the condition of underground water, to improve soil moisture regime and to create micro water storages for protective irrigation during longer dry spells. Department of Agriculture and Cooperation has allocated a sum of Rs. 410 crores during the current year to minimize the impact of drought and improving the ground water recharge.

Crop Insurance Period for Non-Loanee Farmers Extended to September, 15

The Government extended the period of crop insurance for non-loanee farmers from July 31, 2015 to September 15, 2015, under National Agricultural Insurance Scheme. This would benefit farmers of the states which had low rainfall or late rain and delayed planting. In the case of loanee farmers, the period was up to September 30, 2015.

Announcing the decision, Union Agriculture and Farmers Welfare Minister Shri Radha Mohan Singh said that the decision has been taken in the interest of farmers where delayed/low rainfall has been reported.

Government Closes Indian People's Natural Calamity Trust and Transfers its Corpus to PM Relief Fund

Department of Agriculture, Cooperation and Farmers' Welfare has taken a decision to wind up the Indian People's Natural Calamity Trust (INPCT) created by former ruler of Jaipur in 1900, with an objective to provide relief to the Indian people during famine. The Trust is presently administered under the chairmanship of Agriculture Minister with 27 nominated members and two officers. With the passage of time, the Trust seems to have outlived its utility. Since its last meeting held in August, 1995, the Trust has no significant activity except giving donations through PM Relief Fund in case of natural disasters. Now disaster management is being handled by National Disaster Management Authority in Ministry of Home Affairs which has sufficient budget and infrastructure. With the consent of the representative of the former Ruler of Jaipur and opinion of Ministry of Law and Justice, it has been decided

to wind up the Trust and Union Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh decided to transfer the balance fund of nearly Rs. 91 lakhs in its corpus to Prime Minister's Relief Fund for better utilization of the funds.

Steps taken by the Central Government for Relief to Farmers in view of Deficit Monsoon

To provide immediate relief to the farmers, in view of the deficit monsoon during kharif 2015, the Government of India has taken a number of decisions. Orders on these measures have already been issued to all State Governments, which will implement them on the basis of assessed need.

1. *Allocation of additional days of work under MGNREGA to households in drought affected areas:* The Government has decided to provide an additional 50 days of unskilled manual work in the financial year over and above the 100 days assured to job card holders in such rural areas where drought or natural calamities has been notified. This will enable States to provide additional wage employment to rural poor in drought affected areas. The poorest rural households will benefit from this, as it will help in immediate absorption of rural seasonal unemployment, and reduce rural distress.

2. *Diesel Subsidy Scheme for farmers in affected areas:* It has been decided to provide diesel subsidy to the farmers to enable them to provide life saving irrigation through diesel pump sets in the drought and deficit rainfall areas to protect the standing crops (allocation of Rs. 100 cr.). The farmers in the affected regions will be covered during the current South-West monsoon period till 30th September, 2015. The scheme on Diesel Subsidy will be implemented with the participation of the State Governments/UT Administration, with a view to off-set the cost of diesel used for pumping water for providing supplementary irrigations/protective irrigation. The scheme will be applicable to such districts/talukas/areas where the rainfall deficit is more than 50% as on 15th July, 2015, (as reported by India Meteorological Department); to such districts/talukas/areas, which have been declared as drought affected area by the respective State Government/UT Administration; areas with prolonged dry spell continuously for 15 days, *i.e.* scanty rainfall (deficit of 60% or more of normal) for any continuous 15 days period, after the onset date of Monsoon as per reports of IMD. It is proposed to provide 50% subsidy on the cost of diesel (Rs. 2000 per hectare) to the affected farmers, limited to a maximum of two hectares per farmer. The cost of assistance provided shall be shared between the Government of India and the State Government/UT Administration concerned on 50:50 basis.

3. *Enhancement of ceiling on Seed subsidy:* In order to compensate the farmers in the drought affected districts for the additional expenditure incurred in the sowing and/

or purchasing appropriate varieties of drought resistant seeds it has been decided to raise the extant ceiling on seed subsidy by 50% over existing levels for distribution in drought notified districts. The enhancement is valid till 31.12.2015.

4. *Interventions for saving perennial horticulture crops*: Appropriate input support measures will be provided to rejuvenate water stressed horticulture crops, with an additional allocation of Rs. 150 crore. The scheme is to be implemented in all drought affected districts/blocks in the country which are covered under Mission for Integrated Development of Horticulture (MIDH), being implemented by Dept. of Agriculture, Cooperation and Farmers Welfare. Farmers in the drought affected districts/blocks will be provided assistance @ Rs. 6000/- per hectare as per cost norms for a maximum area of two ha. per beneficiary for taking up appropriate combination of interventions. Assistance so provided through subsidy shall be shared between the Government of India and the State Government/UT Administration concerned on 50:50 basis.

5. *Implementation of additional fodder development programme*: Assistance will be provided for additional interventions for production of fodder for mitigating adverse impact of drought on livestock (allocation of Rs. 50 crore). Farmers in the drought affected districts/blocks will be provided assistance @ Rs. 3200/- per hectare as per cost norms for a maximum area of two ha. per beneficiary for taking up additional production of fodder in these districts/blocks. Assistance so provided through subsidy shall be shared between the Government of India and the State Government/UT Administration concerned on 50:50 basis.

6. *Flexible allocation under RKVY and other centrally sponsored schemes*: States have been advised to keep aside about 5 to 10% of fund allocated under Rashtriya Krishi Vikas Yojana (RKVY) for undertaking appropriate interventions, if the situation so warrants, to minimize the adverse impact of an aberrant monsoon on the agriculture sector. 10% of the allocation under Centrally Sponsored Scheme may be utilized in flexible manner by the States to meet contingent requirement arising out of deficient rains.

7. *Crop contingency plan*: Ministry of Agriculture, through ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad has prepared detailed crop Contingency Plans for 600 districts. States have been advised to prepare/update/fine-tune Contingency Plan for each district in consultation with CRIDA-ICAR and the State Agriculture Universities and to prepare location specific remedial measures based on these contingency plans in the event of the late arrival of Monsoon/long dry spells/scanty rainfall/drought conditions e.g. typing up availability of seeds and other inputs for implementing the Contingency Plans. As seen from the experience of last year, these are highly useful in case of a deviant monsoon. these plans are available

at the website of Dept. of Agriculture and Cooperation, Min. of Agriculture as well as Central Institute for Dryland Agriculture (CRIDA), Hyderabad.

8. *Advisories to the state*: State Government have already been advised to initiate advance remedial action e.g. constructing water harvesting structures under MGNREGA and other such schemes, promoting agronomic practices for moisture conservation, promoting cultivation of less water consuming crops and restoring irrigation infrastructure by desilting canals, energizing tube-wells, replacing/repairing faulty pumps. States have also been requested to carry out periodic assessment of preparation for kharif crops, particularly contingency crops and also investment made in water conservation structure under various schemes like Integrated Watershed Management Programme (IWMP) to verify their utility in harvesting the rainfall.

9. *Availability of seeds and other inputs for kharif, 2015*: Availability of seeds and other inputs is being monitored/reviewed on a continuous basis in the weekly Crop Weather Watch Group (CWWG) Meeting being held in the Department of Agriculture. Weekly video conference with States is also being held to get first-hand information about State's preparedness and to advise States appropriately whenever needed.

10. *SMS Advisory*: The Ministry, through the m-kisan portal sends SMS advisories to registered farmers. These advisories include weather based SMS advisories, advisories to suggest measures to minimize adverse impact of extreme weather event. Ministry through various operators send about 700 crore SMS in last one year. These SMS are sent by ICAR/SAU, KVK, AMFU etc and district level state government officials.

11. *Crisis management plan for drought for the year 2015*: A Crisis Management Plan (CMP) for Drought has been in place and is available at the website of Dept. of Agriculture and Cooperation, Ministry of Agriculture. The plan has also been updated recently in consultation with Stakeholder Ministries/Department. Agriculture Minister has also requested all Chief Minister, vide his letter dated 12.05.2015, to direct the officers concerned to expedite preparation of State level Management Plans on Drought.

12. *SDRF/NDRF funds-First Instalment of SDRF released*: The State Government is primarily responsible for providing necessary relief in the wake of natural calamities. Government of India supplements the efforts of the State Government with financial assistance. For undertaking relief measures, funds are available with the State Governments in the form of State Disaster Response Fund (SDRF). Additional financial assistance, over and above SDRF, is considered from National Disaster Response Fund (NDRF) for natural calamities of severe nature and is approved on the basis of Memorandum received from State Government in accordance with established procedure, keeping in view items and norms

in vogue for assistance. The 1st instalment of SDRF has already been released to State Governments. The SDRF funds, besides others, can also be used for emergency supply of drinking water in rural and urban areas, as per the approved guidelines.

Approval for Transfer Back by De-leasing of 72 acres and 3 marla of Land Adjoining Main Water Channel and Forest Area of the Sub campus of Central Institute for Research on Buffaloes at Nabha, Punjab to the Department of Animal Husbandry, Government of Punjab.

The Union Cabinet, chaired by Prime Minister Sri Narendra Modi approved the transfer back by de-leasing of 72 acres and 3 marla of land adjoining to main water channel and forest area of the sub campus of the Central Institute for Research on Buffaloes (CIRB) at Nabha, Punjab to the Department of Animal Husbandry, Government of Punjab for maintaining of cattle at the State-of-Art Advanced Cattle farm at Rauni (Patiala).

The de-leasing of land shall be subject to an undertaking by the Government of Punjab that the de-leased land will be used exclusively for establishing a fodder farm for cattle. CIRB/ICAR will extend the needed technical support (without any financial involvement) for carrying out research on fodder development in Punjab.

The Government of Punjab had ordered the establishment of State-of-the Art Advanced Cattle Farm, construction of which is in full swing. The farm has limited land to cultivate feed and fodder to maintain 300 cattle. Therefore, the land give to CIRB on lease basis was asked back by the Government of Punjab. The decision fulfills the fodder requirements for the Advanced Cattle Farm at Rauni.

**General Guidelines on Bio-security will Help in Preventing Ingress of Diseases in the Poultry Farms
General Guidelines for Bio-security for Poultry Farms Released**

Department of Animal Husbandry, Dairying & Fisheries (DADF), Ministry of Agriculture and Farmers' Welfare, on 18th September, released the "General Guidelines for Bio-security at Central Poultry Development Organization". The Department from time to time reviews the bio-security situation in their subordinate Organizations viz. Central Poultry Development Organizations (CPDOs). The least bio-security guidelines were issued in 2012. It was decided to revisit the bio-security guidelines in light of latest developments and to incorporate some practices in vogue to make them more effective. Keeping this in mind, the General Guidelines for Bio-security at Central Poultry Development Organizations were revised so that the basis tenets can be applied not only to CPDOs but also State and Private Poultry Farms.

Poultry farms across the country need to maintain the basic sanitary conditions essential for healthy birds and hygienic products. An integrated bio-security programme is an application on logical and sound principles specific to an enterprise, monitoring of disease status, evaluation of ongoing poultry farm operations on continuous basis with an objective to contain the diseases at bare minimum level. Some poultry diseases like Avian Influenza are zoonotic in nature, *i.e.* they may be transmitted to humans, and potentially poses serious public health risks.

The farms should strive to maximize the benefits achievable through effective bio-security and to be consistent with HACCP (Hazard Analysis, Critical Control Points) principles which can be developed easily. For this, the Central Poultry Development Organization & Training Institute (Southern Region), Hessarghatta would design training modules and hold workshops based on demand from the States.

After lessons from Avian Influenza and other poultry disease outbreaks across the country both in public and private farms, we must implement, as far as possible, a bio-security plan to prevent any future disasters. These guidelines are proposed to act as roadmap for keeping a close vigil and maintenance of bio-security and have been attempted to cover the conceptual, structural and operational bio-security through advisories on the farm location and design, restricted access to birds, traffic control, isolation and quarantine of new birds, cleaning and sanitation, personnel hygiene, hegienic disposal of poultry manure, disposal of dead birds and other bio/ bio-medical wastes, feed safety, period of rest or rearing of single age group, medication/vaccination of birds, flock profiling, collection of infective/suspected material for laboratory testing etc.

The major routes for disease and pathogen transmission are briefly enumerated. Emphasis is given on feed safety and water management, which were earlier not described in detail in the previous guidelines. It is also suggested therein, to refer the Action Plan on Avian Influenza (revised in March, 2015), compartmentalization checklist, the Prevention and control of Infections and Bio-Medical Waste (Management & Handling) Rules, 1998 under Environment (Protection) Act, 1986 etc., Disposal of dead bird(s) in a bio-secured manner, and compliance to the Prevention and Control of Infectious and Contagious Diseases in Animals Act, 2009. It is urged that the concerned personnel should be well versed of these and apply the bio-security measures in consonance, so that all relevant points are covered.

It is also suggested that if there is any mortality reported in wild bird/water birds/crows, etc. in farm campus the post mortem of such birds should be avoided in farm area. The Department and the Regional/State/District

Disease Diagnostic Labs. should be informed immediately and they may be requested to collect the samples as per their protocol for diagnosis [or for onward transmission to National Institute of High Security Animal Disease (NIHSAD), Bhopal in case of Avian Influenza] for diagnosis, as per the requirement to be decided by the competent authority. If Avian Influenza of Notified disease is suspected or confirmed at any farm demobilize the staff of the farm with immediate effect.

It is also suggested to immediately stop sale-purchase/inflow-outflow of all poultry products, feed or feed ingredients, etc. if disease is even suspected or diagnosed in any shed or farm till final test results of disease diagnosis is done and regarding Notified disease/Avian Influenza after confirmation from designated/NIHSAD Bhopal.

An indicative quick checklist for implementing an effective poultry bio-security plan is also given mentioning about securing perimeter by keeping "restricted" signs posted at drive entrances, avoiding trees or dense foliage around sheds and prevent roosting site for wild birds, restrict entry to essential personnel and record entry, keeping poultry houses locked, providing boots and coveralls for staff and visitors for each shed, personnel precautions like changing by staff in dedicated/disposable boots and coveralls upon entering each different shed. Other relevant pointers are also mentioned like removing poultry mortality daily, storing or disposing them off by an approved method; create awareness about the dangers of raising or visiting other avian species and their contact with their flock. Pointers on monitoring of vehicles, taking appropriate precautions such as disinfection, implementing a strong control program for insect, mammalian and avian vectors are also given. It is also reminded to recheck and review bio-security plan and flock health program, including vaccination protocols, with veterinarian on a regular basis.

It is also added that bio-security on poultry farms is an essential tool for ensuring welfare of poultry and humans by preventing transmission of poultry-related zoonotic and food-borne pathogens. Method of collection of infective/suspected material for laboratory testing is added as it is mostly seen that the samples sent to laboratories are not proper and testing/diagnosis is either not possible or leads to incorrect results.

Thus it is believed that this lucid General Guidelines on bio-security will help prevent ingress of diseases in the poultry farms. If all poultry farms across the country, both public and private follow the basic tenets listed in true spirit it will help in a disease-free, safe and wholesome poultry production.

Union Agriculture Minister Inaugurated Rabi Conference 2015 on 22nd September, Six Emerging Topics Identified for Detailed Group Discussions

The Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) of the Ministry of Agriculture & Farmers Welfare organizes Rabi and Kharif Conferences every year with a view to review performance of the preceding seasons and to prepare strategies for the coming season. In order to review the production performance of Kharif-2015 season, formulate strategies for crop production for ensuring Rabi 2015-16 season, take stock of inputs to ensure timely supply and to create awareness of new technologies & innovations in crop production and allied sectors, a National Conference on Agriculture for Rabi Campaign 2015-16 was organized on 22nd and 23rd September, 2015 at the National Agriculture Science Center, ICAR Pusa Complex, New Delhi.

The Agriculture Production Commissioner/Principal Secretary of Agriculture & Horticulture/Commissioner/Director of Agriculture/Horticulture from all the States/Union Territories; Scientists from Indian Council of Agricultural Research (ICAR); officer from the Department of Fertilizer (Government of India); Refinance institutions like National Bank for Agriculture and Rural Development (NABARD); officer of the Ministry of Agriculture & Farmers Welfare will participate in the conference. During the conference key presentations on performance of crop production during Kharif 2015 and strategies/prospects for Rabi 2015-16; and on focused topics highlighting innovative schemes related to agriculture & horticulture as also new research technologies would be made for providing exposure to the States.

The Conference was inaugurated by the Hon'ble Minister for Agriculture & Farmers, Welfare, Shri Radha Mohan Singh; Hon'ble Ministers of State, Dr. Sanjeev Kumar Balyan and Shri M.K. Kundariya also graced the occasion. They all had addressed the administrators, technocrats, agricultural scientists, representatives of various central departments/autonomous bodies and media persons invited to this important event. Shri Siraj Hussain, Secretary, Department of Agriculture, Cooperation & Farmers Welfare, under whose leadership and guidance the Rabi Conference was organized was present through the two day sessions and addressed the inauguration.

Shri Ashok Angurana, Secretary, Department of Animal Husbandary, Dairy & Fisheries and Dr. S. Ayyappan, Director General, ICAR and the Secretary, DARE also addressed the August gathering and briefly

apprised about the role & contribution of their organizations in agriculture and allied sectors with particular reference to improving the welfare of the farmers.

Six emerging topics identified for detailed group discussions amongst participating states under the guidance of DAC & FW on the first day of the conference are as under:

1. Promoting pulse and oilseeds in rice fallows
2. Promoting organic Farming through Paramparagat Krishi Yojana (PKVY)
3. Enhancing area under irrigation and achieving water use efficiency through Padhan Mantri Krishi Sinchayi Yojana (PMKSY)
4. Creating a nationally integrated market through National Agricultural Market
5. Agrarian crisis and agricultural crisis—Issues and solutions
6. Promotion of Horticulture in the country

The Rabi season is as important as Kharif in ensuring the nation's food security. The normal area that is cultivated in Rabi is 61.43 million ha. The principal crops are wheat, other cereals like barley, rabi jowar, rabi maize, pulses like bengal gram, oilseeds like linseeds, rape seed & mustard, safflower and commercial crops like tobacco. Rabi cropping system contributes to the country's foodgrains

output to an extent of about 51% on an average. The Department's strategy is to maximize the rabi output against the back-drop of rainfall deficit in some parts of the country.

Central Team to Visit Odisha for Assessment of Drought Situation and to Suggest Remedial Measures

Agriculture & Farmers Welfare Minister Shri Radha Mohan Singh has directed the Ministry to constitute a Central Team comprising of officers of the Ministry and a representative of ICAR-Central Rice Research Institute, Cuttack.

Central Team headed by Shri R.P. Mallick, Additional Commissioner and State Officials would shortly visit State of Orissa for assessment of drought situation and to suggest remedial measures.

Shri Dharmendra Pradhan, Minister of State, Petroleum and Natural Gas has requested the Agriculture & Farmers Welfare Minister to depute a Central Team for taking a firsthand view of the prevailing drought situation in different parts of the State and suggest remedial measures and strategies for combating agrarian and rural distress. Shri Pradhan has highlighted that 8 districts namely Dhenkanal, Khurda, Bolangir, Boudh, Bargarh, Subarnapur, Kandhamal and Kenosha have received less than normal rainfall. Additionally, agricultural activities in 103 blocks in 23 districts have been adversely affected.

ARTICLES

Agricultural Production and Trade Policy and Future Directions

A. AMARENDER REDDY* AND DP MALIK**

Abstract

India's performance in the agricultural sector both in terms of production and exports since 2004 is spectacular in many respects, despite the problems of labour shortages, decline in the share of labour force working in the sector. The paper assessed the agricultural production export performance by using the information from Ministry of Agriculture and Directorate of Foreign Trade. Given agricultural sector significantly influenced by the vagaries of the monsoon, average triennium of TE 2004 and TE 2014 compared. Overall, agricultural and allied sector GDP growth was 3.2 % between 2004 and 2014, which is quite good compared to earlier period. The food grain production increased from 200 to 260 million tonnes during TE 2004 to TE 2014 indicating CGR of 2.6% per annum. Especially growth rate in pulses and oilseeds are much higher at 3.4% and 4.4% per annum. The main driving force of the growth of the pulses and oilseeds may be the policy initiatives of steep increase in MSP for pulses and oilseeds compared to other crops. Another booster for agricultural growth is cotton, which is mainly driven by the Bt cotton technology and it revolutionised the agriculture in some drought prone and unirrigated areas. The high value crops, milk, meat, egg and fish all showed significantly higher growth rates mainly due to the rising demand and favourable Govt. policies.

In the past three years, the performance of agricultural exports is spectacular with share in total exports from 10.5% in 2010-11 to 13.5% in 2012-13. India's export basket is highly diverse with guar gum meal, cotton raw, basmati rice, marine products, meat and products, oil meals, spices and rice (other than basmati). The share of agricultural imports in India's total imports is much smaller at 3.8% of which only edible oils contribute about 60 % and pulses contributes 13%. As the production of chemical fertilizers in India is almost stagnant from 2001 onwards, hence fertilizers imported in large quantities *i.e.* 24.1 million tonnes by spending ₹ 47694 crores of foreign exchange in the year 2012-13.

In policy front, the increase in MSP for the pulses and oilseeds helped to some extent to increase in

production, but the gap between demand and supply of both the commodities is still at large. There is better performance of horticulture crops, first time the production of horticulture crops surpassed food grain production in India. However, India needs to increase its food safety standards and market infrastructure to meet both domestic and international demand. However, on the negative side there is stagnation in the production of chemical fertilizers and increase in imports, which is a burden on the foreign exchange. The agricultural exports in the non-traditional commodities like cotton, guar gum and other processed products is increasing, but India is lacking in the necessary processing infrastructure for produce of these crops.

Introduction

India's performance in the agricultural sector since 2004 is spectacular in many respects, despite the problems of labour shortages, decline in the share of labour force working in the sector (Nayyar and Sen 1994; Chand et al., 2004; Joshi et al., 2004; Chand 2014). Given agricultural sector significantly influenced by the vagaries of the monsoon, we have compared the triennium averages for the period 2002 to 2004 for calculating TE 2004 and 2012-2014 for calculating TE 2014 (Table 1). Overall, the food grain production increased from 200 million tonnes to 260 million tonnes from triennium ending 2004 to triennium ending 2014 with compound growth rate of 2.6% per annum. Especially growth rates in pulses and oilseeds are much higher at 3.4% and 4.4% per annum, which is significant positive feature of agricultural growth during this period. As India is deficit in these two items and they are the largest importing items. The main driving force of the growth of the pulses and oilseeds may be the policy initiatives of steep increase in minimum support prices for pulses and oilseeds compared to other crops (figure 1). Another booster for agricultural growth is cotton, which is mainly driven by the Bt cotton technology and it revolutionised the agriculture in some drought prone and unirrigated areas. The high value crops (horticulture) crops, milk, meat, egg and fish all showed significantly higher growth rates mainly due to the rising demand and

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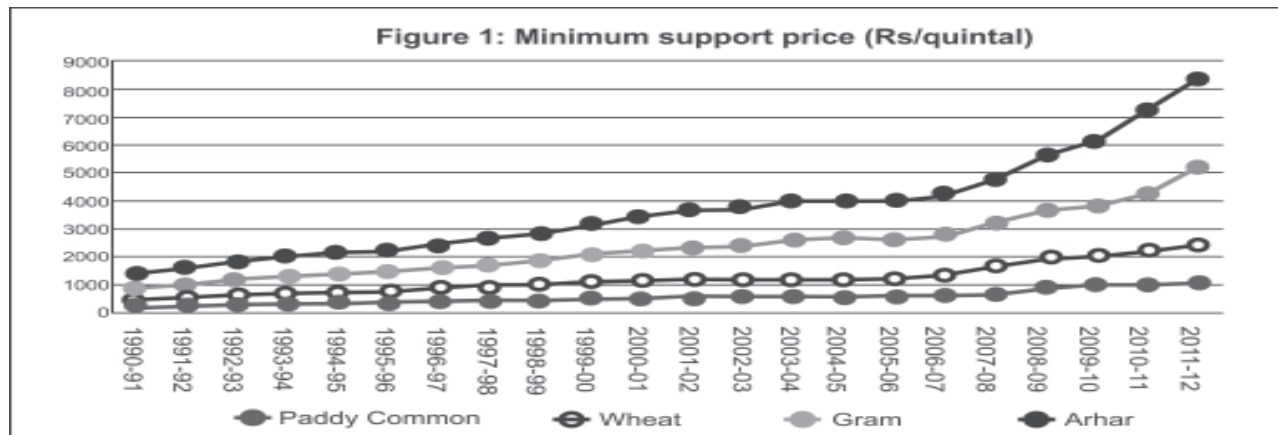
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favourable Govt. Policies. Overall, agricultural and allied sector GDP growth was 3.2 per cent between 2004 and 2014, which is quite good compared to earlier period.

TABLE 1. PERFORMANCE OF AGRICULTURAL PRODUCTION IN INDIA

| Item | TE 2004 | TE 2014 | CGR (%) |
|--------------|---------|---------|---------|
| Rice (mt) | 85 | 106 | 2.2 |
| Wheat (mt) | 70 | 95 | 3.0 |
| Cereals (mt) | 187 | 241 | 2.6 |
| Pulses (mt) | 13 | 18 | 3.4 |

| Item | TE 2004 | TE 2014 | CGR (%) |
|---|---------|---------|---------|
| Food grains(mt) | 200 | 260 | 2.6 |
| Oilseeds (mt) | 20 | 31 | 4.4 |
| Cotton (million bales of each 170 kg) | 11 | 35 | 12.5 |
| Sugarcane (mt) | 273 | 349 | 2.5 |
| Horticultural crops(mt) | 148 | 263 | 5.9 |
| Milk (mt) | 86 | 131 | 4.3 |
| Meat (lakh t) | 20 | 52 | 10.2 |
| Egg (billion) | 40 | 65 | 5.0 |
| Fish (lakh t) | 62 | 89 | 3.7 |
| Agri. GDP at 2004-05 prices (₹ billion) | 5454 | 7466 | 3.2 |

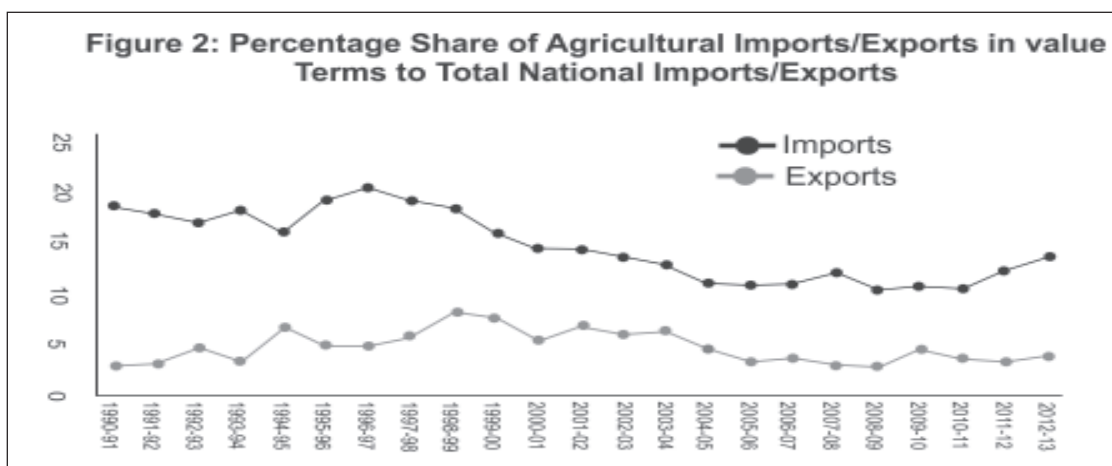


Trends in Foreign Trade

The composition of exports in a free market economy reveals competitive advantage of commodities in international markets. India's agricultural exports as a share of total national exports ranged from 10 to 20 percent since 1990-91. While the share of agricultural imports in the total national imports is less. In the past three years, the performance of agricultural exports is spectacular with share in total exports raised from 10.5% in 2010-11 to 13.5% in 2012-13 (Figure 2). As per World Trade

Organization (WTO), International Trade Statistics, 2012 (based on trade in 2011), global export and import of agricultural and food products is US\$ 1.66 trillion and US\$ 1.82 trillion, respectively, India's share is 2.07 per cent and 1.24 per cent respectively. India has improved its position in agricultural and food exports to 10th position globally.

The significantly large share of agricultural exports in total exports (13.54 %) in India reveals its comparative advantage in production and export of agricultural commodities in international markets. The total export



value was ₹ 2,21,130 crores in 2012-13. India's export basket is highly diverse with guar gum meal, cotton raw, basmati rice, marine products, meat and products, oil meals, spices and rice (other than basmati). In the coming years, the share of food grain exports may reduce due to the

implementation of National Food Security Act, but there is likely possibility of rise in exports of commercial crops like guar gum meal, cotton raw, basmati rice, meat, oil meals and spices. In international markets, demand for processed agricultural products like meat products and dairy products,

processed fruits, juices and vegetables are rising although from lower base. The rising demand for processed products needs to be addressed through investing in the state-of-the-art post-harvest processing facilities. For Indian guar gum meal, major export destinations are the USA, China, Germany, Canada, Russia and Australia. For cotton, major importing countries were China, Bangladesh, Pakistan and Vietnam. For basmati rice, Iran, Saudi Arab, UAE, Iraq and Kuwait are the major importing countries. For marine products (frozen shrimp and fish), the major importing countries are USA, Vietnam, Japan, China and Spain. In case of meat products, Vietnam, Malaysia, Thailand and Saudi Arab are the major importing countries. Within meat products, buffalo meat is major contributor in export. For oil meal, Iran, Vietnam, Japan and Thailand are the major importing countries. For spices, China, USA, Vietnam, Singapore are major export destinations from India. There is a possibility of growing demand from within Asia especially from China and from USA with the revival of the economy, from Arab countries for commodities like basmati rice.

TABLE 2: INDIA'S AGRICULTURAL EXPORTS 2012-2013.

| Commodity | Quantity (000 tonnes) | Value (₹ Crores) | Share % |
|--|--------------------------|---------------------|---------|
| Rice | 10120 | 33808 | 15.3 |
| Wheat | 6472 | 10488 | 4.7 |
| Other cereals | 5463 | 8217 | 3.7 |
| Guar gum Meal | 405 | 21190 | 9.6 |
| Oil Meals | 6343 | 15822 | 7.2 |
| Cotton Raw | 2015 | 19813 | 9.0 |
| Livestock products | | 38959 | 17.6 |
| Coffee and Tea | 521 | 9390 | 4.2 |
| Spices | 994 | 15319 | 6.9 |
| Fruits and vegetables | | 9828 | 4.4 |
| Sugar | 2794 | 8576 | 3.9 |
| Others | | 29,720 | 13.5 |
| Total Agricultural Exports | | 2,21,130 | 100 |
| % Share of Agricultural exports in national exports | | 13.53 | |

Source: DGFT

Imports

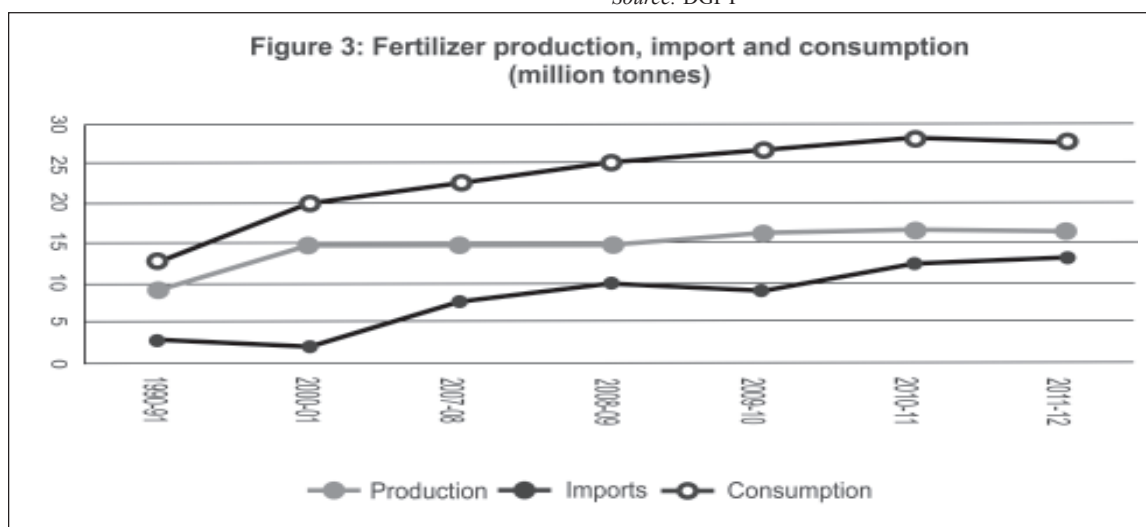
The share of agricultural imports in India's total imports is much smaller at 3.8%. India's agricultural import was Rs. 101286 crores in 2013, of which only edible oils contributed about 60 % and pulses contributed another 13%. Fruits, cashew nuts and natural rubber also had significant share in imports. India also import chemical fertilizers in large quantities and imported 24.1 million tonnes by spending ₹ 47694 crore of foreign exchange in the year 2012-13. As the chemical fertilizer production in India is almost stagnant from 2001 onwards. However, there is a big jump in chemical fertilizer production between 1991 and 2001. Since 2001 imports raised to a large extent as the consumption increased significantly (figure 3).

There are number of government initiatives for export promotion, prominently agriculture export promotion zones, basmati export development foundation, technology mission on cotton etc. The higher share of edible oils and pulses in imports needs to be addressed through both policy and technological interventions. The potential solutions includes effective implementation of Crop Development Programmes like National Food Security Mission(NFSM), National Mission on Oilseeds and Oil Palm (NMOOP) for bridging yield gaps, cultivation of pulses on rice fallow lands, tapping potential of non-conventional sources of edible oils etc.

TABLE 3: INDIA'S AGRICULTURAL IMPORTS 2012-2013

| Commodity | Quantity (000 tonnes) | Value (₹ Crores) | Share % |
|---|--------------------------|---------------------|---------|
| Edible oils | 11013 | 61106 | 60.3 |
| Pulses | 3838 | 12739 | 12.6 |
| Fruits and nuts excl cashew nuts | | 5972 | 5.9 |
| Sugar | 1114 | 3072 | 3.0 |
| Cotton raw | 231 | 2465 | 2.4 |
| Spices | 154 | 2590 | 2.6 |
| Others | | 13342 | 13.2 |
| Total Agricultural Imports | | 1,01,286 | 100.0 |
| % Share of Agricultural Import in national imports | | 3.79 | |

Source: DGFT



Disaggregated Trends in Exports

The table 4 presents change in exports between TE 2004 and TE 2013. India's export basket is highly diverse with major export items like cotton raw, marine products, basmati rice, meat and meat products, guar gum meal, oil meals, spices and sugar were major export items. There is significant increase in all the export items especially cotton raw, meat and preparations, guar gum meal, other cereals and groundnut between TE 2004 and TE 2013.

TABLE 4: INDIA'S EXPORTS OF AGRICULTURAL PRODUCTS
(Quantity in 000 tonnes, value in Rs. Crores)

| Commodity | TE 2004 | | TE 2013 | |
|--|----------|----------|----------|-----------|
| | Quantity | Value | Quantity | Value |
| Cotton Raw | 67 | 345 | 1759 | 18139 |
| Marine Products | 468 | 6311 | 913 | 15655 |
| Rice Basmati | 716 | 1965 | 2940 | 15141 |
| Meat & Preparations | - | 1428 | - | 13596 |
| Guar gum Meal | 116 | 337 | 505 | 13507 |
| Oil Meals | 2577 | 2333 | 6849 | 12821 |
| Spices | 261 | 1566 | 893 | 12136 |
| Sugar | 1440 | 1571 | 2926 | 9227 |
| Common rice | 2814 | 2426 | 3586 | 7765 |
| Other Cereals | 285 | 202 | 4242 | 5769 |
| Coffee | 183 | 1058 | 252 | 4053 |
| Tea | 180 | 1670 | 264 | 3977 |
| Castor Oil | 181 | 631 | 490 | 3913 |
| Wheat | 3471 | 1827 | 2404 | 3837 |
| Groundnut | 119 | 203 | 596 | 3804 |
| Cashew | 109 | 1847 | 109 | 3685 |
| Tobacco Unmanufactured | 102 | 706 | 212 | 3241 |
| Fresh Vegetables | - | 724 | - | 2845 |
| Fresh Fruits | - | 550 | - | 2664 |
| Sesamum Seed | 175 | 548 | 344 | 2573 |
| Processed Fruit Juices | - | 477 | - | 1545 |
| Poultry & Dairy Products | - | 387 | - | 1425 |
| Pulses | 155 | 348 | 194 | 1066 |
| Tobacco Manufactured | 13 | 270 | - | 1040 |
| Processed Vegetables | - | 249 | - | 970 |
| Jute Hessian | - | 315 | - | 838 |
| Fruits/Vegetable Seeds | 6 | 71 | 15 | 269 |
| Niger seed | 25 | 57 | 19 | 83 |
| Cashew nut Shell Liquid | 4 | 6 | 12 | 40 |
| Others | | 3457 | | 8007 |
| Total Agricultural Exports | | 33,883 | | 1,73,633 |
| Total National Imports | | 2,52,507 | | 14,16,267 |
| % Share of Agricultural Import in national imports | | 13.4 | | 12.26 |

Source: DGFT

Disaggregated Trends in Imports

In the import basket, vegetable oils and pulses continue to dominate since 2004. There is almost 40% increase in vegetable oil import and 24% increase in pulses import. There is steep increase in import of sugar, milk and cream. There is significant decrease in imports of cotton raw, cashew nuts, jute and cereal preparations.

TABLE 5: INDIA'S IMPORTS OF AGRICULTURAL PRODUCTS
(Quantity in 000 tonnes, value in Rs. Crores)

| Commodity | TE 2004 | | TE 2013 | |
|--|----------|----------|----------|-----------|
| | Quantity | Value | Quantity | Value |
| Vegetable Oils Fixed (Edible) | 4659 | 8976 | 6544 | 45601 |
| Pulses | 1978 | 2727 | 2448 | 9550 |
| Fruits & Nuts | - | 734 | - | 4772 |
| Sugar | 47 | 43 | 603 | 2058 |
| Spices | 111 | 552 | 98 | 2046 |
| Cotton (Raw & Waste) | 291 | 1620 | 91 | 1376 |
| Cashew Nuts | 336 | 1013 | 128 | 875 |
| Milk & Cream | 5 | 36 | 26 | 546 |
| Jute (Raw) | 112 | 108 | 101 | 364 |
| Cereal Preparation | 40 | 95 | 34 | 292 |
| Tea | 15 | 86 | 16 | 227 |
| Oil Seeds | - | 9 | - | 206 |
| Other Cereals | 2 | 2 | 23 | 67 |
| Vegetable & Animal fats | 1 | 12 | 1 | 24 |
| Rice | - | - | - | 4 |
| Wheat | 1 | 1 | 62 | 121 |
| Others | - | 2600 | - | 9954 |
| Total Agricultural Imports | - | 18,613 | - | 78,082 |
| Total National Imports | - | 3,00,504 | - | 22,06,873 |
| % Share of Agricultural Import in national imports | | 6.19 | | 3.54 |

Source: DGFT

Conclusion

The overall performance of agricultural sector since 2004 is reasonably good with 3.2% of annual compound growth. The increase in MSP and Special Programmes for promotion of technological interventions to attain higher productivity and area expansion for the pulses and oilseeds helped to some extent to increase the production, but the gap between demand and supply of both commodities is still large. There is better performance of horticulture crops, for the first time the production of horticulture crops surpassed foodgrain production in India. Again the progress of high livestock products is very much satisfactory, mainly driven by the demand push. The production of cotton is spectacular, which transformed some of the dry lands of Andhra Pradesh, Maharashtra, Gujarat and Karnataka. However, on the negative side, there is a stagnation in the production of chemical fertilizers and increase in imports,

which is a burden on the foreign exchange. The imports of both edible oils and pulses remain exorbitantly high. The agricultural exports in the non-traditional commodities like cotton, guar gum and other processed products is increasing, but India is lacking in the necessary processing infrastructure to increase processed crops output.

REFERENCES

Nayyar, D., & Sen, A. (1994). International trade and the agricultural sector in India. *Economic and Political Weekly*, 1187-1203.

Chand, R., Jha, D., & Mittal, S. (2004). WTO and Oilseeds Sector: Challenges of Trade Liberalisation. *Economic and political weekly*, 533-537.

Joshi, P. K., Gulati, A., BIRTHAL, P. S., & Tewari, L. (2004). Agriculture diversification in South Asia: patterns, determinants and policy implications. *Economic and Political Weekly*, 2457-2467.

Chand, R. (2014) From Slowdown to Fast Track: Indian Agriculture since 1995. National Centre for Agricultural Economics and Policy Research (NCAP), Policy paper 1. New Delhi-110012

Trends in Growth of Production, Crop Diversification, Productivity, Profitability and Cost Structure in Haryana Agriculture

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Background

Geographically, Haryana is located in north-west of the country, which makes its climate arid to semi arid. The relatively low average rainfall, 354.5 mm, and mostly concentrated in July to September months increases its dependence on irrigation. Due to dire need for irrigation, the ground water irrigation has become a significant source of irrigation in the state. At the time of formation of the state in 1966, the contribution of private investment in irrigation was very low, however, thereafter private investment in irrigation accelerated and become one of the important reasons for bringing in its cultivable area (3.7 m.ha.) under cultivation (98 %) and raising cropping intensity to 184.9%.

The state is endowed with fertile Indo Gangatic plain and accompanied with hard working farmer become harbinger for adoption of high yielding technology. This led to phenomenal increase of income in agricultural sector. The Net State Domestic Product (NSDP) of Haryana is estimated to grow at about 5% compared to about 4% for the country, whereas the growth of agriculture plus animal husbandry for the state grew at about 3% compared to 2.13% for the country during 1970-71 to 1985-86 (Sharma 1992). Haryana recorded 6.4 % average annual economic growth during 1966-67 to 2004-05, which further accelerated to 9.3 % during the period of last 7 years (2005-06 to 2011-12), even higher than the average annual growth rate of 8.5 % of Indian economy during the same period.

Since its formation, Haryana's economy has also experienced a significant structural transformation, mostly from Agriculture and Allied Sector towards Services and Industry sector.

The share of Agriculture and Allied Sector in GDP was 60.7 % in 1969-70, declined to 28.1 % in 2001-02

and further reduced to 19.0 % in 2004-05 and 14.1 % in 2011-12, whereas the share of Industry Sector increased from 17.6 % in 1969-70 to 28.6 % in 2001-02, and the share of Services Sector increased from 21.7 % in 1969-70 to 43.3 % in 2001-02 and further to 58.4 % in 2011-12. The decline in contribution of agriculture in state GDP during this transformation period is mainly on account of better performance of other sectors. Relatively low growth in agricultural sector is mainly on account of saturation in growth of Net Sown Area, low growth of irrigation and almost saturation in the yield growth due to lack of technology break. There is stagnation in NSA for the state, because most of (98 %) its cultivable area (3.7 m.ha.) is already under cultivation, while, the additional irrigation facilities in addition to the improvement in quality of irrigation in existing irrigated area has grown slowly. The cropping intensity is also showing signs of saturation. In 1966-67 only 34% of NSA could grow more than one crop, which increased to 73 % in 2000-01 and further to 82% in 2009-10. Moreover, the gap in cropping intensity across different agro climatic zone of the state is still large¹. The factor responsible for low level of cropping intensity in the southern irrigated zone and western un-irrigated zone of the state are beyond irrigation such as the quality of land, low level of investment, input availability, etc².

The cropping pattern in the state has also undergone significant changes towards high productivity crops like wheat and rice from the low productivity crops like gram, barley, jowar etc. during 1960-61 to 1985-86³. Thereafter, the direction of change in cropping pattern has been continued.

The discussion above indicates a number of changes within agricultural sector. The sources of growth in agriculture is probably moving away from net sown area, cropping intensity to change in cropping pattern towards

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¹ The Western zone and the Central zone have the highest cropping intensity, while the Southern zone has the lowest cropping intensity of 152 % in 2010-11.

² One of the possible reason for variation in the irrigation facilities is groundwater conditions, canal network etc. Controlling for irrigation, one can see that even if area is irrigated Southern Zone of the state have the lowest cropping intensity. Interestingly the Western Zone which shows highest level of cropping intensity (192%) for irrigated land while shows the lowest level of cropping intensity (136%) for the un-irrigated land.

³ Sharma, R.K. (1992).

more productive crops, increase in yield of crops and increase in total factor productivity. The focus of this paper is to examine the issues relating to changes in cropping pattern and sources of growth in Haryana during 1980-81 to 2011-12. Specifically, the relative contribution of area, yield, cropping pattern and total factor productivity in growth of agriculture is examined. The changes in profitability of selected crops and their cost structure have also been discussed. The rest of the chapter is divided into following six sections, Section-1: Trends in Production growth, Section-2: Crop Diversification, Section-3: Trends in Total Factor Productivity, Section-4: Trends in Profitability of Crops, Section-5: Structural Changes in the Cost of Cultivation and Section-6: Conclusion.

Section 1 Trends in Production Growth

Description of Data

The secondary data on area, production and yield of six crops of the state is taken from the website of Ministry of Agriculture, Government of India from 1976-77 to 2011-12. Beyond these six crops, the trends of growth of production of vegetables crop is also worked out zone-wise from 1990-91 to 2012-13. The district-wise area and production of vegetable crops is compiled from Horticultural Department of Haryana from 1990-91 to 2012-13. The input and output data for these six crops of

state is also compiled from Scheme of Cost of Cultivation, Ministry of Agriculture, Government of India during this period. The prices used for deflating the input data including diesel prices are taken from Office of the Economic Adviser's website. The selection of crops is based on limitation of the data reported by different sources for other crops of the state. Ministry of Agriculture, GoI, publishes data only for selected costs and the data for rest of the crops is either not reported or reported is irregularly.

Compound Annual Growth Rate ⁴(CAGR)

The times series data on area, production, yield and inputs for each selected crop is tested for unit root before estimating its growth using regression. The Augmented Dickey Fuller (ADF) applied on with trends and without trends to identify the level of integration of each series. As applying regression on a non-stationary series may result in spurious regression or will increase the chances of rejection of null hypothesis when it is true. The estimated value of coefficients of ADFs is tabulated (at table-2). Comparing estimated and critical values of ADF, it is found that most of the series on area, production and yield except for area and production of sugarcane, are stationary at level without trend. While most of series have found to have non-stationary area trend except for production and yield series of wheat, area and production for mustard, and area for bajra crops.

TABLE-2: ADF RESULTS AT LEVEL (IN LOG TRANSFORMATION) 1976-77 TO 2011-12

| Crops | Area | | Production | | Yield | |
|---------------------|---------------|------------|---------------|------------|---------------|------------|
| | Without Trend | With Trend | Without Trend | With Trend | Without Trend | With Trend |
| Bajra | -2.201 | -1.737 | -1.530 | -3.736 | -1.189 | -4.1 |
| Gram | -1.109 | -3.286 | -1.91 | -3.314 | -2.637 | -3.2 |
| Paddy | -1.655 | -3.321 | -1.19 | -5.138 | -2.528 | -4.1 |
| Mustard | -1.834 | -1.756 | -2.04 | -1.687 | -1.939 | -3.2 |
| Sugarcane | -3.947 | -4.520 | -2.85 | -3.724 | -1.179 | -5.3 |
| Wheat | -1.849 | -3.722 | -1.94 | -2.430 | -1.463 | -2 |
| Z(T) Critical Value | 1% | 5% | 10% | | | |
| Without Trends | -3.689 | -2.975 | -2.619 | | | |
| With Trends | -4.297 | -3.564 | -3.218 | | | |

The value of Durbin-Watson (DW) in OLS estimates indicates problem of series correlation in some series. Therefore, instead of using simple OLS regression on a non-stationary series, ARIMA model is used to estimate Compound Annual Growth Rate (CAGR) as it gives better estimates than OLS in presence of serial correlation.

Trends and Pattern of Growth

The CAGR of area, production and yield of six major crops for the state is calculated and presented in the table-3 below. The production growth for the four crops *i.e.* Paddy, Bajra, Mustard and Wheat has been over three percent, while for

⁴ $\ln Y = a + bt + U$; Where $\ln(Y)$ is log of production, yield or area of a crop. t is time. a is constant. b is the coefficient estimated. The CAGR so can be calculated as: $CAGR = [\text{antilog } b - 1] * 100$.

⁵The Augmented Dickey-Fuller test involves fitting the model $\Delta y_t = \alpha + \beta y_{t-1} + \delta t + \zeta_1 \Delta y_{t-1} + \zeta_2 \Delta y_{t-2} + \dots + \zeta_k \Delta y_{t-k} + e_t$ where k is the number of lags. δt is trend while α is constant term in the model. Testing $\beta = 0$ is equivalent to that y_t follows a unit root process. ADF Test statistics, given in table, if found higher than critical value, given below table, then we cannot reject the null hypothesis of unit root which means the series is non-stationary.

gram it has been negative and very low for Sugarcane during 1976-77 to 2011-12. The production growth of Paddy is mostly driven by its area growth, while production growth of Wheat is found receiving balanced contribution from area and yield growth. The production growth for Bajra and Mustard is *inter-alia* on account of yield growth. While the yield growth for Gram and Paddy has been very low during 1976-77 to 2011-12.

The growth pattern of various crops during 1976-77 to 2011-12 for the state shows that the area growth for Bajra, Gram and Sugarcane crops has been negative, while

Mustard registered high growth of 4.4% followed by paddy and wheat crops. The decline in the growth of area for Kharif crops such as Bajra and Sugarcane and at the same time increase in growth of area to paddy is indicating that the area has been shifting from Bajra and Sugarcane to Paddy. The minimum support price, input subsidy would possibly have favored paddy over other crops. Similarly, in Rabi season, the area growth for mustard and wheat has improved may be at the cost of gram and sugarcane. The trends in the growth of various crops show that the growth in the agricultural production is increasingly being dominated by wheat and paddy.

TABLE 3 CAGR OF MAJOR SIX CROPS IN HARYANA DURING 1976-77 TO 2011-12.

| Crops | Haryana | 1976-77 to 1990-91 | 1991-92 to 2000-01 | 2001-02 to 2011-12 | 1976-77 to 2011-12 |
|-----------|------------|--------------------|--------------------|--------------------|--------------------|
| Bajra | Area | -3.17 | 0.39 | 0.54 | -1.19 |
| | Production | 0.45 | 4.74 | 4.70 | 3.39 |
| | Yield | 3.72 | 4.34 | 4.19 | 4.61 |
| Gram | Area | -5.55 | -8.11 | -10.41 | -7.40 |
| | Production | -6.17 | -8.12 | -11.53 | -6.58 |
| | Yield | -0.73 | -0.13 | -1.22 | 0.89 |
| Paddy | Area | 3.81 | 3.03 | 6.08 | 3.53 |
| | Production | 4.25 | 3.62 | 4.57 | 4.11 |
| | Yield | 0.51 | 0.78 | -1.49 | 0.61 |
| Mustard | Area | 10.02 | -0.53 | -4.50 | 4.38 |
| | Production | 16.91 | 1.48 | -2.61 | 7.18 |
| | Yield | 6.31 | 1.80 | 1.34 | 2.87 |
| Sugarcane | Area | -1.75 | -2.21 | -0.15 | -1.05 |
| | Production | -0.06 | -0.79 | 0.40 | 0.74 |
| | Yield | 1.88 | 1.39 | 0.37 | 1.78 |
| Wheat | Area | 2.33 | 1.58 | 2.72 | 1.75 |
| | Production | 6.18 | 2.92 | 4.25 | 4.19 |
| | Yield | 3.73 | 1.31 | 1.59 | 2.36 |

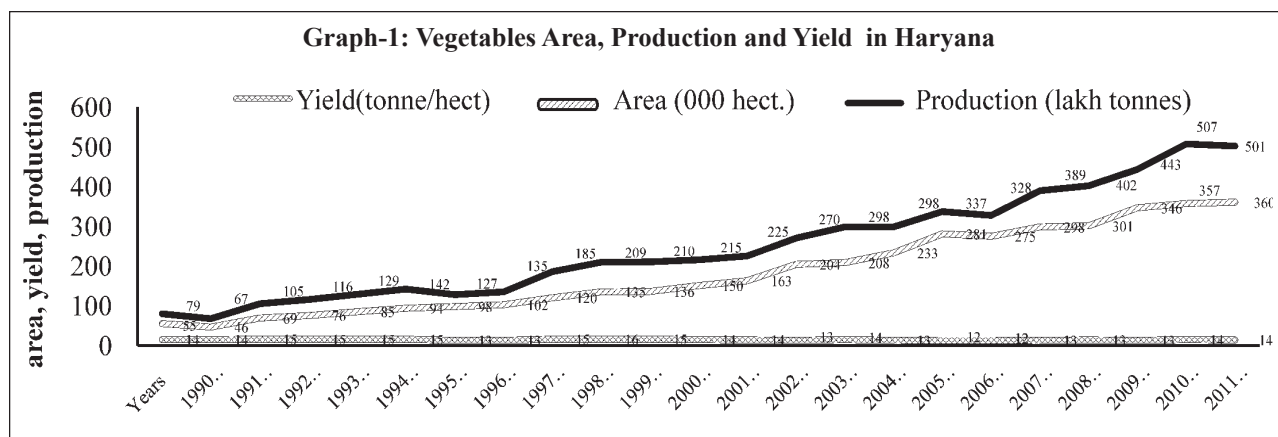
Source: Calculated using the data from Ministry of Agriculture, Government of India.

Trends in Growth of Production of Vegetable

The area under vegetables in Haryana has increased to 360 thousand hectare, in 2012-13 compared 150 thousand

hectare, and 55 thousand hectare in 1990-91. The trends in area, production and yield are given in the graph-1 below.

The growth rate of area, production and yield of



vegetables across zones of the state is calculated for 1990-91 to 1999-00 and 2000-01 to 2012-13, which is presented in the table-4. The vegetable production in the state has grown at 8.9 % Compound Annual Growth Rate (CAGR) during 1990-91 to 2012-13, while its growth has slowed down from 11.2 % during 1990-91 to 1999-00 to 8.1% during 2000-01 to 2012-13. Main driver of vegetable production is its area growth, which grew at 9.6 % during two decade since 1990-91, but declined from 11.3 % during 1990-91 to 1999-00 to 8.7% during 2000-01 to 2012-13. The yield growth of vegetables for the state has been negative during two decades, although it was positive, but low during first decade. Decomposing⁶ of the change in production of vegetables into area effect, yield effect and into joint effect shows that the increase in the vegetable production in the state is mainly on account of increase in its area, which is also true across the zones. The production growth has been over 4% for all vegetable crops except for pea and driven by high growth in their area, which is also true for vegetables across the zones of the state.

The growth of production in vegetable crops across the zone-wise shows that southern zone registered highest growth at 12.5% followed by 9.7 % in Northern and 7.3% in western zone during the period under investigation. The production growth of vegetables has moderated in second decade in all four zones compared to first decade, and the highest decline of about 5 percentage point is recorded in western and central zones of the state. The area growth for Western zone moderated by about 8 percentage points in the second decade when compared to first and it also moderated to about 3 percentage points in Northern zone and Central zones of the state. The area growth in the southern zone has increased contrary to other zones of the state during second decade. Although the growth in production of vegetables has been higher than other crops

in the state, but the slowdown in the growth of production and area, and negative growth of their yield is the cause of concern.

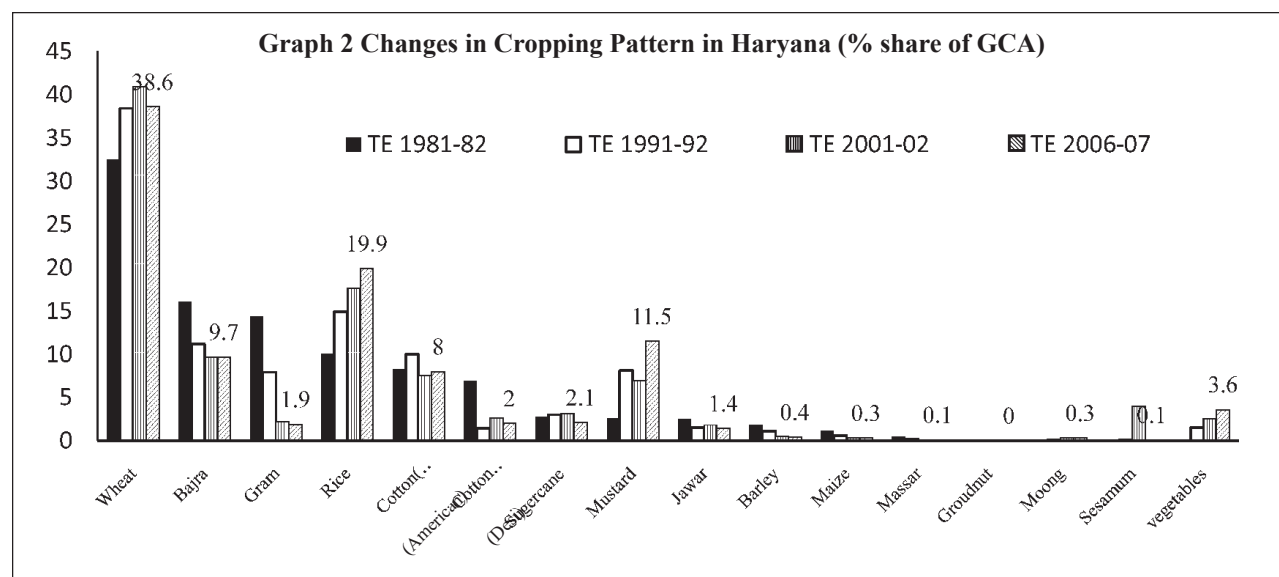
TABLE 4: COMPOUND ANNUAL GROWTH RATE (CAGR) OF AREA, PRODUCTION AND YIELD OF VEGETABLES IN STATE/ZONES.

| State/ Zones | Variables | 1990-91 to 1999-00 | 2000-01 to 2012-13 | all |
|-----------------|------------|-----------------------|-----------------------|------|
| Haryana | Area | 11.3 | 8.7 | 9.6 |
| | Production | 11.2 | 8.1 | 8.9 |
| | Yield | 0.2 | -0.8 | -0.6 |
| Central | Area | 9.5 | 6.3 | 7.1 |
| | Production | 10.6 | 4.8 | 6.6 |
| | Yield | 1.0 | -1.3 | -0.7 |
| Northern | Area | 11.3 | 8.5 | 10.0 |
| | Production | 11.5 | 9.0 | 9.7 |
| | Yield | 0.3 | 0.4 | -0.3 |
| Southern | Area | 15.4 | 16.1 | 13.4 |
| | Production | 14.8 | 14.3 | 12.5 |
| | Yield | -0.5 | -1.7 | -1.0 |
| Western | Area | 11.3 | 3.1 | 7.9 |
| | Production | 8.0 | 2.8 | 7.3 |
| | Yield | -2.9 | -0.4 | -0.7 |

Source: Department of Horticulture, Government of Haryana.

Section 2 Crop Diversification

The skewed pattern of growth towards wheat and paddy is bringing change in the cropping pattern also. The share of area in total Gross Cropped Area (GCA) is calculated and presented in the Graph-2. The result shows that wheat-paddy dominates the cropping pattern in the state. The area share of wheat and paddy has also increased over time since 1980-81. The area under wheat is increasing at the cost of gram, while paddy is taking away area from bajra. The area under vegetables has increase from 1.5 % during TE 1991-92 to 2.5% in TE 2001-12 and 3.6 % in TE 2006-07.



⁶ The growth of production is decomposed into area effect and yield effect. Decomposition is defined as in equation. $\Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$; where Yield effect = $(A_0 \Delta Y)$; Area effect = $(Y_0 \Delta A)$; and Interaction effect = $(\Delta A \Delta Y)$. ?P = change in production; A₀ is area in the base year, ΔY is change in yield; Y₀ is yield in the base year; ΔA is change in area.

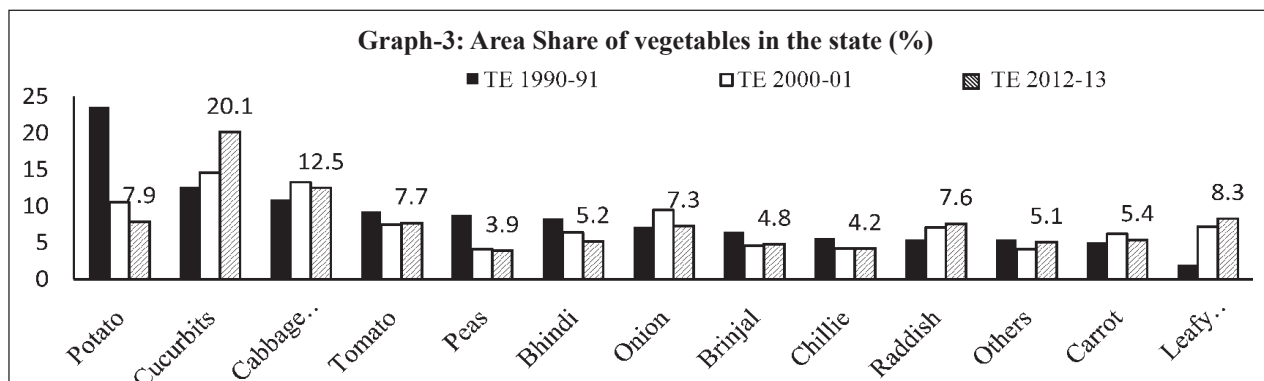
The area share of vegetable in GCA has increased from 1.5% in TE 1990-91 to 3.6 % in TE 2006-07. The regional distribution⁷ of area under vegetables is given in the table-5. Northern region of the state produces two fifth of total state's vegetable production, followed by Southern zone (27.2%) and Central zone (23%) in TE 2012-13. Among the zones, area share of vegetables has increased in Northern zone and Western zone in first decade, while it has increased only for Southern zone in second decade.

Among the vegetable crops, Cucurbits has grown over largest area under vegetables in the state, about 15.4 %, followed by Potato, Cabbage/Cauliflower, Tomato, Onion, Raddish, Bhindi, Others, Leafy Vegetables, Peas, Carrot, Brinjal, Chillie. Trend shows that the area share of Potato, Pea, Bhindi, and to some extent for Tomato has declined over the years, while share of Cucurbits, Cabbage/cauliflower, raddish and leafy vegetables has increased over the years in the state.

TABLE 5. ZONAL CONTRIBUTION IN VEGETABLES AND YIELD IN HARYANA.

| Years | Central | Northern | Southern | Western | Total |
|-------------------------|---------|----------|----------|---------|-------|
| Area Share (in %) | | | | | |
| TE 1990-91 | 34.6 | 37.5 | 14.0 | 14.0 | 100 |
| TE 2000-01 | 29.3 | 39.5 | 12.8 | 18.4 | 100 |
| TE 2012-13 | 23.1 | 39.3 | 27.2 | 10.3 | 100 |
| Production Share (in %) | | | | | |
| TE 1990-91 | 34.1 | 37.2 | 13.8 | 14.9 | 100 |
| TE 2000-01 | 31.5 | 37.4 | 13.6 | 17.6 | 100 |
| TE 2012-13 | 23.2 | 41.9 | 24.9 | 10.0 | 100 |
| Yield (tones/Hect.) | | | | | |
| TE 1990-91 | 14.5 | 14.6 | 14.5 | 15.8 | 14.7 |
| TE 2000-01 | 15.7 | 13.7 | 15.3 | 13.9 | 14.5 |
| TE 2012-13 | 13.7 | 14.5 | 12.5 | 13.2 | 13.6 |

Source: Calculated from the data from Department of Horticulture, Government of Haryana.



Section 3 Trends in Total Factor Productivity

The growth of production can also be decomposed into the input effect and non-input factor effect. The growth in TFP includes the efficient use of resources, accrual of scale efficiency, improvement in the quality of inputs and technology⁸. The aggregate TFP growth also includes the impact of change in cropping pattern on TFP growth. During 1980-81 to 2011-12, the TFP growth is 0.8% for

all six crops. The TFP growth was 0.6% during eighties, which improved during nineties to 1.2 % but moderated during millennium decade to 0.8%. During this period, the TFP growth has been about one and half percent for Wheat and Mustard, while for Sugarcane, Paddy and Bajra, it was lower at around 0.6%. For gram TFP growth was negative. The overall TFP growth although improved during nineties compared to eighties but moderated during

⁷The Agro-Climatic Zones of the state divided based on homogeneous agroclimatic conditions are as, **Central**-Kaithal, Jind, Sonapat, Rohtak, Hajarj; **Northern**-Panchkula, Ambala, Yamunanagar, Kurukshetra, Karnal, Panipat; **Southern**-Gurgaon, Faridabad, Palwal, Rewari, Mahendragarh, Mewat; **Western**-Hisar, Bhiwani, Fatehabad, Sirsa.

⁸The non-input growth of the production is growth in total factor productivity. Tornquist-Theil TFP indices (Desai, 1994) is used for calculating TFP growth as in equation (4): $\ln(TFP_t/TFP_{t-1}) = \frac{1}{2} \sum_j (R_{jt} + R_{jt-1}) \ln(Q_{jt}/Q_{jt-1}) - \frac{1}{2} \sum_i (C_{it} + C_{it-1}) \ln(X_{it}/X_{it-1})$; Where, R_{jt} = Share of output 'j' in revenues in the year 't'; Q_{jt} = Output 'j' in the year 't'; C_{it} = Share of input 'i' in total input cost in year 't'; X_{it} = Input 'i' in period 't'; R_j and C_i are in current prices, and Q_j and X_i (which are in monetary values) at current prices.

last period. The growth of TFP has improved during nineties for Wheat, Sugarcane and Gram, while Mustard, Paddy and Bajra. During 2000s TFP growth has moderated

for Wheat, Sugarcane, Gram and Bajra, while improved for Paddy and Mustard. There is a negative TFP growth for Sugarcane, Gram and Bajra during 2000s.

TABLE 6: TOTAL FACTOR PRODUCTIVITY (TFP) TORNVIST-THEIL INDEX.

| Crops | TFP Growth | | | Input Growth | | | | | Output Growth | | | |
|-----------|--------------------|----------------------|--------------------|--------------------|--------------------|-----------------|--------------------|--------------------|--------------------|----------------------|--------------------|--------------------|
| | 1980-81 to 1990-91 | 1991-92 to 1999-2000 | 2000-01 to 2011-12 | 1980-81 to 2011-12 | 1980-81 to 1990-91 | 1991-92 to 2000 | 2000-01 to 2011-12 | 1980-81 to 2011-12 | 1980-81 to 1990-91 | 1991-92 to 1999-2000 | 2000-01 to 2011-12 | 1980-81 to 2011-12 |
| Wheat | 1.2 | 2.2 | 1.7 | 1.5 | 1.1 | -0.1 | -0.7 | 0.2 | 2.3 | 2.1 | 1.0 | 1.6 |
| Sugarcane | -0.5 | 1.9 | -0.7 | 0.7 | 1.7 | -1.5 | -0.5 | -0.6 | 1.2 | 0.4 | -1.2 | 0.1 |
| Mustard | 1.8 | 0.8 | 2.3 | 1.5 | 3.8 | 0.8 | -0.6 | 1.3 | 5.6 | 1.5 | 1.7 | 2.8 |
| Paddy | 0.9 | 0.4 | 0.8 | 0.6 | 1.4 | 0.6 | 0.2 | 0.7 | 2.3 | 1.0 | 1.0 | 1.2 |
| Gram | 0.7 | 1.1 | -0.3 | -0.2 | -1.1 | -10.3 | -1.2 | -3.0 | -0.3 | -9.2 | -1.5 | -3.2 |
| Bajra | 8.3 | -2.0 | -0.4 | 0.6 | -8.6 | 2.0 | 3.9 | 1.2 | -0.2 | 0.0 | 3.5 | 1.8 |
| All | 0.6 | 1.2 | 0.8 | 0.8 | 1.1 | 0.1 | -0.2 | 0.4 | 1.7 | 1.3 | 0.6 | 1.1 |

Source: Calculated using the data from Ministry of Agriculture Government of India.

Section 4 Trends in Profitability of Crops

The profitability of crop is crucial factor determining cropping pattern. Among rabi crops, the Gross Value of Output (GVO) per hectare has been highest for the Wheat followed by Mustard and Gram for all times. While among kharif crops the GVO per hectare is highest in paddy for all times than Bajra. In case of Sugarcane, the GVO per hectare is highest among all crops of rabi and kharif for all times (except for paddy in TE 1992-93). It may be mentioned that Sugarcane occupies the field for about six month in a year while other crops takes only three and half month. This shows why wheat in rabi and Paddy in kharif are most preferred crops for the farmer if condition allows.

The benefit to cost ratios is calculated for six crops. The results tabulated in the table-7 shows that among rabi crops the benefit-cost (over A₂) ratio for wheat has

improved from 1.9 in TE 1981-82, to 2.9 in TE 1992-93 and highest 3.5 in TE 2011-12, but moderated to 2.7 in TE 2002-03 compared to earlier years. While for Mustard, the benefit-cost ratio is highest in TE 2011-12 and improved in TE 2002-03 compared to in TE 1992-93. For Gram it has been highest in TE 1992-93 and in TE 2011-12 and lowest in TE 2002-03. For kharif crops, the profits over A₂ in paddy has increased from 1.9 in TE 1981-82 to 2.6 in TE 1992-93 and further increased to 2.9 in TE 2011-12. Similar trends have also been improved in its profits over C₂ although there is some moderation in benefit cost ratio in TE 2002-03. The benefit-cost ratio for Bajra moderated has been lower highest in TE 1981-82, although improved in TE 2002-03 and TE 2011-12 compared to TE 1992-93. For sugarcane the benefit to cost over (A₂) ratio has improved in TE 2002-03 and TE 2011-12 compared to TE 1992-93.

TABLE 7 BENEFIT-COST RATIOS SHOWING PROFITABILITY FOR SIX MAJOR CROPS.

| Cost Items | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 | |
|-------------------------------|------------|------------|------------|------------|------------|
| Paddy | | | | | |
| yield (qtl/hect)index | 106 | 111 | 112 | 117 | |
| Byproduct to main product (%) | 0.5 | 0.9 | 1.7 | 1.6 | |
| GVO per hect (Rs/Hect) | 6027 | 15395 | 29293 | 70237 | |
| Benefit to cost ratios | | | | | |
| | A1 | 1.9 | 2.7 | 2.5 | 2.9 |
| | A2 | 1.9 | 2.6 | 2.3 | 2.9 |
| | B1 | 1.7 | 2.4 | 2.2 | 2.6 |
| | B2 | 1.3 | 1.7 | 1.4 | 1.5 |
| | C1 | 1.5 | 2.0 | 1.8 | 2.1 |
| | C2 | 1.2 | 1.5 | 1.2 | 1.4 |
| | C2* | 1.3 | 1.4 | 1.2 | 1.4 |

TABLE 7 BENEFIT-COST RATIOS SHOWING PROFITABILITY FOR SIX MAJOR CROPS.—CONTD.

| Cost Items | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|------------|------------------------------------|------------|------------|------------|------------|
| Wheat | yield (qtl/hect)index base:1980-81 | 96.5 | 136.4 | 154.2 | 171.7 |
| | Byproduct to main product (%) | 13.5 | 21.6 | 15.4 | 20.5 |
| | GVO per hect (Rs/Hect) | 4244 | 12627 | 29275 | 65348 |
| | Benefit to cost ratios | | | | |
| | A1 | 1.9 | 2.9 | 2.9 | 3.5 |
| | A2 | 1.9 | 2.9 | 2.7 | 3.5 |
| | B1 | 1.7 | 2.5 | 2.5 | 2.9 |
| | B2 | 1.3 | 1.7 | 1.5 | 1.6 |
| | C1 | 1.4 | 2.2 | 2.0 | 2.3 |
| | C2 | 1.1 | 1.6 | 1.3 | 1.4 |
| Sugercane | yield (qtl/hect)index | 87 | 81 | 150 | 155 |
| | byproduct to main product (%) | 6.4 | 3.3 | 3.5 | 5.7 |
| | GVO per hect (Rs/Hect) | 8249 | 14714 | 60359 | 157789 |
| | Benefit to cost ratios | | | | |
| | A1 | 4.2 | 2.1 | 3.6 | 4.4 |
| | A2 | 4.2 | 2.1 | 3.6 | 4.4 |
| | B1 | 3.6 | 1.8 | 2.9 | 4.0 |
| | B2 | 2.3 | 1.3 | 1.5 | 1.8 |
| | C1 | 2.5 | 1.4 | 2.3 | 3.4 |
| | C2 | 1.8 | 1.1 | 1.3 | 1.7 |
| Mustard | yield (qtl/hect)index | 121 | 180 | 650 | 1226 |
| | byproduct to main product (%) | 0.1 | 0.2 | 3 | 10 |
| | GVO per hect (Rs/Hect) | 4181 | 6615 | 19214 | 55909 |
| | Benefit to cost ratios | | | | |
| | A1 | 3.7 | 2.6 | 3.2 | 4.8 |
| | A2 | 3.7 | 2.6 | 3.1 | 4.8 |
| | B1 | 2.9 | 2.1 | 2.5 | 3.8 |
| | B2 | 1.8 | 1.3 | 1.5 | 1.9 |
| | C1 | 2.3 | 1.7 | 1.8 | 2.9 |
| | C2 | 1.6 | 1.1 | 1.2 | 1.6 |
| Gram | yield (qtl/hect)index | 124 | 185 | 93 | 146 |
| | byproduct to main product (%) | 10 | 9 | 8 | 12 |
| | GVO per hect (Rs/Hect) | 1406 | 4884 | 5744 | 16632 |
| | Benefit to cost ratios | | | | |
| | A1 | 2.4 | 3.5 | 1.6 | 3.3 |
| | A2 | 2.3 | 3.3 | 1.5 | 3.3 |
| | B1 | 1.8 | 2.8 | 1.2 | 2.4 |
| | B2 | 1.2 | 1.6 | 0.7 | 1.4 |
| | C1 | 1.4 | 2.2 | 0.9 | 1.5 |
| | C2 | 1.0 | 1.3 | 0.6 | 1.0 |
| Bajra | yield (qtl/hect)index | 99 | 90 | 170 | 243 |
| | byproduct to main product (%) | 49.3 | 34.9 | 35.0 | 28.2 |
| | GVO per hect (Rs/Hect) | 1379 | 2830 | 7382 | 19040 |
| | Benefit to cost ratios | | | | |
| | A1 | 2.8 | 1.8 | 2.1 | 2.4 |
| | A2 | 2.7 | 1.8 | 2.0 | 2.4 |
| | B1 | 2.0 | 1.4 | 1.8 | 2.0 |
| | B2 | 1.3 | 0.8 | 1.1 | 1.2 |
| | C1 | 1.4 | 0.9 | 1.0 | 1.2 |
| | C2 | 1.0 | 0.7 | 0.7 | 0.8 |
| C2* | | 0.6 | 0.5 | 0.8 | |

Source: Calculated using the data from Ministry of Agriculture Government of India.

Section 5 Structural Changes in the Cost of Cultivation

The technological progress over time may differ across crops and across regions, which some time reduces cost. It also changes the input-mix according to changes in their relative prices. While the use of inputs can also be the result of policy pushes such as use of chemical fertilizers, hybrid seeds, and mechanization promoted of during green revolution. The changes in relative share human labour, machine labour and land would have implications on income distribution, saving and investment and hence further on growth prospect of agricultural sector and economy at large (Rudra, Ashok). The changes in inputs costs and their relative shares are calculated for selected six crops of the state during 1980-81 to 2011-12.

The structure of the cost of the crops is measured as a percentage share of each inputs items to total cost over years. The changes in the shares show relative importance of the cost component in the total cost of the crop. The observation over times also shows how the structure of cost has changed over time. The changes in cost structure have implication on income distribution and resource use changes. The results on cost structure changes for six major crops of the state is computed and presented in the tables at *Annexure*.

About two third of the total cost of paddy is operational cost and rest is fixed cost in TE 1981-82. The share of fixed cost has increased from 32 % in TE 1981-82 to 41 % in TE 2011-12. The rental value of own land, a component of the fixed capital, and human labour, a component of operational cost, is one fifth in total cost in TE 1981-82, which increased to about one third in TE 2011-12. Share of fertilizer, irrigation, machine labour has moderated over times.

The cost structure of Wheat was dominated by operational cost having more than half share in total cost but its share has continuously moderated over time from 66 % in TE 1981-82 to 53 % in TE 2011-12. The rental value of own land has the highest share in total cost followed by human labour, machine labour, interest on fixed capital and irrigation charges. The share of hired machine labour, casual labour, and family labour has increased, while the share of bullock labour, seeds, fertilizer, irrigation charges has decreased since 1981-82.

The share of operational cost of Sugarcane has declined from 63 % in TE 1981-82 to 46 % in TE 2011-12. Now about half of the total cost per hectare is due to rental value of own land and increased over time. The share of cost of casual labour has increased over time and it become second largest contributor with 20 % share within operational cost. However, the share of family labour has declined over time, so the total share of human labour has been stable around 24-29 %. The share of costs fertilizer, irrigation charges also have moderated over time.

For mustard crop, about half of the total cost is operational cost which has been moderating overtime. The share of human labour, hired machine labour, irrigation charges and fertilizer has increased during two decade.

In Gram, the role of family labour is more than casual labour and increasing over the years, while the share of bullock labour has declined. The share of rental value of own land is significant and ranging between 27 to 36 % of total cost.

Contrary to other crops, the operational cost has increased overtime for Bajra. The share of human labour, machine labour, fertilizers and seeds has increased over time, while the share of interest on fixed capital has declined.

The result shows that the proportion of the fixed cost is increasing in most of the crops, primarily due to increase in rental value of land. This is a reflection of the rising pressure on land resources, declining farm size without as much of reduction in dependency of population from agriculture. Besides, the rising wages in agricultural labour appears to have led to increase in share of cost human labour in almost all crops despite the mechanization of agriculture.

Section 6 Conclusion

Using secondary data on area, production yield and input of six crops since 1980 till 2011-12, in the state, the analysis of trends in sources of growth of agriculture, crop diversification, productivity, profitability and cost structure brings up useful insights. When the net sown area in the state has stopped, their incremental contribution in agricultural production, cropping intensity, relative better growth in few crops, change in cropping pattern and productivity has become prominent for their contributing in agricultural growth of the state. Better growth in production of paddy and wheat is mostly on account of their area growth. Among rabi crops, wheat is taking away area from gram and sugarcane, while among kharif crops paddy is taking away area from Bajra and other crops. The cropping pattern of the state is dominated by wheat-rice combination. The area under these crops is increasing over the years. There is indication of concentration of area under these two crops. The assured Minimum Support Price (MSP) and consequent decline in the price risk are two crucial factor that have played significant role in the promotion of the wheat-paddy combination in the state.

Besides inputs, the contribution of non-input factors, as reflected in TFP growth for all six crops in aggregate was improved during nineties compared to eighties, but moderated in 2000s compared to nineties. TFP growth improved for wheat, sugarcane and gram during nineties compared to eighties, while during 2000s TFP growth paddy and mustard has also improved.

The profitability over A2 cost for rabi and kharif crops improved over the years as reflected in the

benefit-cost ratio of six crops. The Gross Value of Output per hectare is highest for wheat and rice among rabi and kharif crops respectively seems to be one of the reason for the more and more putting area under these crops. Within the total cost, operational cost is about two third but its share is on decline over the years for most of the crops. The rise in the share of fixed cost in total cost of cultivation is mostly on account of increasing share of 'rental value of own land', while within operational cost, the share of human labour, machine labour is important and their relative importance has increased over the years.

The vegetable production grew at 9% CAGR during 1990-2013. The vegetable production growth has moderated during 2000s to about 8% from 11% during nineties. The production growth of the vegetables has mostly been on account of area growth while the yield

growth has almost been stagnant during the two decade. This is true across the zone of the state. The CAGR of area, production and yield among the vegetable crops also shows that most of the vegetables have grown at more than 4% during 1990-2013, but the growth is driven mostly by their area growth, while their growth in yield has been stagnant. The area under vegetables has increased over the years since 1990-91 to 3.6 % in 2006-07, but still low. Central zone contributes 35% and Northern zones about 38 % in the total area under vegetables of the state in 1990-91. While, the share of Southern zone is on the rise and increased from 14 % in 1990-91 to 27.5 in 2012-13. The area share of individual vegetable in the state shows that the cucurbits, cabbage/cauliflower, radish and leafy Vegetables is on the rise while the area under potato and peas is decreasing.

TABLE-1: VEGETABLES' AREA, PRODUCTION SHARE AND YIELD IN HARYANA.

| Crops | TE 1990-91 | TE 2000-01 | TE 2012-13 | All |
|-----------------------------------|-------------|-------------|-------------|------------|
| Share of Area (in %) | | | | |
| Peas | 8.8 | 4.1 | 3.9 | 5.7 |
| Onion | 7.2 | 9.5 | 7.3 | 7.6 |
| Tomato | 9.3 | 7.5 | 7.7 | 7.7 |
| Raddish | 5.5 | 7.1 | 7.6 | 6.8 |
| Carrot | 5.1 | 6.2 | 5.4 | 5.6 |
| Cabbage/Cauliflower | 10.9 | 13.3 | 12.5 | 12.3 |
| Chillie | 5.6 | 4.2 | 4.2 | 4.9 |
| Bhindi | 8.4 | 6.4 | 5.2 | 6.6 |
| Brinjal | 6.5 | 4.6 | 4.8 | 5.2 |
| Cucurbits | 12.7 | 14.6 | 20.1 | 15.4 |
| Leafy Vegetables | 2 | 7.2 | 8.3 | 5.9 |
| Others | 5.5 | 4.1 | 5.1 | 6.6 |
| Potato | 23.6 | 10.6 | 7.9 | 12.7 |
| Total | 100 | 100 | 100 | 100 |
| Share in Production (in %) | | | | |
| Peas | 7.3 | 2.4 | 1.9 | 4 |
| Onion | 7.8 | 11.2 | 11.3 | 9.7 |
| Tomato | 12.4 | 8.1 | 8.2 | 9.3 |
| Raddish | 7.3 | 7.5 | 8.2 | 8 |
| Carrot | 6.4 | 7.1 | 6.7 | 7 |
| Cabbage/Cauliflower | 11.8 | 15.1 | 16.6 | 14.9 |
| Chillie | 3 | 2.7 | 2.7 | 3.1 |
| Bhindi | 5.8 | 4.1 | 2.8 | 4.2 |
| Brinjal | 7.7 | 5.1 | 5.7 | 5.9 |
| Cucurbits | 8.9 | 11.4 | 14.3 | 11.3 |
| Leafy Vegetables | 1.1 | 5.8 | 5.4 | 4.3 |
| Others | 5.6 | 4.8 | 3.1 | 6 |
| Potato | 24.9 | 14.8 | 13.1 | 15.5 |
| Total | 100 | 100 | 100 | 100 |
| Yield (Tonnes/ Hect) | | | | |
| Peas | 12.2 | 8.5 | 6.6 | 9.3 |
| Onion | 16.1 | 16.7 | 21.2 | 17.8 |
| Tomato | 19.4 | 16 | 14.5 | 16.9 |
| Raddish | 19.5 | 15.4 | 14.7 | 16.7 |
| Carrot | 18.2 | 16.9 | 17 | 17.6 |
| Cabbage/Cauliflower | 15.9 | 16.5 | 18 | 16.8 |
| Chillie | 7.9 | 9.4 | 8.7 | 8.8 |
| Bhindi | 10.1 | 9.4 | 7.5 | 8.9 |
| Brinjal | 17.2 | 16.1 | 16.5 | 16 |
| Cucurbits | 10.3 | 11.9 | 9.8 | 10.5 |
| Leafy Vegetables | 8.2 | 11.5 | 8.8 | 10 |
| Others | 15.7 | 15.5 | 8.4 | 12.6 |
| Potato | 15.6 | 20.4 | 22.5 | 18.4 |
| Total | 14.7 | 14.5 | 13.6 | 14 |

Source: Department of Horticulture, Government of Haryana.

TABLE 2 SHARE OF COST COMPONENTS IN TOTAL COST OF PADDY IN HARYANA (IN %).

| Crops-Paddy | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|-------------|----------------------|-------------|-------------|-------------|-------------|
| 1 | Operational Cost | 68.0 | 66.7 | 62.1 | 58.7 |
| i | Human labour | | | | |
| a | Casual | 12.7 | 14.9 | 11.4 | 16.2 |
| b | Attached | 3.1 | 2.8 | 1.8 | 2.3 |
| c | Family | 7.2 | 10.3 | 14.4 | 12.2 |
| | Total | 23.0 | 28.0 | 27.5 | 30.8 |
| ii | Bullock labour | | | | |
| a | Hired | 0.1 | 0.0 | 0.0 | 0.0 |
| b | Owned | 2.9 | 2.8 | 0.2 | 0.3 |
| | Total | 3.0 | 2.9 | 0.2 | 0.3 |
| iii | Machine Labour | | | | |
| a | Hired | 3.0 | 2.4 | 3.8 | 4.9 |
| b | Owned | 4.8 | 2.7 | 3.5 | 2.1 |
| | Total | 7.8 | 5.1 | 7.3 | 7.0 |
| iv | Seed | 1.7 | 1.8 | 1.6 | 1.7 |
| v | Fertilizer & Manure | | | | |
| a | Fertilizer | 12.9 | 9.8 | 9.6 | 5.5 |
| b | Manure | 0.4 | 0.2 | 0.3 | 0.0 |
| | Total | 13.3 | 10.0 | 9.9 | 5.5 |
| vi | Insecticides | 3.6 | 4.3 | 3.6 | 3.3 |
| vii | Irrigation charges | 13.8 | 13.1 | 10.6 | 8.7 |
| viii | Interest on W.C. | 1.8 | 1.7 | 1.4 | 0.9 |
| ix | Miscellaneous | | | | |
| 2 | Fixed Cost | 32.0 | 33.3 | 37.9 | 41.3 |
| i | Rent. Value of ow.l. | 22.8 | 23.7 | 28.9 | 35.3 |
| ii | R.paidL.land | | 0.7 | 3.5 | 0.2 |
| iii | Land rev.cesses T. | 0.2 | | | 0.0 |
| iv | Dep.imp.F.bldgs. | 1.2 | 1.4 | 0.5 | 0.3 |
| v | Int.on fixed Cap. | 7.7 | 7.6 | 5.0 | 5.6 |
| 1+2 | Total Cost | 100 | 100 | 100 | 100 |

Source: Ministry of Agriculture, Government of India.

TABLE 3 SHARE OF COST COMPONENTS IN TOTAL COST OF WHEAT IN HARYANA (IN %).

| Crop-Wheat | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|------------|---------------------|------------|------------|------------|------------|
| 1 | Operational Cost | 66.9 | 61.3 | 56.6 | 53.2 |
| i | Human labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Casual | 4.9 | 5.6 | 4.9 | 6.3 |
| b | Attached | 1.7 | 1.2 | 0.5 | 0.7 |
| c | Family | 10.3 | 8.5 | 12.1 | 12.3 |
| | Total | 16.8 | 15.3 | 17.5 | 19.3 |
| ii | Bullock labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 0.1 | 0.0 | 0.0 | 0.0 |
| b | Owned | 7.8 | 3.1 | 1.0 | 0.5 |
| | Total | 7.8 | 3.2 | 1.1 | 0.5 |
| iii | Machine Labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 6.6 | 8.1 | 9.4 | 11.0 |
| b | Owned | 4.0 | 5.2 | 3.4 | 2.2 |
| | Total | 10.5 | 13.2 | 12.8 | 13.2 |
| iv | Seed | 7.8 | 5.6 | 4.1 | 4.0 |
| v | Fertilizer & Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Fertilizer | 13.4 | 13.6 | 10.0 | 6.6 |

TABLE 3 SHARE OF COST COMPONENTS IN TOTAL COST OF WHEAT IN HARYANA (IN %).—CONTD.

| Crop-Wheat | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|------------|----------------------|------------|------------|------------|------------|
| b | Manure | 0.1 | 0.0 | 0.0 | 0.0 |
| | Total | 13.5 | 13.6 | 10.0 | 6.6 |
| vi | Insecticides | 1.2 | 1.2 | 2.7 | 1.5 |
| vii | Irrigation charges | 7.5 | 7.7 | 7.1 | 6.8 |
| viii | Interest on W.C. | 1.7 | 1.6 | 1.4 | 1.2 |
| ix | Misc. charges | 0.0 | 0.0 | 0.0 | 0.1 |
| 2 | Fixed Cost | 33.1 | 38.7 | 43.4 | 46.8 |
| i | Rent. Value of ow.l. | 21.1 | 27.6 | 32.7 | 38.2 |
| ii | R.paidL.land | 1.2 | 0.4 | 2.7 | 0.1 |
| iii | Land rev. cesses T. | 0.3 | | | 0.0 |
| iv | Dep. imp. F. bldgs. | 1.7 | 1.6 | 1.2 | 0.7 |
| v | Int. on fixed Cap. | 8.8 | 9.1 | 6.8 | 7.8 |
| 1+2 | Total Cost | 100 | 100 | 100 | 100 |

Source: Ministry of Agriculture, Government of India.

TABLE 4 SHARE OF COST COMPONENTS IN TOTAL COST OF SUGARCANE IN HARYANA (IN %).

| Crop-Sugarcane | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|----------------|----------------------|------------|------------|------------|------------|
| 1 | Operational Cost | 62.9 | 65.2 | 48.4 | 46.4 |
| i | Human labour | | | | |
| a | Casual | 2.8 | 5.0 | 12.1 | 20.2 |
| b | Attached | 3.9 | 3.2 | 1.5 | 2.0 |
| c | Family | 22.0 | 16.0 | 12.0 | 7.1 |
| | Total | 28.7 | 24.1 | 25.5 | 29.3 |
| ii | Bullock labour | | | | |
| a | Hired | 0.1 | 0.1 | 0.1 | 0.0 |
| b | Owned | 5.9 | 4.6 | 0.5 | 0.0 |
| | Total | 6.0 | 4.7 | 0.6 | 0.1 |
| iii | Machine Labour | | | | |
| a | Hired | 0.2 | 0.6 | 0.7 | 0.8 |
| b | Owned | 1.2 | 1.7 | 3.0 | 1.7 |
| | Total | 1.4 | 2.3 | 3.6 | 2.5 |
| iv | Seed | 5.4 | 16.5 | 5.7 | 5.9 |
| v | Fertilizer & Manure | | | | |
| a | Fertilizer | 11.6 | 5.5 | 4.3 | 3.1 |
| b | Manure | 1.3 | 0.3 | 0.1 | 0.1 |
| | Total | 12.9 | 5.7 | 4.4 | 3.2 |
| vi | Insecticides | 0.2 | 0.3 | 1.7 | 0.7 |
| vii | Irrigation charges | 5.9 | 8.6 | 4.7 | 2.3 |
| viii | Interest on W.C. | 2.4 | 2.9 | 2.1 | 2.3 |
| ix | Misc. | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | Fixed Cost | 37.1 | 34.8 | 51.6 | 53.6 |
| i | Rent. Value of ow.l. | 27.7 | 25.9 | 42.0 | 48.9 |
| ii | R.paidL.land | 0.2 | 0.0 | 0.0 | 0.0 |
| iii | Land rev. cesses T. | 0.3 | 0.0 | 0.0 | 0.0 |
| iv | Dep. imp. F. bldgs. | 1.6 | 1.4 | 1.4 | 0.2 |
| v | Int. on fixed Cap. | 7.2 | 7.6 | 8.2 | 4.5 |
| 1+2 | Total Cost | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Ministry of Agriculture, Government of India.

TABLE 5 SHARE OF COST COMPONENTS IN TOTAL COST OF MUSTARD IN HARYANA (IN %).

| Crop: Mustard | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|---------------|----------------------|------------|------------|------------|------------|
| 1 | Operational Cost | 52.9 | 53.3 | 56.3 | 47.8 |
| i | Human labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Casual | 1.5 | 3.9 | 3.3 | 5.7 |
| b | Attached | 1.8 | 0.4 | 0.4 | 0.1 |
| c | Family | 12.8 | 13.7 | 20.2 | 14.8 |
| | Total | 16.2 | 18.1 | 23.9 | 20.6 |
| ii | Bullock labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 0.2 | 0.3 | 0.0 | 0.1 |
| b | Owned | 10.6 | 5.7 | 2.9 | 0.5 |
| | Total | 10.8 | 6.0 | 3.0 | 0.6 |
| iii | Machine Labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 1.8 | 6.2 | 6.7 | 8.6 |
| b | Owned | 8.8 | 2.4 | 3.6 | 3.2 |
| | Total | 10.6 | 8.6 | 10.3 | 11.8 |
| iv | Seed | 1.1 | 1.3 | 0.9 | 1.3 |
| v | Fertilizer & Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Fertilizer | 7.5 | 11.4 | 8.1 | 6.2 |
| b | Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| | Total | 7.5 | 11.4 | 8.1 | 6.2 |
| vi | Insecticides | 0.5 | 0.3 | 0.4 | 0.5 |
| vii | Irrigation charges | 5.0 | 6.3 | 8.6 | 5.8 |
| viii | Interest on W.C. | 1.2 | 1.2 | 1.1 | 1.0 |
| ix | Miscellaneous | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | Fixed Cost | 47.1 | 46.7 | 43.7 | 52.2 |
| i | Rent. Value of ow.l. | 31.7 | 33.3 | 31.5 | 42.7 |
| ii | R.paidL.land | 0.1 | 0.0 | 1.6 | 0.0 |
| iii | Land rev. cesses T. | 0.4 | 0.0 | 0.0 | 0.0 |
| iv | Dep. imp. F. bldgs. | 2.1 | 2.4 | 1.3 | 0.8 |
| v | Int. on fixed Cap. | 12.7 | 11.0 | 9.4 | 8.8 |
| 1+2 | Total Cost | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Ministry of Agriculture, Government of India.

TABLE 6 SHARE OF COST COMPONENTS IN TOTAL COST OF GRAM IN HARYANA (IN %).

| Crop: Gram | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|------------|---------------------|------------|------------|------------|------------|
| 1 | Operational Cost | 55.4 | 49.0 | 56.8 | 56.5 |
| i | Human labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Casual | 1.4 | 2.5 | 1.7 | 2.8 |
| b | Attached | 1.1 | 1.0 | 0.5 | 0.0 |
| c | Family | 17.7 | 14.7 | 17.0 | 26.7 |
| | Total | 20.1 | 18.1 | 19.2 | 29.4 |
| ii | Bullock labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 0.0 | 0.3 | 0.1 | 0.3 |
| b | Owned | 14.0 | 10.4 | 2.0 | 1.8 |
| | Total | 14.0 | 10.7 | 2.2 | 2.1 |
| iii | Machine Labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 1.0 | 6.3 | 2.3 | 6.6 |
| b | Owned | 2.9 | 1.3 | 10.4 | 5.6 |
| | Total | 3.9 | 7.6 | 12.7 | 12.2 |
| iv | Seed | 14.0 | 9.7 | 11.5 | 6.8 |
| v | Fertilizer & Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Fertilizer | 0.1 | 0.2 | 4.1 | 1.3 |
| b | Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| | Total | 0.1 | 0.2 | 4.1 | 1.3 |

TABLE 6 SHARE OF COST COMPONENTS IN TOTAL COST OF GRAM IN HARYANA (IN %)—*CONTD.*

| Crop: Gram | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|------------|----------------------|------------|------------|------------|------------|
| vi | Insecticides | 0.0 | 0.0 | 1.6 | 0.0 |
| vii | Irrigation charges | 2.1 | 1.6 | 4.4 | 3.7 |
| viii | Interest on W.C. | 1.1 | 1.0 | 1.2 | 0.9 |
| ix | Miscellaneous | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | Fixed Cost | 44.6 | 51.0 | 43.2 | 43.5 |
| i | Rent. Value of ow.l. | 27.6 | 36.5 | 28.2 | 30.8 |
| ii | R.paid L.land | 0.6 | 1.6 | 1.2 | 0.0 |
| iii | Land rev.cesses T. | 0.7 | 0.0 | 0.0 | 0.0 |
| iv | Dep.imp.F.bldgs. | 3.5 | 4.4 | 0.9 | 1.0 |
| v | Int.on fixed Cap. | 12.2 | 8.4 | 12.8 | 11.7 |
| 1+2 | Total Cost | 100 | 100 | 100 | 100 |

Source: Ministry of Agriculture, Government of India.

TABLE 7 SHARE OF COST COMPONENTS IN TOTAL COST OF BAJRA IN HARYANA (IN %).

| Crop: Bajra | | TE 1981-82 | TE 1992-93 | TE 2002-03 | TE 2011-12 |
|-------------|----------------------|------------|------------|------------|------------|
| 1 | Operational Cost | 53.4 | 54.6 | 68.5 | 64.5 |
| i | Human labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Casual | 2.6 | 4.6 | 3.6 | 8.1 |
| b | Attached | 0.6 | 0.7 | 0.4 | 0.3 |
| c | Family | 22.6 | 22.2 | 34.5 | 29.8 |
| | Total | 25.8 | 27.5 | 38.5 | 38.3 |
| ii | Bullock labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 0.3 | 0.3 | 0.1 | 0.3 |
| b | Owned | 14.2 | 9.2 | 4.4 | 2.2 |
| | Total | 14.6 | 9.5 | 4.5 | 2.5 |
| iii | Machine Labour | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Hired | 2.9 | 7.3 | 9.9 | 11.5 |
| b | Owned | 1.7 | 1.9 | 4.2 | 2.9 |
| | Total | 4.6 | 9.2 | 14.2 | 14.4 |
| iv | Seed | 1.8 | 1.4 | 2.6 | 2.8 |
| v | Fertilizer & Manure | 0.0 | 0.0 | 0.0 | 0.0 |
| a | Fertilizer | 2.3 | 3.3 | 3.8 | 3.8 |
| b | Manure | 0.2 | 0.1 | 0.0 | 0.0 |
| | Total | 2.5 | 3.5 | 3.8 | 3.8 |
| vi | Insecticides | 0.0 | 0.0 | 0.0 | 0.0 |
| vii | Irrigation charges | 3.1 | 2.6 | 4.0 | 1.5 |
| viii | Interest on W.C. | 0.9 | 1.0 | 1.0 | 1.0 |
| ix | Miscellaneous | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | Fixed Cost | 46.6 | 45.4 | 31.5 | 35.5 |
| i | Rent. Value of ow.l. | 26.8 | 28.6 | 21.6 | 27.0 |
| ii | R.paid L.land | 1.4 | 0.4 | 1.4 | 0.0 |
| iii | Land rev.cesses T. | 0.6 | 0.0 | 0.0 | 0.0 |
| iv | Dep.imp. F.bldgs. | 4.1 | 3.9 | 1.5 | 1.0 |
| v | Int.on fixed Cap. | 13.8 | 12.4 | 7.0 | 7.5 |
| 1+2 | Total Cost | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Ministry of Agriculture, Government of India.

TABLE 8 CAGR OF VEGETABLES IN HARYANA.

| Yield | Very high (>8%) | High (4-8%) | Medium (2-3.9%) | Low (0-1.9%) | Negative (<0) |
|--------------------|--|--|--------------------|--|--|
| 1990-91 to 1999-00 | | Leafy Vegetables | Chillie, Cucurbits | Raddish, Bhindi, Brinjal, Tomato, Cabbage/ Cauliflower | Peas, Potato, Onion, Others, Carrot |
| 2000-01 to 2012-13 | | | Onion | Carrot, Raddish, Cabbage/Cauliflower, Potato | Others, Bhindi, Tomato, Brinjal, Cucurbit, Chillie, Leafy Vegetables |
| all | | | Potato | Chillie, Cabbage/ Cauliflower, Leafy Vegetables, Onion | Others, Peas, Bhindi, Tomato, Raddish, Carrot, Brinjal, Cucurbit |
| Area | Very high (>8%) | High (4-8%) | Medium (2-3.9%) | Low (0-1.9%) | Negative (<0) |
| 1990-91 to 1999-00 | Bhindi, Peas, Tomato, Cucurbits, Chillie, Carrot, Radish, Cabbage/Cauliflower, Onion, Leafy Vegetables, Others | Potato, Brinjal | | | |
| 2000-01 to 2012-13 | Peas, Chillie, Tomato, Brinjal, Raddish, Others Leafy Vegetables, Cucurbits | Potato, Onion, Bhindi, Carrot, Cabbage/ Cauliflower | | | |
| all | Brinjal, Tomato, Onion, Carrot, Cabbage/Cauliflower, Raddish, Cucurbits, Leafy Vegetables | Peas, Bhindi, Chillie, Others | Potato | | |
| Production | Very high (>8%) | High (4-8%) | Medium (2-3.9%) | Low (0-1.9%) | Negative (<0) |
| 1990-91 to 1999-00 | Tomato, Cucurbits, Chillie, Carrot, Raddish, Onion, Cabbage/Cauliflower, Others, Leafy Vegetables | Brinjal, Bhindi | | Potato, Peas | |
| 2000-01 to 2012-13 | Brinjal, Tomato, Chillie, Raddish, Onion, Cabbage/ Cauliflower, Cucurbits | Bhindi, Others, Peas, Carrot, Potato, Leafy Vegetables | | | |
| all | Carrot, Raddish, Cabbage/Cauliflower, Onion, Cucurbits, Leafy Vegetables | Bhindi, Potato, Tomato, Brinjal, Chillie | Peas, Others | | |

Source: Calculated from Department of Horticulture, Government of Haryana.

Understanding The Contour and Role of Pani (Water) Panchayats under BGREI Programme in Jharkhand: An Empirical Analysis

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Background:

In July 2010, the General Assembly of the UN declared water and sanitation a basic human right. This gave a fillip to the efforts of the Indian Civil Society to pursue national legislation. As a follow-up, the UN adopted a new resolution in September 2011, asking countries to ensure enough financing to enable people achieving the Right. But 41 countries, including both 'developed' and 'developing' abstained from voting and 122 countries including India, voted in favour.

In India, access to 'water and sanitation' is not a fundamental or constitutional right. In common parlance, one can not take the Government to court for not providing these two basic needs. However, there have been numerous judicial pronouncements interpreting 'the Right to Life' giving such rights over water and sanitation. There are 44 such orders from High Courts and the Supreme Court. These orders cover various aspects of water and sanitation like: pollution, access to groundwater and toilets. It is to be noted that areas/regions 'devoid of groundwater' face the threat of 'lower crop productivities' and, lower agricultural productions.

'Right to Water' is also seen as a strategic move to ensure that government does not change 'water allocation priority' in the face of growing industrialization. There are numerous conflicts in the country over allocation of water to competing users, like farmers and industry. But, unlike other rights for a dignified human life, water and sanitation pose a much more complex and difficult challenge. Water and Sanitation are state subjects. After the 73rd and 74th Constitutional Amendments, states have the power to delegate these subjects to the Panchayats. It is, therefore, desirable to see and depict, how far Gram Panchayats (GPs) and Panchayati Raj Institutions (PRIs) are able to

effectively deal with 'water related issues and demands', particularly for agricultural, means irrigation purposes.

BGREI: Basic Perception

The Bringing Green Revolution to Eastern India (BGREI) Program was launched in the year 2010-11 with an allocation of Rs. 400/- crores as a sub-scheme of 'Rashtriya Krishi Vikash Yojana (RKVY)' with the objective to increase the productivity of Rice-Based Cropping Systems (RBCSs) through improved agronomy. The programme had been implemented in seven states, namely: (i) Assam, (ii) West Bengal, (iii) Bihar, (iv) Jharkhand, (v) Eastern Uttar Pradesh, (vi) Odisha and (vii) Chattisgarh on the basis of the plans devised by these states. Most of the activities taken up under the program during the year 2010-11 were 'Short-Term Crop Specific Strategies (STCSSs)'.

The initiative on BGREI continued during 2011-12 also to supplement the efforts of the state governments. A provision of funds to the tune of Rs. 400/- crores had been made additionally under RKVY for implementation in the year 2011-12. The program for 2011-12 included a bouquet of three broad categories of interventions, viz.; (i) Block Demonstrations of Rice and Wheat, (ii) Asset Building Activities (ABAs) for water conservation and utilization; and (iii) Site Specific Activities (SSAs) for facilitating the petty works, such as: (a) construction/ Renovation of irrigation channels and (b) Electric power supply for agriculture purposes.

As a matter of fact, nearly 17 per cent of the funds allocated under RKVY were meant for ABAs. ABAs proposed would mainly focus on 'Water Management Activities (WMAs)' such as: (i) construction of shallow tube-wells, dug well/bore well; and (ii) distribution of pump sets, drum seeders, zero till seed drills (ZTSDs).

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Further, nearly 19 per cent of the funds are allocated to the states for taking up SSAs assisting in enhancing agriculture production, such as: (i) improving quality of electric power supply, (ii) construction/ renovation of field/ irrigation channels; and (iii) institutional building for inputs supply etc. No doubt, the Irrigation Water Management, distribution/supply related aspects and responsibilities contained under ABAs and SSAs of BGREI programmes are to be dovetailed and provided to farmers by equipoising with the effective use of 'Water (Pani) Panchayats'.

In the above backdrop, the role being played by 'Water Panchayats' and 'extracted desired expansion and strengthening of these panchayats' need to be elaboratory examined.

Deliverables of the Programme:

1. Compact demonstration of production technology of rice, wheat in different agro-climatic sub-regions covering nearly 4 lakh hectares. Nearly 269 units of Rice demonstrations covering about 2.69 lakh hectares of rice in 97 non-NFSM Rice districts (out of a total 183 districts means 53%) of seven eastern states; and 122 units of wheat covering about 1.22 lakh hectares of wheat in 29 non-NFSM wheat districts (out of 84 total districts; *i.e.* 34.52%) in 3 states of: Bihar, West Bengal and Eastern UP were to be covered.
2. Out of 24.4 million hectares (MHAs) of rice area in eastern region, nearly 13 MHAs (53.28%) falls under non-NFSM districts. Therefore, the rice demonstration proposed in 2.69 lakh hectares out of 24.4 MHAs is nearly 2% of the non-NFSM rice area for 'Intensive Technology Pro motion (ITP)'. Rest of the area was to be served by on-going schemes.
3. Reduction of gap in between the actual and potential productivities of rice in the districts by 50% leading to an average increase of about 500 kg/hectare, means 5 Qtls./hectare of crop yield for rice, as-well-as wheat.
4. Creation of water management structures - 29,500 shallow tube-wells, 9,000 dug well/bore well; 42,000 pump sets, 2,000 zero till seed drills and 5380 drum seeders to ensure sustained increase in crop production.
5. Promotion of line sowing/planting for overcoming various stresses, input use efficiency and crop management for increased production.

Actually, this paper seeks to examine the role of 'Water (PANI) Panchayats' in regard to 'Water Management' aspects of BGREI Programme.

Statement of the Problem:

In Jharkhand, all the sub-zones are characterized by non-existence of perennial rivers, erratic rainfall, high soil erosion and lack of soil and water conservation practices. The data on Food Security Outcome Index (FSOI) in Jharkhand reveals that about 2/3 of the total districts are in insecure categories (IHD, 2008). In view of it, Government of Jharkhand assigned as one of the interventions of BGREI (*i.e.* SSA) to the Directorate of Soil Conservation (DSC, Government of Jharkhand). The DSC has formed Jharkhand Rajya Water (PANI) Panchayat (JRPP) in 2011 at the beneficiaries level to execute the works of Birsa Pucca Check Dam (BPCD), Loose Boulder Check Dam (LBCD), Guard Wall, and Lift Irrigation (LI) on cent-per-cent participatory basis. Number of JRPP under the scheme across the districts in Jharkhand was 232 in 2010-11 and 175 in 2011-12.

Some other deterrent factors in Jharkhand are: very low water holding capacity of the soil due to porous nature and undulated topography, average rainfall being 1200-1400 mm, wasting of 60% of the total rainfall due to surface run-off and leaching, and thus, only 40% water being available for crop use. In these contexts, it is significant to encourage the maximization of benefit from the available water by Participatory Community Irrigation Management (PCIM) through Water Users' Association (*i.e.*, PP).

Objectives:

1. To describe the concept, formation, term and functions of Water (PANI) Panchayats (PPs).
2. Examine PPs' role in promoting SSA as a component of BGREI.
3. Explore PPs' effects on APY in respective command areas; and
4. Suggest Observation-based Action Points.

Methodology:

Based on empirical analysis of *50 beneficiaries and 25 non-beneficiaries from five different rice ecology districts of Jharkhand, namely: (i) Rainfed upland, (ii) Rain fed shallow low land, (iii) Rainfed medium deep water, (iv) Rainfed deep water and (v) Irrigated. As a part of the study entitled: "End-Term Evaluation of the Implementation of BGREI Programme in Bihar & Jharkhand" assigned to "AERC for Bihar & Jharkhand", 'TMBU' by M.OA, GOI, this paper follows the statistical tools used in the study.

TABLE-1: DISTRIBUTION OF SAMPLE BY ECOLOGIES, STATE, DISTRICT AND BLOCK

| Ecology | Rainfed Upland | Rainfed Shallow Low Land | Rainfed Medium Deep Water | Rainfed Deep Water | Irrigated |
|------------------------------------|--|--------------------------|---------------------------|--------------------|-----------|
| State | Jharkhand | | | | |
| Districts | Pakur | Bokaro | Godda | Jamtara | Sahebganj |
| Blocks | Maheshpur | Petarwar | Basantra | Fatehpur | Barharwa |
| No. of Beneficiary Respondents | 10 | 10 | 10 | 10 | 10 |
| No. of Non-beneficiary Respondents | 05 | 05 | 05 | 05 | 05 |
| Sample Size | 50 Beneficiaries + 25 Non-beneficiaries = 75 Farm households | | | | |

Statistical Analysis of Primary Data :

Data collected from the sample households was analyzed by adopting casual forecasting methods by devising econometric models:

(a) Mean Difference Test

$$z = (\bar{x}_1 - \bar{x}_2) / \left(\frac{1}{N_1} + \frac{1}{N_2} \right)^{1/2}$$

Where z = Standard Normal Variate.

= Mean of Series 1 (say of beneficiaries)

= Mean of Series 2 (say of non-beneficiaries)

= Standard Deviation

N₁ = Number Observations in Series 1 (say of beneficiaries)

N₂ = Number of Observations in Series 2 (say of non-beneficiaries)

(b) Multiple Regression Analysis (Linear)

Form of Regression Model

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + e;$$

Where, Y = Yield per hectare (productivity)

a = Constant

b₁ - b₇ = Coefficients

X₁ = Costs of Micro-nutrients (imputed value in case of beneficiary farms)

X₂ = Costs of Seeds (imputed value in case of beneficiary farms)

X₃ = Other Costs (total costs less 1 & 2)

X₄ = Dummy for Ecological Region 1

X₅ = Dummy for Ecological Region 2

X₆ = Dummy for Ecological Region 3

X₇ = Dummy for Ecological Region 4

e = error term

(c) Statistical analysis of the Secondary Data:

The time series data of area, production & yield of rice

and wheat for the period 2005-06 to 2011-12 was analysed using regression analysis to compute Compound Growth Rates (CGRs) by way of exponential smoothening (Base Year - QE: 2009-10 = 100). In Regression Analysis, LOGEST calculates an exponential curve that fits the data and returns an array of values that describes the curve.

$$y = b * m^x$$

Where; the dependent y-value is a function of the independent x-values. The m-values are bases corresponding to each exponent x-value, and b is a constant value.

A Brief Profile of the State:

Jharkhand state was carved out from Bihar in 2000. It has a geographical area of 79.71 lakh hectares with a population of 329.66 lakh (Census-2011) (P), contributing 2.72 per cent of total population of the country. Out of the total population, 51.36 per cent are male and 48.64 per cent female. The population density is 414 persons per square km. The sex ratio is 947 female per 1000 male. Jharkhand is mostly rural with 78 per cent of the state's population residing in villages. According to NSSO 61st round (2004-05) and Planning Commission, the incidence of poverty was estimated at 40.3 per cent in the state, as compared to national average of 27.5 per cent. Population of the state consists of about 28 per cent scheduled tribes, 12 per cent scheduled castes and 60 per cent others. The state has 5 administrative divisions, 24 districts, 260 blocks, 4462 Gram Panchayats (GPs) and 32615 revenue villages. Out of the total geographical area 28.08 per cent are net sown area, 29.20 per cent forests, and 8.60 per cent is in non-agricultural uses. The percentage of irrigated area is about 9 per cent and the cropping intensity is 116 per cent. The state comes under agro-climatic zone-VII and in zones XII & XIII as per agro-ecological characteristics of the country. The state receives rainfall of about 1200-1500 mm/annum.

Rainfall:

The district-wise monthly rainfall and per cent departure from normal in BGREI and NFSM districts of Jharkhand state during 2010-11 & 2011-2012 have been described in the section. The rainfall data in BGREI districts in respect of newly created districts namely; Chatra, Deoghar, Dumka,

Latehar, Garwaha, Saraikela and Jamtara have not been compiled distinctively by IMD. There is enormous variability in rainfall pattern over time and space impacting agriculture production adversely in Jharkhand state. It might be mentioned here that total irrigated area in the state is 13 per cent, which is the lowest in the country.

The rainfall data in NFSM districts in respect of newly created districts namely: Khunti, Simdega and Ramgarh have not been compiled distinctively by IMD. Rainfall pattern in NFSM districts also show outsized variability over time and space in both the years in Jharkhand, besides being deficient.

Water (PANI) Panchayats : Emanation

1. For ensuring most effective and best possible use of available scarce water resources in Jharkhand (having only 12% of cultivable land under 'assured irrigation facilities'), such measures were felt necessary to be devised. It was urgently desirable, so that: (i) Water harvesting devices of the local farmers, (ii) construction, (iii) Uses, and (iv) maintenance on cent-per-cent people's participation basis are undertaken. In this background, the concept of 'Birsas Irrigation Yojana (BIY)' has been developed, chief components of which are: (i) Birsa Pucca Check Dam (BPCD), (ii) Loose Boulder Check Dam (LBCD), (iii) Lift Irrigation (LI) and (iv) Distribution System.
2. On small rivers, rivulets and hilly drains etc., situated in different areas of Jharkhand, if low cost BPCD, LBCD, Guard walls, ponds, LI and pump houses are constructed/made, and maintained on participatory basis, then nearly 25-30 acres of land area can be provided with assured irrigation by each such unit.
3. In view of the above conception, such small schemes of irrigation have been decided to be implemented by Water Panchayats, under which a group of 12 beneficiary farmers is to be constituted. During the course of time, it is to be provided the legal status of co-operative society.
4. 10 per cent of the estimated cost is to be necessarily contributed by 'the farmers group' either in cash or by way of labour during the course of construction. It is with the view to maintain 'strong psychological tie-up' of people with created public utility infrastructure on sustainable basis.
5. Having convened the General Body Meeting (GBM) comprising 'Beneficiary Member Farmers (BMFs)', two literate, active and progressive farmer members will be elected as 'Chairman' and 'Secretary-Cum-Treasurer' of the concerned 'Water Panchayat (WP/PP)'. A Bank Account in the name of the said WP/PP will be opened in the nearest bank (which ought to be jointly operated by 'the two members'. In this Bank

Account : (i) share contribution of all beneficiary members using 'Created Irrigation Facility (CIF)', (ii) fixed irrigation charges, etc., will be deposited. The deposited amount in this Savings Bank Account is to be used as Revolving Fund for all operational and maintenance related works of 'the created asset'.

Formation and Conditions of Water Panchayats:

In the light of the provisions consented by the Department of Agriculture and Sugarcane Development, Govt. of Jharkhand (GOJ), and Directorate of Soil Conservation, GOJ, Ranchi, 'Water Panchayat' will be constituted as per the following terms and conditions having convened general GBM of beneficiary farmers of the sanctioned 'Integrated Land and Water Conservation'.

Construction/Management Planning (Jharkhand State PANI Panchayat Guidelines-2011, Memo No. 2250, dt. 24.08.2011):

1. 05 members' Working Committee will be selected convening a GBM of all beneficiary farmers of the 'Water Panchayat', which will have two years' tenure. Members of the Working Committee shall be allowed to function for a maximum of two terms, i.e.; four years.
2. Through the GBM of beneficiary farmers attended by 2/3rd of the farmer members, (which should be more than the minimum 50% of total number of members), any member of the Working Committee (including the Chairman and 'The Secretary-Cum-Treasurer') can be removed by majority voting. For the remaining period, any new Farmer Member shall be elected.
3. In the above described Executive Committee/Working Committee, 'Soil Conservation Officer (SCO)', or any other Officer/Employee authorized by him will be nominated as Designated Member from Government side. His responsibility will be to provide correct guidance to the Executive Committee on continuous basis. But, that SCO will not have the right to vote in the meetings of the Executive Committee.
4. Minimum 10% of the estimated cost of sanctioned plans by the Water Panchayat is to be received/ provided and deposited in the concerned Bank Account by every beneficiary farmer member, either in the form of cash, or material required in construction work/by offering physical labour.
5. Meeting of the Executive Committee/Working Committee is to be convened on a definite date every month. In one year, the GBM of all beneficiary farmers will be organised for atleast twice. Presence of atleast 03 members of the Executive Committee, and 50% farmer members of the General Body will be required as quorum for the meeting.

6. Amendment/(s) in the guidelines of 'the Water Panchayat' shall, or can be made by the State Government of Jharkhand through Notification.

Functions of Water Panchayats:

Water (PANI) Panchayats have been entrusted with following duties and responsibilities:

- (1) To execute 'Integrated Land and Water Conservation Plans (ILWCP)' Management of Construction Works.
- (2) To identify and select crops (as per the type or class of land) for crop production in identified areas meant for 'ILWCP'.
- (3) To identify and sowing of those crops, which can be grown successfully with the use of minimum water.
- (4) To prepare 'Annual Calendar of Crops Coverage (ACCCs)' containing selected crops for Rabi, Kharif and Summer.
- (5) To decide/fix water charges in the light of areas under irrigation, consumption of diesel, use of pump sets, expenditures on maintenance and other components after having convened meetings of 'Beneficiaries' from time-to-time.
- (6) One year after the completion of the scheme/yojana, necessary maintenance related works have to be done from out of the Revolving Fund. It has to be performed in the light of the decisions taken by the Executive Committee.
- (7) Secretary of the 'Water Panchayat' shall be fully responsible for monitoring and maintenance of all the created assets. Required works like - repairing of pump sets, etc., shall be done only after the approval of the Chairman.
- (8) To get seeds/other implements distributed among the Members by the Chairman and the Secretary at subsidised rates in case of availability.
- (9) All necessary activities or formalities are to be done by 'the Chairman' and 'the Secretary-Cum-Treasurer' for installing 'Sprinkler System' / 'Drip System'.
- (10) To perform works related to permanent maintenance, necessary repairing etc., of the acquired infrastructures.
- (11) To undertake works containing: (a) Infrastructural development, (b) Pump house, (c) Irrigation pipes-their maintenance and monitoring, (d) in case of siltation, to get it removed by offer of 'free physical labour', and (e) water harvesting.
- (12) To estimate 'water requirement based on its availability, and distribute accordingly among the members by convening monthly meeting or 'Special Meetings' of the members of 'Water Panchayat'.

- (13) To settle down any type of dispute at the Panchayat level itself. Legal settlement of any dispute will be done within the territory of the concerned district.
- (14) At the end of every financial year, it will be the responsibility of 'the Water Panchayat' to submit 'Annual Statement of Total Deposited Amount in the Savings' Bank Account (ASTDASBA) to the local SCO/ 'Soil Conservation (Survey) Officer (SCSO)'.
- (15) It is the responsibility of the SCO/SCSO to maintain detail at the office level related to 'deposited amount, available balance in the Bank Account and its utilization.'
- (16) These provisions have been implemented since immediate effect, i.e.; 24th August, 2011.

Results and Discussion:

Adequacy of the BGREI Programme:

The need based interventions made under BGREI programme by the concerned states were commenced with a view to enhance the productivity of rice and wheat crops. Its programme formulated in 2010-11 was made by the concerned states in the first year of its implementation on the pattern of RKVY main Scheme. The component specific structure of BGREI programme in Jharkhand state based on per cent share of total expenditure during 2010-11 is presented in table no. 2.

TABLE-2 : COMPONENT SPECIFIC STRUCTURE OF BGREI PROGRAMME DURING THE YEAR 2010-11 BASED ON PERCENTAGE SHARE IN EXPENDITURE IN JHARKHAND.

| Sl. No. | Components | Jharkhand |
|---------|--|-----------|
| 1 | Crop demonstrations | 01.2% |
| 2 | Induced Agricultural Inputs Supply | 01.3% |
| 3 | Farmers & Staff trainings, Farmers fair, farmers study visits. | 00.5% |
| 4 | Water asset building | 89.3% |
| 5 | Improved farm equipments & machinery | 07.5% |
| 6 | Seed multiplication | 00.2% |
| 7 | Soil amelioration | 00.0% |
| 8 | e-post surveillance | 00.0% |
| 9 | Soil & water resources conservation | 00.0% |
| 10 | Sugarcane Industry Department | 00.0% |
| 11 | Contingencies | 00.0% |
| 12 | Monitoring | 00.0% |
| Total | | 100.0% |

Activities related to 'Water Asset Building (WAB)' in Jharkhand reveal highest percentage share in total expenditure (89.3%) suggesting positive role of 'Water (PANI) Panchayats (W/PPs)'.

Jharkhand :

There were three (3) major activities in BGREI programme during the year 2010-11. The activity of maize & wheat development programme consisted of seventeen (17) interventions, some of which were namely; seed multiplication, seed distribution, Technology demonstrations, conventional tillage method in wheat, zero tillage in wheat, induced supply of zero till seed drills, Rotavators and Power Tillers, Induced supply of micro-nutrients, Integrated Pest Management, induced supply of plant protection chemicals & weedicides and 'Farm Field Schools', patterned farmers' trainings. Similarly, the pulses development program consisted of fourteen (14)

interventions, out of which some are Seed distribution, Block demonstrations of 2 ha each, induced supply of soil amendments (lime, gypsum & phosphorous), induced supply of micro-nutrients, induced supply of Rhizobium & PSB culture, Integrated Pest Management, induced supply of plant protection chemicals, induced supply of Knapsack sprayers, Zero Till seed drill, Rotavator, Sprinkler sets, Pump sets, pipe for water conveyance and 'Farm Field Schools' patterned farmers training. Another activities related to site specific needs were namely; Birsa Pucca Check Dam (BPCD), Loose Boulder Check Dam (LBCE) and Guard Wall (GW). These are being directly/ or indirectly driven, extended, maintained and water distribution aspect handled by 'Water (PANI) Panchayats'.

TABLE-3: PHYSICAL AND FINANCIAL UTILIZATION UNDER BGREI PROGRAMME DURING 2010-11 IN JHARKHAND

(Financial in Lakh Rupees).

| S.No. | Components | Factor | Jharkhand | |
|-------|--------------------------------------|--------|------------|-----------|
| | | | Physical | Financial |
| 1. | Total Demonstrations | A | 4500 Nos. | 90.00 |
| | | U | 874 Nos. | 17.758 |
| 2. | Total Agricultural Inputs | A | --- | 149.26 |
| | | U | --- | 19.15 |
| 3. | Total Extension Activities | A | 131 Nos. | 36.03 |
| | | U | 10 Nos. | 8.03 |
| 4. | Water Asset Building | A | --- | 2470.18 |
| | | U | --- | 1321.02 |
| 5. | Total Improvement of Farm Implements | A | 1409 Nos. | 272.85 |
| | | U | 1144 Nos. | 111.30 |
| 6. | Total Seed Multiplications | A | 5500 qtls. | 55.00 |
| | | U | 299 qtls. | 2.99 |
| 7. | Grand Total | A | --- | 3073.32 |
| | | U | --- | 1480.25 |

TABLE-4: PHYSICAL AND FINANCIAL ACHIEVEMENT UNDER BGREI IN JHARKHAND DURING 2011-12.

(Unit : Financial: Rs. In Lakhs)

| Sl. No. | Indicative intervention specific programme proposed by DAC | Programme approved by SLSC | | Achievement till 31.03.2012 | | | |
|---------|--|----------------------------|------------------|-----------------------------|-----------|----|--------|
| | | Physical Target | Financial Target | Physical | Financial | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1. | Block demonstrations Autumn Rice (1000 ha clusters in Numbers) | 17 | 1271 | 17 | 1298.84 | 17 | 948.13 |
| 2. | Shallow tube wells | 4000 | 480 | 0 | 0 | 0 | 0 |
| 3. | Pump-set (Numbers) | 600 | 60 | 0 | 0 | 0 | 0 |
| 4. | Bore well/Dug well (Number) | 3000 | 900 | 0 | 0 | 0 | 0 |

TABLE-4: PHYSICAL AND FINANCIAL ACHIEVEMENT UNDER BGREI IN JHARKHAND DURING 2011-12. CONTD.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----|---|-------|------|-----|-------------------------|-----|-----------|
| 5. | Site specific needs Schemes of 2010-11 to be completed in 2011-12 as under: | | | | | | |
| | (a) BPCD | --- | --- | 232 | 1220.447 | --- | 1002.0457 |
| | (b) LBCD | | | 232 | | | |
| | (c) Lift Irrigation | | | 232 | | | |
| 6. | Schemes for 2011-12 | | | | | | |
| | (a) BPCD | --- | 457 | 175 | 787.50 | --- | 1121.917 |
| | (b) LBCD | | | 167 | 375.75 | --- | |
| | (c) Lift Irrigation | | | 160 | 504.00 | --- | |
| | | Total | 3168 | --- | 4186.537 | --- | 3072.093 |
| | | | | | % Financial Utilization | | 73.38% |

Out of the financial targets for the programme approved by the State Level Steering Committee (SLSC) for Jharkhand state to the tune of Rs.4,186.537 lakh, the achievements till March, 2012 was Rs. 3,072.093 lakh (73.38%). It shows positive and encouraging involvement of WPs/PPs in one way, or the other. It is so because most of the components under this come under the mandatory role of PPs/Water Panchayats.

Monitoring Status of the Programme by CRRI, Cuttack:

Monitoring of BGREI programme for extending technical backstopping was decided to be carried out by the nominated scientists of ICAR-SAU formations under overall supervision of CRRI- Cuttack. The outcome of the field visits based on the reports received from ICAR-SAU formations is presented below in table no. 5.

TABLE-5: FIELD VISITS UNDERTAKEN BY THE SCIENTISTS OF ICAR-SAU DURING 2011-02 IN JHARKHAND

| State | Total Districts | Number of districts visited by ICAR-SAU | | |
|-----------|-----------------|---|--------------|-------|
| | | CRRI | SAUs | Total |
| Jharkhand | 17 | 03 | Not Reported | 03 |

Monitoring by Central Steering Committee (CSC):

The staff members of BGREI Cell have visited 09 districts in Jharkhand out of 17 districts (table-6).

TABLE-7: CGR OF AREA, PRODUCTION & YIELD OF RICE CROP IN BGREI & NFSM DISTRICTS DURING 2010-11 & 2011-12 IN JHARKHAND STATE (BASE YEAR QE: 2009-10).

| State | 2010-11* | | | 2011-12* | | |
|-----------|-----------------|----------------|-------------|-----------------|----------------|-------------|
| | BGREI Districts | NFSM Districts | Whole State | BGREI Districts | NFSM Districts | Whole State |
| | AREA | | | | | |
| Jharkhand | (-) 15.0 | (-) 9.1 | (-) 12.3 | (-) 6.8 | (-) 3.0 | (-) 5.1 |
| | PRODUCTION | | | | | |
| Jharkhand | (-) 13.0 | (-) 5.9 | (-) 9.9 | (-) 3.6 | 1.5 | (-) 1.4 |
| | YIELD | | | | | |
| Jharkhand | 2.4 | 3.4 | 2.8 | 3.5 | 4.6 | 3.9 |

Source: Extrapolated from *Final estimates, **4th Advance estimates, DES, MoA, GoI.

TABLE-6: FIELD VISITS BY BGREI CELL FOR MONITORING OF BGREI PROGRAM DURING KHARIF-2011 IN JHARKHAND

| State | Kharif-2011 | | |
|-----------|-----------------|-------------------|---------------------|
| | Total districts | Visited districts | % visited districts |
| Jharkhand | 17 | 09 | 53% |

*Some BGREI components across all the districts in Jharkhand State. Source: BGREI Cell, DAC, GoI.

Variability in APY of Rice and Wheat in BGREI and NFSM Districts in Jharkhand:

To analyze the comparative scenario of Area, Production and Yield in BGREI and NFSM districts prevailing in Jharkhand state, the relevant data has been presented in table no. 7. It could be seen from the referred table that BGREI districts are more vulnerable in terms of area, production and yield deceleration as compared to NFSM districts. This clearly reveals that NFSM programme has greater sustainability in all three aspects viz., area, production and yield as compared to BGREI districts. The reasons for area, production and yield deceleration in rice may be due to deficient and erratic distribution of rainfall and drought, besides increasing land use for non-agricultural purposes.

BGREI Programme: Its Impact On Yield and Farmers' Income

In order to estimate the effectualness of the programme on : (i) grain yield and (ii) farmers' income in Jharkhand —

the Mean Difference Test (MDT) meant for harvesting yield of paddy, pulses and wheat between 'BGREI beneficiaries' and 'non-beneficiaries' — has been used. The calculated data based on field survey undertaken as per methodology is presented in table No. - 8 below:

TABLE 8 MEAN DIFFERENCE TEST OF GRAIN YIELD OF PADDY IN JHARKHAND

| State | Test/Checks Yield (In Kg/Hectare) | | | | | | |
|----------------------------|-----------------------------------|------|---------|------------|---------------------------|-------|----|
| | N | Mean | SD | SE of Mean | t-statistics (0.01 level) | DF | |
| Kharif-2011 : Paddy | | | | | | | |
| Jharkhand | Beneficiary | 50 | 2977.30 | 124.167 | 17.560 | 6.751 | 73 |
| | Non-Beneficiary | 25 | 2691.20 | 244.051 | 48.810 | 5.515 | 31 |

SOURCE: Field Survey Data collected after the initiative on BGREI continued during 2011-12

Test results clearly reveal that yield rates of Kharif paddy in Jharkhand between 'beneficiary' and 'non-beneficiary farmers' were statistically significant at 0.01 per cent level of probability. It also delved that the yield rates for 'beneficiary farmers' — were higher than 'the non-beneficiary farmers'.

Impact of Inputs on Total Yield

With a view to make certain the impact of various inputs on total yield, analysis was made to find out the factors determining yield of paddy, which is one of the most significantly grown cereal crops in Jharkhand. For this purpose, 'Multiple Regression Analysis (MRA)' was used. 'Yield per hectare' was taken as dependent variable and

the predictor (independent) variables - including both continuous and dummy variables. Value of seeds used per hectare, value of micro-nutrient used per hectare and 'other costs (including fertilizers, plant protection chemicals etc.)' per hectare — were taken as continuous variables. The dummy variables included — (i) ecological dummies for rainfed upland, (ii) rainfed medium, (iii) rainfed deep water and (iv) irrigated ecologies. Impact of inputs on the total yield of paddy is described below through the table.

It is indicated having glanced on the estimated results that the overall specification of the model is validated as approximated by the value of R^2 . [$R^2 = (TSS) - \text{Error of Sum Squares (ESS)}/TSS$]. The result of the Regression has been presented in table No.-9.

TABLE 9 IMPACT OF INPUTS' DETERMINATION IN THE TOTAL YIELD OF PADDY IN KHARIF — 2011 (JHARKHAND)

| S.No. | Factors/Interventions | Summary of Multiple Regression |
|-------|---|--------------------------------|
| | R^2 | |
| | Adjusted R^2 | |
| | SE of Estimate | |
| | Dependent Variable (Yield-Kg/Hectare) | |
| | Coefficients of Independent Variables | |
| 1. | Constant | 2385.034 |
| 2. | Costs of seed per Hectare (Rs.) | (-) 0.323 |
| 3. | Costs of Micro-nutrients per hectare (Rs.) | 0.090 |
| 4. | Other Costs Per Hectare (Rs.) | 0.032 |
| 5. | Dummy of Rainfed Upland Ecology | 104.137 |
| 6. | Dummy for Rainfed Shallow Low Land Ecology | 12.616 |
| 7. | Dummy for Rainfed Medium Deep Water Ecology | 92.809 |
| 8. | Dummy for Rainfed Deep Water Ecology | -77.886 |
| 9. | Dummy for HYV Irrigated Ecology | -- |
| 10. | Dummy for Irrigated Hybrid Ecology | -- |
| 11. | Dummy for Irrigated Traditional Ecology | -- |

SOURCE: Estimated & Calculated from Field Data

While extracting impact of BGREI Programme on productivity and production of cereals (particularly paddy)-'the predictor variables of other costs' were found statistically significant — suggesting that higher use of other inputs, other than seed and micro-nutrient, results in higher levels of productivity. This, however, does not establish the affectivity of BGREI programme through its intervention in seed and micro-nutrient provisions. At the same time, all the ecological dummies turned out to be statistically insignificant accompanying with varying degrees of co-efficients. This confirms that ecological variation in Jharkhand did not have any significant impact on the productivity of the crops. It, therefore, did not require 'ecology- specific technologies' under the BGREI programme for enhancing productivity of the crops in Jharkhand State.

Connotation/Note:

It is to be noted here that out of the three categories of interventions under BGREI— 'Asset Building Activities (for water conservation and utilization (ABAWCU)' — is one of the most important components. Under it, activities like: (i) Construction of shallow tube wells, (ii) dug well/ bore wells, (iii) distribution of pump sets, (iv) Site Specific Activities (SSAs) for facilitating the petty works, such as construction/renovation of field/irrigation channels — are undertaken. It is to be explicitly mentioned here that most of these activities are performed by 'Pani Panchayats'/Water Panchayats — (PPs/WPs) in Jharkhand. So, any positive or negative impact of BGREI programme on productivity, production, income of beneficiaries and/ecology — should be considered (to a great extent) — as the role and/ contribution of PPs/WPs — played for the development of agricultural sector in Jharkhand.

It is revealed from the table that despite significant declines in area and production of Rice crop in Jharkhand in both the surveyed types of districts, i.e.; BGREI districts and NFSM districts during the years: 2010-11 and 2011-12, yields have increased in encouraging way. It shows positive impact of the programme on productivities.

Conclusion:

- Significant increase in grain yield of rice has been witnessed in the Block Demonstrations under BGREI;
- BGREI program has narrowed down the yield gap across rice ecologies;
- Water asset building component under BGREI Program has resulted in increased Cropping Intensity;
- Progressive farmers proved the most viable link between Extension machinery and 'linked beneficiary farmers';
- Technical backstopping was largely extended by State Extension Workers;

- Farmers' perception gathered during the study revealed that BGREI program was as one of the best programmes in terms of adequacy of Input package/technology dissemination, and;
- Problems of marketing of harvested produce and low market prices still persist.

Observation-based Action Points:

- (1) 'The Chairman', 'The Secretary-Cum-Treasurers' of all 'Water (PANI) Panchayats' should be necessarily sent to 'State Institute/Regional Level Co-operative Training Institutes' for better understanding of Co-operative Principles (in different phases).
- (2) With the view to enhance 'scientific vision' and professionalism in planning, implementing, delivery (distribution) and better monitoring of 'Water Harvesting', 'Water Management and Conservation— related activities', all the Beneficiary Farmer Members (BFMs) of Water Panchayats should (in different periods), be sent for one week's / a fortnight's training programme to state level 'Water and Land Management Institutes (WALMI)'.
(3) With the view to create awareness and knowledge of different provisions, privileges, assistance or advantages being provided through different agriculture and Rural Development Programmes/ Schemes among the general members of Water Panchayats, special honorarium-based lectures may be arranged from time-to-time by scholars, experts/ professionals or Faculty Members of 'S.I.R.D.', Agricultural Universities, 'Agro-Economic Research Centres', University Departments of "Rural Economics & Co-operation", and other concerned Institutions.
- (4) Arrangement for providing basic knowledge related to Office Management, Auditing, 'Preparing and maintaining', 'Income-Expenditure Register', etc. should be urgently made for the 'Chairman', 'Secretary-Cum-Treasurer', and Members of the Executive Committee.
- (5) Timely delivery of recommended agri-inputs under BGREI programme should be ensured in one go. (*Attn: Directorate of Agriculture, Govt. of Jharkhand*).
- (6) There is need to establish co-ordination between the BGREI programme implementing agencies to ensure the quality of deliverables. (*Attn: BGREI Cell, Deptt. of Agriculture, Govt. of Jharkhand*).
- (7) Use of implements made under the BGREI programme should be promoted. (*Attn: Directorate of Agriculture, Govt. of Jharkhand*).

- (8) Infrastructure created under Water Asset Building should be functional. Some disputes were found in course of field survey, which should be settled with for smooth functioning of the scheme. (Attn: Directorate of Soil Conservation, Deptt. of Agriculture, Govt. of Jharkhand).
 - (9) Strengthening of co-ordination for technical backstopping between KVK, ATMA and State extension functionaries is required. (Attn: Directorate of Agriculture, Govt. of Jharkhand).
 - (10) Improvement in monitoring, evaluation and documentation is urgently needed. (Attn: Directorate of Agriculture, Govt. of Jharkhand).
 - (11) Irrigational water available at the field/micro level should be utilized by way of connecting their sources with the crop fields. (Attn: Deptt. of Water Resources & Directorate of Soil Conservation, Govt. of Jharkhand).
3. "Jharkhand State PANI Panchayat Guidelines 2011", Directorate of Soil Conservation, Department of Agriculture and Sugarcane Development, Jharkhand.
 4. Dr. Sinha, Ranjan Kumar and Dr. Sinha, Rajiv Kumar (2013), "End-Term Evaluation of the Implementation of Bringing Green Revolution to Eastern India (BGREI) Programme in Bihar & Jharkhand," "AERC for Bihar & Jharkhand", 'TMBU', Research Study No. 34.
 5. Blyn, G. (1966): *Agricultural Trends in India, 1891-1947: Availability and Productivity*, Philadelphia: University of Pennsylvania Press.
 6. Kurosaki, T. (1999): *Agriculture in India and Pakistan, 1900-95: Productivity and Crop mix*, Economic & Political Weekly, 35 (52), December, 25 A160-A168.
 7. Thakur, T.C. (2009): "Technological Advances in Soil Conservation and Nutrient Management in Rainfed Agriculture, Theme paper on Engineering Intervention for Sustainable Rainfed Agriculture", 43rd Annual Convention of Indian Society of Agricultural Engineers, held between February 15-17, 2009 at Birsa Agricultural University, Ranchi, (Jharkhand).

REFERENCES

1. Mahapatra, Richard "Access to Water and Sanitation: A Development Challenge," 'PANCHAYATI RAJ UPDATE', Vol.-XX, No. 3, March 2013, p. 1.
2. NFSM Cell, DAC, Ministry of Agriculture, Government of India, December 16, 2011.

AGRO-ECONOMIC RESEARCH

MGNREGA

Impact of MGNREGA on Wage Rates, Food Security and Rural Urban Migration in Odisha*

DR. G. GANGADHARA RAO AND SRI N. RAMGOPAL

Introduction:

Rural employment grew at the annual rate of 0.58 percent between 1993-94 and 1999-2000. But the rate of growth of the rural labour force was much higher. This has resulted in lot of stress on rural households. It was realized that a sustainable strategy of poverty alleviation has to be based on increasing the productive employment opportunities in the process of growth itself. As a consequence, the stress was laid on employment and poverty alleviation in the Sixth Five Year Plan. This as a backdrop, National Rural Employment Guarantee Act (NREGA) came into existence in September, 2005. It came into force on February 2, 2006 and was implemented in a phased manner. In phase I, it was introduced in 200 of the most backward districts and was expanded in 2007-08 covering another 130 districts in phase II. By April 1st 2008, the remaining 274 rural districts were also brought into its fold. From October 2nd 2009, National Rural Employment Guarantee Scheme (NREGS) has been renamed as Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

MGNREGS seeks to provide at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work. Further, it is different from other wage employment programmes as it bestows a legal right and guarantees to the rural population through an act of parliament and not just a scheme like other wage employment programmes. Viewed in a wider perspective, MGNREGA signals a possible reshaping of state priorities in India through a democratic determination to provide real livelihood opportunities for the rural poor. Thus, as a progressive legislation for hitherto excluded groups; women, scheduled castes, scheduled tribes, among others, MGNREGS can help to reclaim the lost faith in the possibility of pro-people governance.

Features of MGNREGA:

- (i) Time bound employment guarantee and wage payment within 15 days.

- (ii) Incentive-disincentive structure to the state Governments for providing employment, as 90 percent of the cost for employment provided is borne by the Centre while payment of unemployment allowances are borne by the State Government (at their own cost); and (iii) Emphasis on labour intensive works prohibiting the use of contractors and machinery.
- (iv) The Act mandates 33 percent participation for women.
- (v) The cost sharing by Central and State Governments are 75 percent and 25 percent respectively.

The Problem:

Keeping in view several success and failure cases of earlier employment programmes, the MGNREGS was launched in the year 2005, with high expectations in terms of employment generation, alleviation of poverty, food security, halting migration and overall rural development. As the scheme is in its initial stage, it is necessary to evaluate the scheme for its impact on rural poor. How much distressed and disadvantageous sections are benefited in the form of relative wage, unseasonal wage support by MGNREGS works and the impact on the rural incomes is to be brought to the sharp focus to formulate policies. In this connection, the Ministry of Agriculture, Government of India asked its Agro-Economic Research Centres to take up an evaluation study on the implementation of MGNREGS in their respective states. Therefore, the Agro-Economic Research Centre, Andhra University, Visakhapatnam has taken up the evaluation study in Odisha, with the following objectives.

Objectives of the Study:

1. To measure the extent of man power employment generated under MGNREGS, their various socio-economic characteristics and gender variability in all the districts implementing MGNREGS since its inception in Odisha.

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2. To compare wage differentials between MGNREGS activities and other wage employment activities.
3. To know the effect of MGNREGS on the pattern of migration from rural to urban areas.
4. To find out the nature of assets created under MGNREGS and their durability.
5. To Identify factors determining the participation of people in MGNREGS and whether MGNREGS has been successful in ensuring better food security to the beneficiaries; and
6. To assess the implementation of MGNREGS, its functioning and to suggest suitable policy measures to further strengthen the programme.

Data base and Methodology:

The study is based on both primary and secondary data. For primary data, reference period is January 2009 to December 2009. Five districts namely Bargarh, Boudh, Ganjam, Khurda and Mayurbhanj are selected. From each districts, two villages are selected keeping into account their distance from the location of the district or the main city/town. One village is selected from the nearby periphery of around 5 kilometers of the districts/city head quarters and the second village is selected from the farthest location of 20 kilometers or more than that. From each selected village, primary data is collected from 20 participants in MGNREGS and 5 non-participants working as wage employed. Thus 10 villages are selected and a total number of 250 households are surveyed in details with the help of a structured questionnaire. Therefore, in Odisha, 200 participants and 50 non-participants are surveyed to estimate the variations spatially and temporally. For selecting participant households, a list of all beneficiaries in the village are obtained from the Gram Panchayat or programme Officer in the village along with the information of caste and gender. After getting the list, the participant households are selected giving proportionate representation to the community *i.e.*, (i) Scheduled Castes (ii) Scheduled Tribes (iii) Other Backward Castes and (iv) Other Castes, through a stratified Random sampling method with a due representation to gender. Since the list for non-participants of MGNREGS is not available, the non-participating households are selected with analogous design of MGNREGS workers. To analyze the incomes and consumption aspects of the participants, Gini ratio's and to analyze the determinants of participation in MGNREGS, the Logit function are adopted to find the variations across selected groups of workers and villages.

Functioning of MGNREGS:

Highest number (4.10 lakhs) of job cards were issued in Ganjam district in 2008-09 followed by Mayurbhanj (4.05), Balasore (2.72) Sundargarh (2.84), Kalahandi (2.64) and Koraput (2.62). Ganjam continued its lead in issuing job

cards through 2009-10 and 2010-11 and reached 4.45 lakhs. Among the five selected districts Ganjam and Mayurbhanj led the other districts. Boudh figures last with 82281 job cards in 2010-11. In Mayurbhanj, a high percentage of (54.34) job cards were issued to scheduled tribe households. In other selected districts other castes dominate among the job card holders. At the state level, the total number of job cards issued has risen from 5267853 in 2008-09 to 6025230 by 2010-11.

Employment Generated:

The highest percentge of households who were provided employment for job car holders could be found Gajapati district (41.93) whereas the lowest percentage was recorded in Nayagarh (3.36) district in 2008-09. Among the selected districts Ganjam recorded the highest percentage of 39.62 and Khurda performed badly with 7.35 percent of households who could get employment out of the job card holding households. In the later years, Kandhamal recorded highest percentage of employment among job card holders with 51 and 58 in 2009-10 and 2010-11 respectively. At the state level, these figures have moved consistently upward from 23 to 33 in 2008—11.

Ganjam stood first among all districts in providing employment for 60 days per household and also recording the highest percentages of 14.36 households who could get more than 100 days of work in 2008-09. Mayurbhanj also performed well with 44 days of work per household and 6.23 percent of households who could get more than 100 days of work. At the state level, the average days of per household employment rose from 36 in 2008 to 49 in 2011.

Ganjam leads the state in Scheduled Caste population with 18 percent and able to provide employment to around 25 percent of total employed. This trend continued all through 2008-11. Sundargarh district with 50 percent of population being tribals is doing well in taking care of the community by providing 75, 77 and 73 percent of person days through 2008—11. Koraput and Mayurbhanj districts similarly have 50 percent tribal population. They are also performing well in tribal welfare by providing 50 to 65 percent of person days to tribals in the reference period. There was also stress on provision of employment to women in MGNREGS. Ganjam led the other districts by providing proportionate share of 48, 49 and 50 percent of person days to women through 2008-11. Overall at the state level Scheduled Caste got 19 percent, Scheduled Tribes got 35 percent and women formed 37 percent share in total person days created during 2008-11. Among the employed households, only 4 percent could get 100 days of employment in 2008-09. But, in later years it has shown an increase as about 6 percent in 2009-10 and 10 percent in 2010-11 are benefited with 100 days of employment at the state level.

Number of Projects Completed and Total Amount Spent:

Odisha has spent Rs. 1,17,456.3 lakhs on different projects till 2010-11 under MGNREGS. Out of this, a lion's share of 51 percent has gone for Rural Road Connectivity followed by other projects like Renovation of Traditional Water Bodies with 19 percent and Water Conservation Projects with 12 percent. At the state level, only 30 percent of projects could be completed by 2010-11 in Rural Road Connectivity Works. One of the components of MGNREGS works is Flood Controls and Protection. At the state level works, completed were only 4 percent in 2008-09 but subsequently it picked up in the next year and 22 percent were completed. However, it could not maintain the tempo in 2010-11 and ended with only 14 percent. Considerable focus was also laid on Water Conservation and Water Harvesting projects. In fact, this category of works occupied third rank in funds allocation. The overall picture looks very disappointing as most districts have shown a very bad performance. The position of Bargarh and Mayurbhanj is unenviable as each one has 97 to 100 percent of works still unfinished. The position of other districts like Dhenkanal, Bolangir, Kandhamal, Rayagada and Baleswar is no better as around 95 percent of works are still in progress. At the state level, only 21 percent of the projects got completed by 2010-11. Drought Proofing works do not need much technology and quite suitable for MGNREGS works. But, evidently no enthusiasm is shown in completing these works as no single work was completed in 8 of the 30 districts. In another 5 districts, more than 95 percent works are still being finished. At the state level, 20 percent of initiated works got completed by 2010-11. Micro-irrigation works got bogged down as one third of the districts reported no single project as completed. The state average of works completed in this category is only 16 percent in 2010-11. Even this is four fold increase from 4 percent in 2008-09. To help poor Scheduled Caste farmers reap better yields MGNREGS incorporated some irrigation scheme to benefit their lands. Puri was a bit late entrant as it initiated these schemes only in 2010-11. By this time Malkanagiri district could complete 80 percent of these irrigation schemes. The state's average of completed works is only 4.32 percent. In Renovation of Water Bodies like tanks, Gajapati with 68 percent and Jaipur with 62 percent of completed works performed well while Kendrapara with 2 percent and Mayurbhanj with 4 percent struggled to keep pace. Overall, it is only 31 percent at state/aggregate level. Yet, the pace has doubled from previous year of 2009-10. On the aggregate, only 7 percent works were completed in 2008-09. But this climbed to 27 percent by 2010-11. However, overall completion reflects a tardy progress of works under MGNREGS.

Expenditure on Different Projects:

In the total funds allocated under Road connectivity projects in 2008—11, 17 to 25 percent is spent on finishing

the pending projects and the remaining balance is spent on the on-going in the year at the state level. Smaller proportion of funds under Flood control and protection scheme, 9 percent in 2008-09 to 15 percent in 2009-10 were spent for completion of projects while major amounts 85 to 91 percent are deployed in running projects in 2008—11. In one third of the districts, no amounts were spent to complete the projects and the projects were still on-going. Under water conservation and water harvesting scheme, 9 to 18 percent of funds were spent to complete the projects while 82 to 91 percent got allocated and spent for on-going projects in 2008-11 at state level. In 9 districts in 2008-09 nothing was spent to complete the projects and total funds were spent on on-going projects. Funds for Drought proofing scheme were doubled from 2009-10 and stands at Rs 3,762 lakhs. At state level only 4 percent was spent in 2008-09 for completion of projects. It improved to 24 in 2009-10 but fell again to 15 percent in the next year 2010-11. Funds for Micro-irrigation scheme increased from 1450 lakhs in 2008-09 to 2,464 lakh by 2010-11. In 11 districts, no projects was completed in 2008—11 and hence no money was spent to complete projects. A fair amount of 23 percent was spent on completed projects while large amounts were spent in on-going projects in 2008-09 and 2010-11. A large amount of Rs. 7,282 lakhs were spent under Irrigation for SC and ST farmers and other Weaker Section's programme in 2010-11 in the state. This was almost 5 fold increase from 2008-09. The programme has shown steady progress in 2008—11 as amount spent on completed projects increased from 9 percent to 32 percent. Amount spent under Renovation of Traditional Water Bodies in 2010-11 was 22014 lakhs. This is 50 percent increase from previous year at the state level. Only 20 percent of the fund was spent to complete the pending projects while the balance amount was spent on on-going projects in 2010-11. The exception being Gajapati district where 75 percent of the fund was spent on completed projects. Only 21 percent of the amount for Land development was spent for completion where as 79 percent of money was gone for on-going works at the state level. But, number of districts who have spent 100 percent of fund on on-going works decreased from 17 in 2008-09 to 9 in 2010-11. Only Malkanagiri could spend 81 percent of allocated money to complete the programmes.

Performance of MGNREGS:

Muster roll verification is periodically taken up to bring transparency and to see that the needy are really given employment when needed. In 2008-09 only 5 districts could carry out 100 percent verification. In the following year, 2009-10 eight districts could verify all the muster rolls. In 2010-11, 12 out of 30 districts successfully completed verification of all the muster rolls. At the state level, the tally increased from 72 percent in 2008-09 to 84 by 2010-11.

In 2008-09, only 3900 Gram Panchayats (GP) out of 64th reported social auditing in their villages, only 11 districts could complete social audit in all the villages. But, as many as 10 districts could conduct the process in less than 2 percent of the villages. In the following year 2009-10, 16 districts carried out social auditing in all the villages. But the dismal performance is confined to only 3 districts *i.e.*, Naupada, Sambaipur and Kendujhar. In the latest year, 2010-11, many districts realized the necessity and 27 districts fully complied with social auditing. Even the remaining three districts have reported more than 97 percent compliance. At the state level, 97 percent of all GPs conducted social audit by 2010-11.

In 2008-09, a total number of 84374 works were taken up at the state level. Out of these, 60 percent were inspected at block level and 19 percent were inspected at district level. In 2009-10, 72 percent at block level and 19 percent at district level were inspected. But 2010-11, the total number of works taken up increased to 255970. Majority of these works *i.e.*, 60 percent were inspected at block level where as only 11 percent of works were examined at district level. In 2008-09, a total number of 768 complaints were received at state level. Out of this, ninety percent were disposed. In the following year 2009-10, out of 631 total complaints 83 percent were resolved. The number of complaints increased to 1452 by 2010-11 in proportion to increased number of works. But, percentage of resolved cases dropped to 37 percent on the overall. Bolangir, Ganjam, Sonepur and Kendrapara districts have succeeded in disposing all pending complaints in that year.

Wages are paid to the labourers through bank and post office accounts to avoid corruption. Workers are asked to open accounts either with a bank or a post office in their village. No minimum balance is required and the credited amount is immediately allowed to be withdrawn. In 2008-09, a total amount of Rs. 22929 lakhs of rupees were paid as wages. Out of this, 80 percent is paid through Bank accounts and remaining 20 percent was paid through post office accounts. A vast majority of these accounts are individual and yet, some joint accounts are also held. The phenomenon is dominant among post office accounts as 20 percent of the accounts are jointly held. However, at the state level, 88 percent are individual and 12 percent are jointly held. In the following year 2009-10, post office accounts have increased and formed 46 percent of total accounts. Again, the proportion of joint accounts are lesser at 9 percent when compared with post office accounts, where it is 21 percent. On an average only 15 percent are joint accounts in the year. Overall, 54 percent of wages are paid through banks and the remaining amount through post offices. By 2010-11, the proportion of joint accounts decreased to 8 percent at the state level. The post offices also geared up to the occasion and are taking considerable work load in disbursing the wages. About 43 percent of the amounts is paid through this channel.

In MGNREGS, if a worker demanded work and if it is not provided within 15 days he is eligible to receive un-employment allowance in 15 days. Though there were many such instances where employment could not be provided in stipulated time, no un-employment allowance was paid in any district. Navrangpur reported 5613 days where allowance should be paid. Jagatsinghpur reported very low incidence of 49 days in 2010-11. Overall, no un-employment allowance is paid.

For the reference year 2010-11, Ganjam district seems to be lagging behind with 16 percent of the total works in the state falling under the category of spill over works from previous year. Gajapati district took the lead in new works with 56 percent of total works. No other district reported even 5 percent of new works in the reference year. Some of the works taken up in 2010-11 are likely to spill over in to the next financial year *i.e.*, 2011-12. Under this category, a higher number of 11 percent is reported from Ganjam and Kendujhar districts. Though 56 percent of works are reported to be taken up in Gajapati district, only 0.86 percent are likely to spill over to next financial year.

In the total person days to be generated in 2011-12, Ganjam leads other districts by reporting 33 percent of the share. It is followed by Mayurbhanj district with 11 percent.

Household Profile of the Sample:

As 97 percent of the respondents in beneficiary category are heads of the household, it is 100 percent in non-beneficiaries. Overall, 98 percent of the sample respondents are heads of the household.

In an indication that MGNRGS is really nearer to the target, the percentage of illiterates, which is an outcome of poverty and backwardness, is high in beneficiaries at 35 percent. Non-participants of MGNRGS have only 19 percent illiterates among the family. Overall figure is 32 percent. Other backward castes dominate the overall sample at 45 percent followed by 38 percent scheduled castes and 13 percent scheduled tribes. Only 3 percent belong to General Category. In non-beneficiaries other backward castes overwhelmingly dominate at 70 percent. Scheduled Castes and Scheduled Tribes are lower in number in non-participants. But, in beneficiary group scheduled castes represent at 44 percent followed by other backward castes at 39 percent. Scheduled Tribes share is 14.5 percent. These numbers reflect that MGNRGS has reached the targeted groups as desired.

Among the beneficiaries, 11.5 percent are also beneficiaries under Indira Awas Yojana. Non-participants of MGNRGS do not have any benefits under the IAY. Seventy two percent of participants sample fall under Below Poverty Line category, where as the non-participants are only 24 percent. As a consequence, more non-participants

(46 percent) fall under above poverty line group. In the participants the corresponding figure is 9 percent. Overall, 62 percent are under BPL group and 16 percent are APL group. As elsewhere, 87 percent of decision makers in beneficiary and 94 percent non-beneficiary sample are males. Overall, it is 88 percent. Workers dependent on farming are more in non-beneficiary group at 44 percent followed by 10 percent of workers engaged in self-business. In the beneficiary sample, though the main occupation is farming with 36 percent engaged in it, 19 percent are also deriving their income from daily wages. On the overall, 37 percent depend on farming and 16 percent on daily wages. Migration for work is more at 8 percent in non-beneficiaries and only 3 percent of beneficiaries report the same. Overall, it is 4 percent.

In contrast to non-participants of MGNREGS, where they also cultivate some land, workers in MGNREGS are mostly landless poor. Hence, 45 percent of them have Agricultural Casual Labour as main occupation. 27 percent are engaged in non-agricultural casual labour. A small percentage of 5 are employed on their own farms. Only 4 percent of beneficiaries are self-employed in non-farming activities. About 19 percent of the beneficiaries have reported MGNREGS as their main occupation.

When the total sample is analyzed agriculture casual labour remains as the main stay of sustenance for 37 percent of people. Non-agricultural labour follows at 25 percent. When 13 percent reported self-employment in agriculture an equal number are participating in MGNREGS works for livelihood. A minute percent of 1.4 reported working as migrants.

In the net income of beneficiary households, income from MGNREGS constitutes only 13 percent. The other major sources of income are wages from agriculture (36 percent) and wages from non-agriculture (37 percent). Only 6 percent of the income comes from agriculture/livestock. They also derive 4 percent of their income from self-employment in non-farming activities.

Most of the non-participants, in the MGNREGS sample hold some agricultural lands. So they receive 60 percent of their income from agriculture/livestock. About 17 percent of income comes from wages on non-agriculture. Relatively a smaller number of 8 percent is receiving their income from agricultural wages. Almost the same proportion of income is accruing from wages as migrant labour. About 6 percent of the income comes from self-employed non-farming activities.

Main sources of income on the aggregate are agriculture/livestock (28 percent) followed by wages from non-agriculture (29 percent) and wages from agriculture (27 percent). About 8 percent of income is received from MGNREGS works. A minute, 3 percent of income comes from work as migrant labour. Another 4 percent comes from

self-employment on non-farming activities. Workers participating in MGNREGS reported an average income of Rs. 36, 433 per household. The non-participants reported roughly 3 times more, *i.e.*, Rs. 102194. The aggregate per household income for the entire sample is Rs. 49, 586.

The monthly consumption expenditure of non-participants of MGNREGS is twice as high when compared to the beneficiary group, where it is Rs. 553/-. The expenditure of non-beneficiaries is consistently higher, though small, as almost all food items except on Rice. This figure is much more significant when non-food expenditure is compared. It is almost more than double the beneficiary figure of Rs. 350/-.

In both the groups, *i.e.*, the beneficiary and non-beneficiary, except for rice all other food expenditure is lower than the NSS 2004-05 data. Non-food expenditure has sharply risen in the sample when compared to NSS 2004-05 data. It is double in the beneficiary group and more than 4 times in non-beneficiary group. The details are presented in Table 3.5. This increase is mostly noticed in education and clothing. Especially expenditure on education is four times higher in non-beneficiary group than in the beneficiary group.

Work Profile Under MGNREGS, Wage Structure and Migration Issues:

SC participation is highest (1.29) followed by OBCs (0.87) and STs (0.36) when per household family member participation in the scheme is considered. SC households reported 25.73 days, OBCs 23.24 and STs 8.72 days of employment in a year. But, these figures are nowhere near promised 100 days of work in a year. When project-wise employment is analyzed the highest number of 33 percent is employed in rural road connectivity works followed by 30 percent in provision of irrigation facility for SC farmers, 18 percent in Water Conservation and Water Harvesting, 12 percent in renovation of traditional water bodies and 8 percent in flood control and protection.

Overall, half of the sample households felt the quality of the assets 'good' while a little more than a quarter (27 percent) said 'very good'. Only 22 percent were disappointed and said that the quality was 'bad'. It may be noted that no un-employment allowance was paid under MGNREGS in the sample districts.

When wage rates of MGNREGS are analyzed workers in Khorda obtained high wage rates when compared to other districts. Workers in Scheduled Caste Community received a high wage rate of Rs. 104.35 followed by general category with Rs. 100.41. In Mayurbhanj, workers in general category earned a high wage of Rs. 100.69 when compared with other. Boudh reported a uniform wage rate of Rs. 90 across all communities. In fact, this is the minimum wage rate for

unskilled labour declared by the Government of Odisha for the year 2009. The picture of Bargarh with reference to wage rates is more or less same as of Boudh; Ganjam surprisingly reported lower wages across all communities with an aggregate of Rs. 65.98 when compared with other districts. When the aggregate wage rate of selected districts is analyzed, the figure comes to Rs. 87.92 much lower than Rs. 90., the minimum wage rate of Odisha. Respondents in the sample reported finding work nearer to the village under the scheme. They had to travel only one or two kilometers for work.

MGNREGS aims at providing employment near the residing villages so that workers need not migrate to distant places for work. Very few people have reported out migration after registering for work MGNREGS. Even these people returned back to their villages once the works got underway. Among those migrants, 63 percent could find work in the nearby town while 37 percent head to go to little farther town in the same district.

Qualitative Aspects

Household Assets Holdings:

The per household land is 12 times less to participations compared to non-beneficiary. Housing property is more than two times less to participant compared to non-beneficiary. In case of live stock, we cannot find much variation but it is three times less for beneficiary than that of non-beneficiary. The possession of agricultural implements is at very low ebb to the participants and it shows that they are not in the line of having agricultural apparatus which is useful for cultivation. Thus, the participants are very vulnerable from every aspect of asset estimation comparatively with non-beneficiary. In average per household total "Asset Holding" is six times low. It obviously exhibits how much the participants are poor when compared to non-participants of MGNREGS.

Household Status on Borrowings and Their Financial Vulnerability

It is very interesting fact that the beneficiaries of MGNREGS received institutional loan (Rs.1245/-) at 15 times low compared to their counterpart. They are in the shackles of trades-cum-money lenders and further they are compelled to be under landlord employment, as their exigencies might have led to that extent of settlement of finances. The beneficiaries do not have good sources of loan either from friends or 'others'. The non-participants of MGNREGA are not in the clutches of traders-cum-money lenders and landlord employment. There is deviation in the sources of loan between these two groups. The rate of interest are exorbitant at 24 percent and above for both groups.

Household Strength on Borrowing and other Household Assets of Sample Villages:

The household strength on borrowing and other household assets is given in the table 5.2B. There is no wage work to these whom the workers are indebted. The participants of scheme have low (66%) availability of co-operative credit compared to non-beneficiaries and they had very limited family membership in co-operative societies, while the availability of informal credit from other society/SHG in village is very high to the participants of scheme. All family members of both groups (100%) are members of such societies.

Qualitative Functioning of MGNREGA from Sample Villages:

There is no corruption (100%) for using job card to participant but some irregularities akin to job card maintenance are there. The entries (20%) even after working in the scheme did not take place. The fake information or incomplete information or missing information took place for all participants (100%). Overwritten entries and signature column are blank to all participants (100%), despite of these lapses, there one facility left with participants is the job card with the participants (100%). The payment was done in bank to participants (100%) and the bank account was in their names only. Gram Panchayat sanctioned the amount with proper details and the drinking water facility, period of rest, child care facility and first aid kit were available at work site. The monitoring is good by administration and no other complaint is lodged relating to work site to Gram Panchayat. All participants (100%) expressed that the work done was very useful to the villages. The respondents (100%) are fully aware of the scheme.

Some Qualitative Aspects of Food Security

The participants of the scheme reported that there was neither type of payment to get job card. There is no bribe for the procuring of job card by participants. The participants divulged that the migration of family members to town was there due to high wage in nearest towns. The migration is a selective one by the agricultural labour based on their physical fitness. They referred works like construction, moving cart loads, etc., which were fit for the middle aged people. They expressed that the aged and women prefer MGNREGS, while others made commutation. There was not much work back in the village in MGNREGS, as these labour were work specific in the towns.

Potential Benefits of MGNREGS to Sample Villages:

The protection from poverty and reduction of distress migration was reported at 90% and 92% respectively. There is economic independence to women who are participants of MGNREGS and the reduction to indebtedness took place. Thus, there is potential accrual of benefits to the beneficiaries.

MGNREGS and Food Security of Sample Villages:

The families of participants did not face insufficient food security or any other deprivations. They face protection in meeting expenditure for (44%) education and medical (56%). They encounter in-sufficient wage (56%) in other activities and the lack of work in time (44%). To achieve and develop the scheme implementation, as suggested by participants, there is need to increase the number of days of scheme (56%) and arranging availability of works nearer to village (44%). All the participants (100%) unanimously expressed that there should be compulsory work allocation particularly to landless agricultural labour.

Infrastructure Available in the Sample Villages:

It is reported that no village has rail connectivity in this study but 90% of sample villages have nearest connectivity and the average distance of 10 villages is 21.50 kms.

In the selected sample villages in Odisha, 20% villages have agricultural produce market and the other villages are at 6.75 kms. distance to the market. If the infrastructure availability to the village economy is observed, the rail connectivity (21.50 kms.), Hospital (9.78 kms.) and Commercial Bank (7.20 km.) are much distant in Odisha. No other items under 'any other' are identified in the study villages in Odisha.

Occupational Structure in Sample Villages:

The dependence on agriculture has been declined during 2001-09, as the cultivators and agricultural labour shows a declining trend by 26.46 to 24.89 and 63.93 to 63.42 respectively. The non-farm activities have increased in the study villages. A new shift in 'other services' has reported towards non-farm activities. Significantly 'other services' demonstrates higher growth during the study period in Odisha.

Wage Rates of Labour in all Sample Villages: (State level/Overall):

Both wage rates of male and female have increased, while the wage of female are still lower than that of wage rates of male. The gap of wage rates for non-agricultural wages between male and female increased during 2005-09. This means that the wage curve has become much positive to make workers in non-agricultural sector. In case of 'other skilled' workers, the wage rates increased much to electricians rather than plumber and workers of pump set boring. This indicates the skill set of electrician has led to higher wages in rural Odisha, particularly in the study area.

Average Prevailing Labour Charges for Agricultural Operations in Sample Villages by Overall/State:

There has been acceleration of costs for all agricultural operations in the study area during study period at overall/state. The per acre cultivation costs are estimated as per the farmer response. Out of costs/charges of agricultural operations, harvesting of paddy and transplanting are the

highest charges out of all and ploughing and weeding have also shown much charges compared to others.

Qualitative Changes in Sample Villages during Last One year in Odisha:

There was no shortage of agriculture/wage labour at any point in last year as the participants answered 'no' by 80 percent. But it could be inferred that after implementation of MGNREGS, the cost of cultivation has been increased enormously. All the participants by 100 percent accepted the fact that the wage rate offered in town is higher than the wage rate of MGNREGS. All the participants by 100 percent reported that some labourers came back to work in MGNREGS, but some others were still moving to towns due to wage difference. No stagnancy in wages of labour took place after MGNREGS. The 60 percent of the participants reported that more children from their villages attended schools. It also enhanced the regularity in schooling of children of participants. MGNREGS has changed the situation of attached labour in agriculture in Odisha as expressed by 50% of the participants. The awareness of the villages has increased in leaps and bounds.

Qualitative Functioning of MGNREGS:

There was a shortage of 20 percent of agricultural wage labour during July and August months of agricultural seasons. The scheme has very positive impact on the existing wages of casual labour during the last five years. The standard of living has increased in the study villages at 20 percent and their consumption of pulses and oils increased by 22 percent. The regular attendance of children of participants of MGNREGS took place and these are able to increase purchases of increase purchases of books at 15 percent compared to the previous level. The Gram Sabha has generated the awareness of villagers by 36 percent over the government schemes. Further, they suggested stopping the scheme during agricultural peak season, since the wages are sufficient and it is useful for agricultural production.

Policy Recommendations

(1) Need of Streamlining the Scheme Administration:

As there is much reference of the participants, there is need for the fixing the responsibilities and liabilities to the staff who are involved in the scheme regularly. There are certain requisites for the scheme: 1) maintaining proper record 2) proper response from concerned personnel 3) avoiding tampering existing record and other aspects in administration. Hence it is better to establish a proper responsible hierarchy in the scheme implementation at village and block levels.

(2) Unemployment Allowance:

There is no awareness of availability of unemployment allowance among the participants and this allowance is not executed in the study villages. As there are limited days

(below 100) of works by the scheme, there is dire entail for 'Unemployment Allowance' to the participants during slack season in Odisha. This will highly enable the 'more than middle aged' and the women to have employment in their vicinities and it generates much better financial conditions of the agricultural labour. Otherwise the works allotment should be sufficient to the participants during sagging days.

(3) No Scheme Operating during Agricultural Season:

Unanimously and absolutely the participants express that it is better to stop the scheme operation during agricultural season to avoid disturbance to agricultural activities and to make labour available to the cultivators. This will not have any negative impact on the incomes or on the demand for labour of the participants, since the similar or higher wages to exist in rural Odisha during the busy agricultural activity phase.

(4) Mechanization of Agriculture and Rural Migration:

The rural migration to urban area could not be withheld, since the higher wages and dose proximity to urban areas are reasons for migration of agricultural labour. In this hour of mechanization of agricultural even at smaller levels of landholding sizes, the able bodied and best fit labour tend to migrate to urban areas to earn higher wages. The farmers unable to cope with this situation, as the threshing and harvesting operations of agricultural demand energetic

labour. The peasants are left with less energetic labour and it costs them much time and higher wages to use the limited available labour in the vicinity. Further, the huge increase in non-farm activities like in 'Construction' and 'Other Services' has created scarcity for the required eligible/able bodied labour to the cultivator. Therefore, it would be much better to operate a good mechanization scheme which would differ from its present scheme by its requirements of investment and its utility levels in agriculture across Odisha to cover successfully and properly marginal, small and medium farmers.

(5) Implementation of 100 days Employment:

The 100 days employment norm has still not been achieved in Odisha in the study area in question. It would be much better to increase the number of days of scheme during slack agricultural season. It generates employment particularly to women and aged men in the villages where other avenues of employment to these particular groups becomes difficult. This will not upset the agricultural operations. Otherwise the required earth works in the fields like levelling of plot, lining of canals etc. of the farms of peasants may be permitted. This ill be useful to both farmers and agricultural labour. In another way it accelerates the farm production and reduces the investment burden to the cultivator and at the same time the labour works could be generated to the labour of the villages. Further, it nultifies the payment of 'unemployment allowance'.

Assessment of Pre and Post Harvest Losses in Tur Crop in Gujarat*

RAJESHREE A. DUTTA, MANISH MAKWANA AND HIMANSHU PARMAR

1. Introduction

Agriculture is the largest sector of economic activity in India. Agriculture, which is considered as the backbone of India, not only provides food and raw materials but also employment to a very large proportion of population. Though its contribution to the overall GDP has declined from about 50 percent in 1950-51 to lower at 15 percent in 2010-11, the growth of agriculture and allied activities continues to be a critical factor in overall performance of Indian economy (MoA, 2012). Since agriculture forms the resource base for a number of agro-based industries and agro-services; it would be more meaningful to view agriculture not as farming alone but as a holistic value chain, which includes farming wholeselling, warehousing, processing and retailing.

Indian agriculture has undergone considerable transformations overtime. The transformations are seen in the form of changes in agrarian structure, technology interventions, cropping pattern, enterprise mix and marketing system. More emphasis has been given on increasing agricultural production through adoption of high yielding varieties along with use of chemicals, fertilizer and pesticides. Since land availability is limited, more emphasis has been put on increasing productivity of crops. All these developments have entailed to increase the building up of pests and diseases which have great negative effect on productivity and hence on production. In order to control pests and disease, higher amount of pesticides is used which resulted in developing insects and disease resistance and it has further led to reduction in crop yield.

At present scenario, there has been considerable increase in attention to the role of agriculture in order to meet the food security needs of the country. In this context, pulses are very important crop for Indian agriculture as it meets most of the protein needs of Indian population. There is a supply and demand gap in pulse crop, for this reason, India has to import pulses. Even with the best efforts by government, production of pulses have registered slight growth or remained stagnant. Generally, pulses are more susceptible to pests and disease. This crop is adversely affected by a number of biotic and abiotic stresses which are responsible for lower yield and hence loss in production. All other management practices of crop harvesting will be useless if crop is not protected against pre and post harvest losses.

Among pulses, tur is very important crop for India as it is the largest producer and consumer of it in the world. Tur is also important crop for Gujarat. The share of Gujarat in the total area and production of the tur in the country was 7.54 and 10.22 percent during TE 2007-10 respectively. Tur crop is highly susceptible to pests and disease so there is need to reduce if not eliminates these losses by protecting the crop. Again, after crop is harvested, it undergoes several operations and if improperly done may result in serious losses. Damage to grains may happen due to improper application of post harvest practices such as harvesting, threshing, winnowing, transportation and storage.

Looking into these aspects, the Directorate of Economics and Statistics, Department of Agriculture Co-operation & Farmers Welfare, Ministry of Agriculture & Farmer Welfare. Government of India entrusted Agro-Economic Research Centre, Vallabh Vidyanagar, Gujarat State to undertake this study, "*Assessment of Pre and Post Harvest Losses in Tur Crop in Gujarat*" with the objectives shown below.

2. Objectives of the Study

1. To estimate the physical and financial losses caused by pests and diseases in tur at farm level.
2. To examine the measures of pests and disease management to reduce the crop loss due to pests and diseases at farm level.
3. To arrive at post harvest losses in tur under different agro climatic conditions.
4. To identify factors responsible for such losses and suggest ways and means to reduce the extent of losses in different operations in order to increase national productivity.

3. Methodology

This study makes an attempt to assess the pre and post harvest losses of tur crop in the Gujarat state. The study was coordinated by Agricultural Development and Rural Transformation Center (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore. The survey proposal, instruments, guidelines, tabulation and chapter scheme, technical inputs and guidance, for the study was provided by the Coordinating Agency.

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The study is based on both the primary as well as the secondary data. The primary data were collected for agriculture year 2011-12 (July to June). Two major tur producing districts were selected for different agro climatic regions of the state for field survey. Accordingly, Vadodara and Bharuch were selected for the present study. From each selected districts, one major tur producing block was selected purposively and from each selected block, two sample villages using distance criteria from market, i.e., one village nearby market and one far off from the market

were selected for field survey. From each selected villages, total 30 sample farmers growing tur of different farm size categories *i.e.* marginal (<2.50 acres), small (2.51 to 5.00 acres.), medium (5.01 to 10.00 acres) and large (>10.01 acres) and representing different social strata such as SCs, STs OBCs and General castes were selected. Thus altogether 120 sample households were selected for primary survey of the study. The village-wise and farm size-wise distribution of sample farmers is presented in Table 1.

TABLE 1: LIST OF SELECTED DISTRICTS, BLOCKS, VILLAGES AND CATEGORY- WISE SAMPLE HOUSEHOLDS IN GUJARAT STATE

| State | Districts | Blocks | Villages | MF | SF | MDF | LF | Total |
|---------------|-----------|---------|-------------|----|----|-----|----|-------|
| Gujarat state | Bharuch | Bharuch | 1. Dahegam | 3 | 5 | 10 | 11 | 29 |
| | | | 2. Bhadbhut | 6 | 6 | 5 | 14 | 31 |
| | Vadodara | Karjan | 3. Miyagam | 6 | 6 | 6 | 12 | 30 |
| | | | 4. Mantorj | 5 | 7 | 4 | 14 | 30 |
| Grand Total | | | | 20 | 24 | 25 | 51 | 120 |

NOTES: MF=Marginal Farmers (<2.50 acres), SF=Small Farmers (2.51 to 5.00 acres), MDF=Medium Farmers (5.01 to 10.00 acres) and LF=Large Farmers (>10.01 acres)

Methods of Primary Data Collection

The primary survey instrument was prepared and finalized by Agricultural Development and Rural Transformation Center (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore after consultation with associated AERCs. The season wise primary data were collected by recall method from the selected sample households by interviewing the decision makers or head of the households.

In addition to field survey, other related important information and data were also collected through personal discussion with District Agriculture Officials, Taluka Development Officers and officials of State Agriculture and State's different agencies like KVK, Agricultural Universities and research centres of selected crop.

Secondary Data Collection

The secondary data required for the study were collected from the various government departments such as Directorate of Agriculture, GOG, Directorate of Economics and Statistics of Gujarat state and Central/States government publications and websites. District-wise data on area under selected crop was collected from the above mentioned sources. Block-wise data on area under tur crop was collected from district level official like District Agriculture Officials, District Statistical Officials, etc.

4. Background of Pre and Post Harvest Losses

At present, increased productivity is an essential component of a vibrant agricultural sector and improved pre and post-harvest technology is essential to ensure high yield and quality of products. Large quantity of crops is being lost at pre and post harvest stages. Assessment of pre-post harvest

losses at the various stages of production would help to increase yield and in identifying factors responsible for such loss and the extent of loss.

Pre harvest losses

Pre-harvest lost is mainly due to pests and disease. The estimation of crop loss due to pests and disease is a complex subject. It is difficult to assess the loss caused by the individual pest as a particular crop may be infested by the pest in the farmers' field condition. Further, extent of crop loss either physical or financial depends on the type of variety, stage of crop growth, pest population and weather conditions.

Generally, 'Pest' is an organism that causes damage resulting economic loss to plant or animal. The expression of pest is used broadly to insects, other invertebrates like rats, birds, etc. that cause damage to crops, stores products or animals. Disease producing pathogens of plants and weeds are also referred as crop pest.

In country like India, insects are dominating over other pests by acquiring character like resistance to toxic, chemicals and resurgence particularly in intense crop management of practices adopted by the farmers, In the past one and half decades, the periodical unabated explosions of aphids, whiteflies, bollworms, pod borers, defoliators, coccids, cut worms, plant happens etc., are direct damagers to crops and diseases transmitters in different regions of the country have made agriculture less remunerative and highly risk prone.

Hence, there is need to reduce if not eliminate these losses by protecting the crops from different pests through appropriate techniques. At present day, the role of crop protection in agriculture is of great importance and a

challenging process than before, as the so called resistance spices should be brought under control, if it is not done, yield of crop may reduce drastically.

Post-harvest losses

After the crop is harvested, it undergoes several operations that if improperly done, may result in serious losses. Damage to grain may happen due to improper application of post harvest practices such as threshing, drying or transportation, lack of adequate storage facilities, absence of primary grading and sorting, render food unusable or cause food to rot. At the processing level, use of primitive technology, lack of modernization and inefficiency in energy use result in a huge loss. Thus there is a sizable quantitative and qualitative loss of crops during different post harvest operations like threshing, winnowing, transportation, processing, storage and marketing.

5. Status of Agriculture Economy in Gujarat

Agriculture in Gujarat largely depends on south-west monsoon. Gujarat has all the odd in the field of agriculture, about 70 percent of its agriculture is rainfed, 50 percent of its districts are drought prone areas and 20 percent of its area is tribal, surrounded by undulating terrain where despite good rains, crops get rained and washed away (Shelat, 2007). It has recurrent droughts where almost three years in every decade are drought years. Beside rainfall is uneven and erratic. The state is surrounded by sea on three sides. The salinity ingress is on rise affecting the productivity of crops. Despite all these constrain, Gujarat is an outstanding performer in agriculture in India.

The details on area, production, yield and cropping pattern are presented in Table 2. It reveals that area under foodgrain has declined over the period. While increase in production was attributed to productivity growth rate as it rose significantly between Triennium Ending (TE) 1977-80 to 2007-10. Similarly production of cotton and oilseeds have also shown increasing trends due to both increase in area and yield.

Cropping pattern in Gujarat has changed over the years. Foodgrain crops were important in 1950s, but later on non-foodgrain crops dominated crop pattern in the state. Decline was the sharpest in the last decade and can be attributed to the fall in area under coarse cereals. Area under bajra and jowar went down remarkably. Area under pulses increased upto late 90's but then declined. In the last three decades, share of oilseeds in GCA remained almost stagnant or slightly increased due to increase in share under rapeseed and mustard and castor seeds as groundnut is losing importance. Its share is falling in GCA over the period. Share of cotton has increased.

Major expansion in irrigation, water management, implementation of drip and sprinkler irrigation, providing Kisan Credit Cards and Soil Health Cards for farmers in

the past years have led agriculture economy towards the inclusive growth (GoC.2012).

TABLE 2: Area, Production and Yield and Cropping Pattern: Gujarat

| Crops | TE 1977-80 | TE 1987-90 | TE 1997-00 | TE 2007-10 |
|------------------------------------|------------|------------|------------|------------|
| Total cereals | | | | |
| Area | 41742 | 37163 | 34243 | 32199 |
| Production | 38990 | 38110 | 49636 | 60947 |
| Yield | 934 | 1025 | 1449 | 1893 |
| Total Pulses | | | | |
| Area | 6574 | 8617 | 8604 | 8002 |
| Production | 3418 | 4578 | 5676 | 6241 |
| Yield | 520 | 531 | 660 | 780 |
| Total foodgrains | | | | |
| Area | 48315 | 45780 | 42848 | 40200 |
| Production | 42408 | 42687 | 55312 | 67194 |
| Yield | 878 | 932 | 1291 | 1671 |
| Total oilseeds | | | | |
| Area | 24766 | 24296 | 28917 | 28039 |
| Production | 21245 | 23227 | 31911 | 38804 |
| Yield | 858 | 956 | 1104 | 1384 |
| Cotton | | | | |
| Area | 18361 | 10394 | 16269 | 24133 |
| Production | 19928 | 12893 | 31888 | 75636 |
| Yield | 185 | 211 | 333 | 533 |
| Cropping Pattern (% to GCA) | | | | |
| Total cereals | 39.62 | 37.82 | 31.02 | 27.27 |
| Total pulses | 6.24 | 8.77 | 7.79 | 6.78 |
| Total foodgrains | 45.86 | 46.59 | 38.82 | 34.05 |
| Total oilseeds | 23.51 | 24.73 | 26.20 | 23.75 |
| Cotton | 17.43 | 10.58 | 14.74 | 20.44 |

NOTE: Area in '00 ha.; Production in 00 MT; Yield in Kg./ha.

Source: GoG (Various years)

6. Importance of Tur Crop in Gujarat and in Selected Districts

Among the pulses grown in India, chickpea accounts for 40-50 percent of the total pulses production then followed by tur (15-16 percent), black gram (10-12 percent) and lentil (9-10 percent). Tur is also known as pigeon pea, arhar and red gram.

India is the largest producer and consumer of tur in the world. India accounted for about 70-75 percent of the total area and production of tur in the world. It consumes around 90 percent of the tur produced globally. Tur is the main pulse crop among all the pulses grown in Gujarat. Tur, which accounted for 1.82 percent of CGA in TE 1977-80 increased to over 4.13 percent in TE 1987-90 but then decreased to 3.38 percent in TE 1997-2000 and further down to around 2.25 percent in TE 2007-10. The decrease in area under tur cultivation has been due to shifting in area towards cotton cultivation. Details of tur crop in Gujarat are given in Table 3.

TABLE 3: DETAILS OF TUR CROP IN GUJARAT AND SELECTED DISTRICTS

| Particulars | TE 1977-80 | TE 1987-90 | TE 1977-80 | TE 2007-10 |
|------------------------------------|--------------|--------------|--------------|--------------|
| % share of Gujarat in India | | | | |
| Area | NA | 10.02 | 10.89 | 7.54 |
| Production | NA | 8.78 | 12.82 | 10.22 |
| % of GCA | | | | |
| Bharuch | 12.34 | 38.49 | 23.22 | 16.23 |
| Vadodara | 8.14 | 17.77 | 16.35 | 13.44 |
| Gujarat | 1.82 | 4.13 | 3.38 | 2.25 |
| Area | | | | |
| Bharuch | 538 (76.59) | 1645 (92.64) | 959 (88.14) | 733 (84.64) |
| Vadodara | 433 (73.92) | 987 (84.69) | 930 (84.59) | 747 (80.14) |
| Gujarat | 1920 (29.21) | 4056 (47.07) | 3728 (43.33) | 266 (33.23) |
| Production | | | | |
| Bharuch | 282 (77.21) | 750 (91.50) | 564 (89.34) | 591 (87.95) |
| Vadodara | 237 (70.05) | 615 (87.45) | 737 (88.12) | 816 (85.18) |
| Gujarat | 995 (28.99) | 2483 (54.25) | 3072 (54.12) | 2660 (42.57) |
| Yield | | | | |
| Bharuch | 524 | 456 | 588 | 806 |
| Vadodara | 523 | 623 | 792 | 1092 |
| Gujarat | 518 | 612 | 824 | 1000 |

NOTES. Percentage in parenthesis represents the proportion of tur in total pulses in respective districts,
Area in '00 ha. Production in '00.MT; Yield in Kg. ha.

SOURCE: GoG (Various years)

The contribution of tur cultivation in the total area under pulses and food grains was 29.21 and 3.97 percent in TE 1977-80 respectively and the same rose to 47.07 and 8.86 percent in TE 1987-90. Then afterwards share of tur in both continuously declined and it touched to 33.23 and 4.71 percent in TE 2007-10. Similar trend was reported in tur production. However, share of tur production in the total pulses and food grains production was higher due to higher yield of tur.

Although, tur accounted for only 2.25 percent of GCA of the state during 2007-10, it is a very important crop for the districts of Vadodara and Bharuch. Area under tur increased significantly between TE 1977-80 and 1987-90. Tur was grown on 8.44 percent of GCA of Vadodara district and 12.34 percent of Bharuch district in TE 1997-2000. While their share in GCA was as high as 17.72 and 38.49 percent in TE 1987-90 respectively. Then onwards, its share in GCA decreased significantly in Bharuch and was 16.23 percent during TE 2007-10 and same was 13.44 percent for Vadodara. Still these districts remain the major tur producing districts in the state. The share of Vadodara and Bharuch in the total area cultivated

tur in the state was 28.08 and 27.56 percent respectively and in case of production, Vadodara contributed 30.68 percent and Bharuch 22.22 percent in the total production of tur in TE 2007-10.

In Gujarat, area under tur was 1.92 lakh hectares in TE 1977-80 which increased to 4.06 lakh hectares in TE 1987-90 and then area continuously declined and was 2.66 lakh hectare in 2007-10. Although production has constantly increased from 0.99 lakh tonnes in TE 1977-80 to 2.48 and 3.07 lakh tonnes in TE 1987-90 and 1997-2000 respectively but in subsequent decade, production of tur declined to 2.66 lakh tonnes in TE 2007-10. There was significant increase in yield of tur from 518 kg./ha. in TE 1977-80 to 1000 kg./ ha. in TE 2007-10.

The exceptional growth of tur production between TE 1977-1980 and 1987-1990 was mainly due to high rate of area expansion as yield had not increased significantly during this period. During the next period *i.e.* TE 1997-2000, area cultivated under tur declined marginally but production increased due to increase in yield. Subsequently, both area and production of tur decreased in TE 2007-10, even though yield did increase during this period, indicating

significant decline of the area under tur cultivation. Thus the growth of production was negative during this period due to significant decline in area and slow growth in yield. To conclude tur has exhibited best growth performance upto end of 80's but then mainly decline in area was responsible for sluggishness in the growth of production of tur in Gujarat.

The districts of Vadodara and Bharuch are the main tur producing districts in Gujarat. The pattern of tur in area, production and yield was almost similar to the pattern as observed for the state.

As per CACP reports, overall C2 cost has increased by 189 percent during the last fourteen years in tur cultivation. The share of A2 cost worked out to be around 57 percent of C2 during 1996-97 and 2009-10. The share of operational cost in the total cost was 63.94 percent and of fixed cost 36.06 percent during 2009-10.

The cost item-wise analysis brought out that in operational cost expenses on machine labour, use of fertilizer and manure and irrigation charges has increased while expenses on human labour did not change much but share of animal labour and insecticides in the total operational cost had declined. The item-wise analysis of fixed cost revealed that there was year to year wide variation in the contribution of rental value of owned land in the total fixed cost. Rent paid for leased in land was reported only for few years.

There was no trend reported in the profitability of tur crop over the period. Return fluctuates significantly from year to year. Return has usually increased or decreased due to yield and price to tur.

Major Findings from Primary Data

7.1 Households Characteristics, Cropping Pattern and Production Structure

For field survey, total 120 farmers growing tur were selected of which 20 were marginal, 24 small, 25 medium and 51 large farmers, Majority of respondents were head of the households. There were only 3.33 percent of the total selected households having all the family members illiterate.

About half of the respondents were from general caste, 35 percent households belongs of OBC, 9 percent of SC and 3 percent to ST. The distance of main market from the sample farms was on an average 14.58 kilometers. The annual average family income of farmers worked out to be Rs. 2.47 lakh. It was Rs. 1.46 lakh for marginal, Rs. 1.69 lakh for small, Rs. 2.03 lakh for medium and Rs. 3.46 lakh for large farm size categories.

After taking into account uncultivable land, leased in the leased out land, the overall on an average net operational area and gross cropped area of the selected

farmers was 12.94 acres and 15.19 acres per household respectively having cropping intensity of 117. Main sources of irrigation for the selected farmers were canal water and electric tube wells.

The cropping pattern of these farmers indicated that tur, cotton, sugarcane and wheat were the main crops grown by them. Tur was grown on 41.09 percent of GCA of the selected farmers. Importance of tur in cropping pattern had decreased with increasing in land holding size. The area under cultivation was maximum 73.40 percent of GCA of marginal farmers and least 38.98 percent of GCA of large farmers. Selected farmers were mostly using HYV seeds for cultivation.

Overall, average yield of tur was 4.31 quintals per acre with highest of 4.74 quintals per acre of medium farmers and lowest of 3.64 quintals per acre of small farmers.

Tur produced was mainly marketed as 95.39 percent of the total production of tur with the highest 96.80 percent by large and lowest 89.65 percent by medium farmers.

7.2 Per Harvest Losses

On the constraints faced in cultivation of tur, the selected 80.63 percent households indicated that pest and diseases problem was most important constraint faced by them in cultivation of tur. While 62 to 63 percent informed each water deficiency and high cost of inputs as most important constraints. On the other hand, low output price and poor seed quality was reported as important constraints by 50.83 and 44.17 percent households respectively. Thus pests and disease problem, water deficiency and high cost of inputs were most important and poor seed quality and low output price were important constraints revealed by the farmers in cultivation of tur.

All the households were able to distinguish between pest and disease attack. Majority of the selected farmers were using HYV seed for tur cultivation. Major pest of tur crop in local and HY varieties was pod borer, there were 80 percent respondents in HYV of tur reporting severity of pod borer attack as very important with 62.60 percent indicating frequency of attack in every season. Production loss due to this pest was quite high as around 21 percent households reported loss by 25 to 50 percent, 35 and 30 percent farmers revealed loss between 10 to 25 and 5 to 10 percent respectively. Next important pests affecting crop were pod fly and aphid.

Major diseases affecting local and HYV of crop were dry root rot and fusarium mildew. About total 60 percent households indicated severity of dry root rot disease as very important or important with appearing once in season or in two seasons, with loss of production between 1 to 10 percent. Other diseases attached HVY of tur were fusarium mildew, sterility mosaic and yellow mosaic.

Production losses due to these diseases varied between 1 to 10 percent.

Severity of attack of any weeds was not important for local variety of tur. For HYV of tur, barnyard grass, purple nut sedge, bermuda grass and ecliptic were major

weeds affecting the crop. Production loss due to weeds was less than five percent.

Magnitude of Crop Loss: Pre Harvest

The magnitude of crop loss due to pests, disease and weed infestation in tur crop is presented in Table 4.

TABLE 4: THE MAGNITUDE OF CROP LOSS DUE TO PESTS, DISEASE AND WEED INFESTATION

| Description | Marginal | | Small | | Medium | | Large | | Total | |
|---|----------|-------|-------|-------|--------|-------|-------|-------|-------|-------|
| | Local | HYV | Local | HYV | Local | HYV | Local | HYV | Local | HYV |
| Actual production with attack (quintal/acre) | 4.00 | 3.64 | 3.76 | 3.62 | 4.70 | 4.75 | 3.29 | 4.52 | 3.60 | 4.44 |
| Normal production without attack (quintal/acre) | 4.91 | 4.25 | 4.62 | 4.26 | 5.69 | 5.58 | 3.94 | 5.26 | 4.35 | 5.17 |
| Loss of output (quintal/acre) | 0.91 | 0.61 | 0.86 | 0.64 | 0.99 | 0.83 | 0.66 | 0.73 | 0.74 | 0.73 |
| Percentage loss over actual production | 22.65 | 16.75 | 22.78 | 17.68 | 20.98 | 17.48 | 19.96 | 16.24 | 20.64 | 16.53 |
| Percentage loss over normal production | 18.46 | 14.35 | 18.56 | 15.03 | 17.34 | 14.88 | 16.64 | 13.97 | 17.11 | 14.18 |

SOURCE: Field survey

Overall, the magnitude of pre harvest crop loss due to pests, diseases and weeds infestations was 0.74 and 0.73 quintal per acre for local and HYV varieties of tur respectively. However, percentage loss over normal production was 14.18 percent for HYV and 17.11 percent for local varieties. Thus even though per acre loss was almost same for both varieties Production loss was comparatively less in HYV due to high yield of it. Normal production without attack was 5.17 and 4.35 quintals per acre for HYV and local variety respectively.

All the selected farmers adopted chemical control measures for pests and disease in tur crop which include weedicides, insecticides and fungicide. Only around 16 percent households adopted biological methods to control pests and disease.

Household took advice for pests and disease control management from government extension agents, private input traders, fellow farmers, TV/Radio/Newspapers and agricultural universities/KVKs. The number of households took advice these various sources to control pests and diseases ranged between 83 to 100 percent except Agricultural University/KVK. Advice taken from fellow farmers was the most important source for the households followed by private traders and government extension agents. Advice from difference sources of media was least important for them.

The most important suggestions to minimize pre-harvest losses were timely use of pesticides, weedicides and insecticides as per requirements, carry out farm

activities in time and availability of improved variety of certified seeds.

7.3 Post Harvest Losses

The production loss of crop during different stages of post harvest revealed that area harvested per household was maximum 5.24 area of HYV of tur during mid stage which was 75 percent of the total area harvested. In case of the remaining area, 11.55 percent of the total area of local variety was harvested in mid stage and 11.70 and 3.00 percent area of HYV and local variety was harvested in early stage respectively. The entire area in early stage was harvested manually while in mid stage, it was around 82 percent. Quantity loss during mid stage of HYV tur was 0.97 percent of the harvested crop which worked out to be 4.12 kg. per acre of harvest and ranking of this loss was reported medium by 45.63 per cent and low by 39.81 percent of the total households harvesting HYV tur during mid stage.

Area/quantity of tur crop was mostly mechanically threshed, as 70.83 and 11.67 percent of households revealed that a threshing was done mechanically for HYV and local variety respectively. The quantity lost during mechanical threshing was 3.70 and 3.00kg. per acre for HYV and local varieties respectively, while same was 4.89 and 1.88 kg. per acre in manually threshing. Majority farmers ranked these losses as low or medium. The loss of quantity in HYV worked out to be 0.84 and 1.19 percent of the quantity threshed mechanically and manually respectively.

Not many farmers were doing winnowing either mechanically or manually. Quantity lost varied between 0.22 to 0.53 percent of the amount winnowed in HYV and local varieties.

There were various modes of transportation used by the selected farmers to transport produce to market. Trolley was the main mode of transportation used by sample households to transport tur to market. The average quantity transported by trolley per household was 24.89 quintals with cost of Rs. 21.02 per quintal and loss was 0.32 kg. per quintal of amount transported and 0.20 kg. per quintal of amount handled. This loss was ranked low and medium by the farmers. Another mode of transport was bullock cart. The quantity transported through head load, tempo and other was negligible. Overall quantity transported per household was 29.53 quintals with the cost of Rs. 22.70 per quintal. The quantity lost in transportation was 0.35 percent of amount transported and 0.21 percent of amount handled. These losses were ranked low by 62.91 percent and medium by 35.76 percent of the households.

The selected farmers stored their 84.28 percent produce in pucca house and 13.18 percent in kutchra house and mode of storage was gunny/plastic bags. The average quantity lost during storage in pucca house per quintal of storage was 0.49 kg. due to weight loss, 0.25 kg. due to rodents and 0.23 kg. due to fungus. Generally, quantity lost during storage in Kutchra house was less than stored in pucca house, mainly loss due to reduction in weight

was quite low because quantity was stored in kutchra house for an average of five days. Average quantity stored per household was 21.53 quintals and storage cost was Rs. 17.26 per quintals for storage in pucca house. Farmers stored their produce for eleven days only. As revealed by the selected households, actual storage capacity of gunny/plastic bags was 5646 quintals and actual quantity stored was 3030 quintals which worked out to be 53.67 percent of capacity utilization.

Magnitude of Crop Loss: Post Harvest

Overall total post harvest loss of crop was 3.05 kg. per quintal, of which per quintal loss of harvesting was 1.08 kg., in threshing 0.69 kg., in winnowing, 0.20 kg., in transportation 0.35 kg., in handling 0.21 kg. and in storage 0.52 kg. It was reported that in each of these stages, post harvest losses has decreased with increase in farm size. The total post harvest loss was maximum 7.24 kg. per quintal for marginal farmers and minimum 2.43 kg. per quintal was for large farmers. The total post harvest losses per quintal by farm size are presented in Table 5.

Overall physical condition of the storage was good. Between 70 to 77 percent of the selected households informed to have good roof, good condition wall and cemented good condition floor for storage structure. Rat guards were not installed to protect the crop by 83.33 percent of the selected households. The major storage pest control measure for tur was sun drying, removal of infected grain from storage and destroying.

TABLE 5: TOTAL POST HARVEST LOSS PER QUINTAL BY FARM SIZE

| Particulars | Marginal | Small | Medium | Large | Total |
|--|----------|-------|--------|-------|-------|
| Quantity lost in harvesting (Kg. per qtl.) | 2.37 | 1.69 | 1.16 | 0.93 | 1.08 |
| Quantity lost in threshing (Kg. per qtl.) | 1.62 | 1.20 | 0.85 | 0.56 | 0.69 |
| Quantity lost in winnowing (Kg. per qtl.) | 0.41 | 0.42 | 0.28 | 0.15 | 0.20 |
| Quantity lost in transport (Kg. per qtl.) | 1.02 | 0.74 | 0.51 | 0.24 | 0.35 |
| Quantity lost in handling (Kg. per qtl.) | 0.60 | 0.45 | 0.29 | 0.15 | 0.21 |
| Quantity lost in storage (Kg. per qtl.) | 1.23 | 0.90 | 0.78 | 0.39 | 0.52 |
| Total post harvest lost (Kg. per qtl.) | 7.24 | 5.41 | 3.88 | 2.43 | 3.05 |
| Total post harvest lost (Kg. per acre*) | 25.66 | 17.92 | 18.42 | 11.51 | 13.84 |

NOTE: Post harvest loss per acre is calculated by multiplying losses in kg. per quintal by the productivity per acre.

SOURCE: Field Survey

In order to minimize the post harvest losses, the households suggested having proper scientific storage facility at village and market level followed by development of proper marketing system.

8. Policy suggestions

Keeping in view of the above cited conclusion, the following policy issues can be drawn.

- (1) Pests are the major problem in cultivation of tur. Pesticides, insecticides and weedicides should be

available in time to farmers at reasonable price.

- (2) Ever increasing prices of farm inputs is another constraint faced by the farmers. It should be kept in control by checking the prices charged by private traders.
- (3) Farmers are forced to sell their produce due to non availability of proper storage facilities. Construction of storage facilities for tur should be made available that exist for other crops like wheat.

- (4) Government should procure the crop and should have proper marketing channel, so that farmers get satisfactory price.
- (5) It was reported that farmers were not considering advice given by government extension agencies on crop management as important or reliable. They were more dependent on advice of private input dealers. Hence there is need to take steps by government for their extension agents so that farmers trust them and reduce dependence on private dealers.
- (6) Green tur is used for vegetable. In fact, some farmers are growing it only for this purpose. Separate variety for both *i.e.* green and tender use (vegetable) and pulse purpose should be developed.
- (7) There are some location specific problems like crop destroyed by pigs and blue bulls. This should be addressed properly.
- (8) There is a need of imparting training programmes for farmers on the following aspects.
- a. Proper training should be given to farmers on control management of pests and diseases, so that production loss can be minimized.
 - b. It was observed during field work that the farmers are eager to know about the biological methods to control pests and diseases but did not have enough knowledge about it. There is a need to train farmers about it.
 - c. Quantity lost during harvesting was highest. Farmers should make aware about harvesting time to attain maximum weight and to avoid grains shattering due to pod splitting.
- 9) Infusion of new technologies, better practices, coordination and investment in infrastructure from field to consumption are critical for reducing losses. So far research on tur pest management has focused on the identification and development of resistant cultivars and on chemical to control pests and diseases. Looking into interest of farmers on biotechnology, research should focus on environmentally sound pest management strategies that are compatible with the needs and limitations of tur cultivators.

STATISTICAL TABLES

WAGES

1 : AVERAGE 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 | | |
|----------------|-------------|------------|--------------|----------------------------|--------------|-----|--------------------|-----|----------|-----|----------------|-------------|---------|
| | | | | | M | W | M | W | M | W | Carpenter | Black Smith | Cobbler |
| Andhra Pradesh | Krishna | Ghantasala | July,15 | 8 | 325 | 150 | 300 | 150 | 250 | 200 | NA | NA | NA |
| | Guntur | Tadikonda | July,15 | 8 | 313 | 200 | NA | NA | 250 | NA | NA | NA | NA |
| Telangana | Ranga Reddy | Arutala | March,15 | 8 | 260 | 190 | 300 | NA | NA | NA | NA | NA | NA |
| Karnataka | Bangalore | Harisandra | June,15 | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Tumkur | Gidlahali | June,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 : AVERAGE 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 Labour | | |
|------------------|-------------|-------------|--------------|----------------|----------------------------|-----------|--------|---------|------------|-------------------|----------|----------------|-------------|---------|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler |
| Assam | Barpeta | Laharapara | May,15 | M | 8 | 250 | 250 | 250 | 250 | 250 | 200 | 300 | 250 | 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 |
| | Shekhapura | 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 | Sihaba | June,15 | M | 8 | 300 | 150 | NA | 150 | 150 | 100 | 250 | 200 | 100 |
| | | | | W | 8 | NA | NA | NA | 120 | 100 | 80 | NA | 80 | 80 |
| Gujarat* | Rajkot | Rajkot | Apr,15 | M | 8 | 221 | 213 | 160 | 183 | 150 | 190 | 442 | 442 | 350 |
| | | | | W | 8 | NA | 169 | 150 | 180 | 138 | 125 | NA | NA | NA |
| | Dahod | Dahod | Apr,15 | M | 8 | 186 | 157 | 157 | 157 | 129 | NA | 257 | 207 | 207 |
| | | | | W | 8 | NA | 157 | 157 | 157 | 129 | NA | NA | NA | NA |
| Haryana | Panipat | Ugarakheri | Aug,15 | M | 8 | 400 | 400 | 400 | 400 | 400 | NA | NA | NA | NA |
| | | | | W | 8 | NA | 300 | 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 |

1.1 : AVERAGE DAILY AGRICULTURAL WAGES IN SOME STATES (OPERATION-WISE) - *Contd.*

(In Rs.)

| State | District | Centre | Month & Year | Type of Labour | Normal Daily working Hours | Ploughing | Sowing | Weeding | Harvesting | Other Agri. Labour | Herds-man | Skilled Labours | | | |
|----------------|---------------|--------------|--------------|----------------|----------------------------|-----------|--------|---------|------------|--------------------|-----------|-----------------|-------------|---------|----|
| | | | | | | | | | | | | Carpenter | Black Smith | Cobbler | |
| Kerala | Kozhikode | Koduvally | June,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 | June,15 | M | 4-8 | 500 | 500 | NA | 500 | 466.66 | NA | 600 | NA | NA | |
| | | | | W | 4-8 | NA | NA | 300 | 300 | 300 | NA | NA | NA | NA | |
| Madhya Pradesh | Hoshangabad | Sangarkhera | July,15 | M | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| | Satna | Kotar | July,15 | M | 8 | 200 | 200 | 200 | 200 | 200 | 200 | 300 | 300 | 300 | |
| | | | | W | 8 | NA | 200 | 200 | 200 | 200 | 200 | NA | NA | NA | |
| | Shyampurkala | Vijaypur | July,15 | M | 8 | NA | 300 | NA | NA | NA | NA | 250 | 300 | 300 | NA |
| | | | | W | 8 | NA | 300 | NA | NA | NA | NA | NA | NA | NA | NA |
| Odisha | Bhadrak | Chandbali | May,15 | M | 8 | 250 | 250 | NA | 250 | 250 | 200 | 400 | 300 | 200 | |
| | | | | W | 8 | NA | 200 | NA | 200 | 150 | 200 | NA | NA | NA | |
| | Ganjam | Aska | Apr,15 | M | 8 | 300 | 200 | 200 | 250 | 200 | 200 | 400 | 400 | 200 | |
| | | | | W | 8 | NA | 200 | 100 | 250 | 100 | 100 | NA | NA | NA | |
| Punjab | Ludhiana | 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 | July,15 | M | 8 | NA | NA | NA | NA | NA | 300 | 700 | 500 | NA | |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| | Jalore | Sarnau | July,15 | M | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| Tamil Nadu* | Thanjavur | Pulvarnatham | March,15 | M | 8 | NA | 317 | NA | NA | 316 | NA | NA | NA | NA | |
| | | | | W | 8 | NA | NA | 123 | 117 | 122 | NA | NA | NA | NA | |
| | Tirunelveli | Malayakulam | May,15 | M | 8 | NA | 287 | NA | 375 | 471 | NA | NA | NA | NA | |
| | | | | W | 8 | NA | 135 | 158 | 155 | 300 | NA | NA | NA | NA | |
| Tripura | State Average | Apr, 14 | M | 8 | 287 | 263 | 264 | 277 | 261 | 270 | 305 | 212 | 285 | | |
| | | | | W | 8 | NA | 197 | 201 | 209 | 197 | 200 | NA | NA | NA | |
| Uttar Pradesh* | Meerut | Ganeshpur | June,15 | M | 8 | 283 | 271 | 272 | NA | 266 | NA | 385 | NA | NA | |
| | | | | W | 8 | NA | 200 | 200 | NA | 200 | NA | NA | NA | NA | |
| | Auraiya | Auraiya | June,15 | M | 8 | 150 | 150 | 150 | 160 | 150 | NA | 250 | NA | NA | |
| | | | | W | 8 | NA | NA | NA | 160 | 150 | NA | NA | NA | NA | |
| | Chandauli | Chandauli | June,15 | M | 8 | NA | 200 | 200 | 200 | 200 | NA | 350 | NA | NA | |
| | | | | W | 8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | |

M-Man

W-Woman

NA- Not Available

* States reported district average daily wages

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

| Commodity | Variety | Unit | State | Centre | Sep-15 | Aug-15 | Sep-14 |
|----------------|-----------|---------|----------------|--------------|--------|--------|--------|
| Wheat | PBW 343 | Quintal | Punjab | Amritsar | NA | 1600 | 1500 |
| Wheat | Dara | Quintal | Uttar Pradesh | Chandausi | 1470 | 1470 | NA |
| Wheat | Lokvan | Quintal | Madhya Pradesh | Bhopal | 1425 | 1452 | 1650 |
| Jowar | - | Quintal | Maharashtra | Mumbai | 2300 | 2200 | 2350 |
| Gram | No III | Quintal | Madhya Pradesh | Sehore | 4426 | 4530 | 2435 |
| Maize | Yellow | Quintal | Uttar Pradesh | Kanpur | 1370 | 1365 | 1315 |
| Gram Split | - | Quintal | Bihar | Patna | 5750 | 5500 | 4445 |
| Gram Split | - | Quintal | Maharashtra | Mumbai | 5800 | 5600 | 3900 |
| Arhar Split | - | Quintal | Bihar | Patna | 10000 | 9140 | 6890 |
| Arhar Split | - | Quintal | Maharashtra | Mumbai | 11000 | 10000 | 6750 |
| Arhar Split | - | Quintal | NCT of Delhi | Delhi | 9650 | 9550 | 6035 |
| Arhar Split | Sort II | Quintal | Tamil Nadu | Chennai | 12500 | 12500 | 7400 |
| Gur | - | Quintal | Maharashtra | Mumbai | 3100 | 3100 | 4300 |
| Gur | Sort II | Quintal | Tamil Nadu | Coimbatore | 4000 | 4000 | 4300 |
| Gur | Balti | Quintal | Uttar Pradesh | Hapur | NA | NA | 2700 |
| Mustard Seed | Black (S) | Quintal | Uttar Pradesh | Kanpur | 4000 | 3950 | 3325 |
| Mustard Seed | Black | Quintal | West Bengal | Raniganj | 4450 | 4450 | 3600 |
| Mustard Seed | - | Quintal | West Bengal | Kolkata | 4950 | 4700 | 3900 |
| Linseed | Bada Dana | Quintal | Uttar Pradesh | Kanpur | 4240 | 4240 | 4150 |
| Linseed | Small | Quintal | Uttar Pradesh | Varanasi | 3980 | 3935 | 3850 |
| Cotton Seed | Mixed | Quintal | Tamil Nadu | Virudhunagar | 2000 | 1900 | 1800 |
| Cotton Seed | MCU 5 | Quintal | Tamil Nadu | Coimbatore | 2000 | 2000 | 2375 |
| Castor Seed | - | Quintal | Telangana | Hyderabad | 3950 | 4050 | 3725 |
| Sesamum Seed | White | Quintal | Uttar Pradesh | Varanasi | 13500 | 13415 | 13000 |
| Copra | FAQ | Quintal | Kerala | Alleppey | 7800 | 8300 | 10150 |
| Groundnut | Pods | Quintal | Tamil Nadu | Coimbatore | 4500 | 4500 | 5000 |
| Groundnut | - | Quintal | Maharashtra | Mumbai | 6500 | 6500 | 5400 |
| Mustard Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1369 | 1368 | 1200 |
| Mustard Oil | Ordinary | 15 Kg. | West Bengal | Kolkata | 1575 | 1500 | 1230 |
| Groundnut Oil | - | 15 Kg. | Maharashtra | Mumbai | 1650 | 1500 | 1163 |
| Groundnut Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 1920 | 1845 | 1298 |
| Linseed Oil | - | 15 Kg. | Uttar Pradesh | Kanpur | 1391 | 1395 | 1414 |
| Castor Oil | - | 15 Kg. | Telangana | Hyderabad | 1283 | 1260 | 1238 |
| Sesamum Oil | - | 15 Kg. | NCT of Delhi | Delhi | 1890 | 1880 | 1860 |
| Sesamum Oil | Ordinary | 15 Kg. | Tamil Nadu | Chennai | 1800 | 1800 | 2475 |
| Coconut Oil | - | 15 Kg. | Kerala | Cochin | 1650 | 1755 | 2265 |
| Mustard Cake | - | Quintal | Uttar Pradesh | Kanpur | 2055 | 2000 | 1775 |
| Groundnut Cake | - | Quintal | Telangana | Hyderabad | 4071 | 4071 | 3500 |
| Cotton/Kapas | NH 44 | Quintal | Andhra Pradesh | Nandyal | 4000 | 4000 | 4300 |
| Cotton/Kapas | LRA | Quintal | Tamil Nadu | Virudhunagar | NT | 3400 | NT |
| Jute Raw | TD 5 | Quintal | West Bengal | Kolkata | 4400 | 4040 | 2775 |

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

| Commodity | Variety | Unit | State | Centre | Sep-15 | Aug-15 | Sep-14 |
|--------------|--------------|------------|---------------|--------------|--------|--------|--------|
| Jute Raw | W 5 | Quintal | West Bengal | Kolkata | 4350 | 3990 | 2725 |
| Oranges | Big | 100 No | Tamil Nadu | Chennai | 500 | 500 | 630 |
| Banana | - | 100 No. | NCT of Delhi | Delhi | 375 | 375 | 375 |
| Banana | Medium | 100 No. | Tamil Nadu | Kodaikkanal | 502 | 495 | 478 |
| Cashewnuts | Raw | Quintal | Maharashtra | Mumbai | 65000 | 65000 | 58000 |
| Almonds | - | Quintal | Maharashtra | Mumbai | 73000 | 72000 | 65000 |
| Walnuts | - | Quintal | Maharashtra | Mumbai | 72000 | 70000 | 65000 |
| Kishmish | - | Quintal | Maharashtra | Mumbai | 20000 | 19000 | 19000 |
| Peas Green | - | Quintal | Maharashtra | Mumbai | 4100 | 4100 | 4700 |
| Tomatoes | Ripe | Quintal | Uttar Pradesh | Kanpur | 1750 | 1370 | 2200 |
| Ladyfinger | - | Quintal | Tamil Nadu | Chennai | 1500 | 1200 | 1500 |
| Cauliflower | - | 100 No. | Tamil Nadu | Chennai | 1350 | 1500 | 1425 |
| Potatoes | Red | Quintal | Bihar | Patna | 780 | 780 | 1890 |
| Potatoes | Desi | Quintal | West Bengal | Kolkata | 660 | 640 | 1700 |
| Potatoes | Sort I | Quintal | Tamil Nadu | Mettupalayam | NA | NA | 3298 |
| Onions | Pole | Quintal | Maharashtra | Nashik | 3800 | 4500 | 1200 |
| Turmeric | Nadan | Quintal | Kerala | Cochin | 12500 | 12500 | 10000 |
| Turmeric | Salam | Quintal | Tamil Nadu | Chennai | 8100 | 8100 | 9300 |
| Chillies | - | Quintal | Bihar | Patna | 9400 | 9100 | 9200 |
| Black Pepper | Nadan | Quintal | Kerala | Kozhikode | NT | 63000 | 55000 |
| Ginger | Dry | Quintal | Kerala | Cochin | 20000 | 22000 | 23500 |
| Cardamom | Major | Quintal | NCT of Delhi | Delhi | 131000 | 131500 | 135000 |
| Cardamom | Small | Quintal | West Bengal | Kolkata | 105000 | 110000 | 120000 |
| Milk | Buffalo | 100 Liters | West Bengal | Kolkata | 3600 | 3600 | 3600 |
| Ghee Deshi | Deshi No 1 | Quintal | NCT of Delhi | Delhi | 30015 | 30015 | 30015 |
| Ghee Deshi | - | Quintal | Maharashtra | Mumbai | 47000 | 47000 | 36000 |
| Ghee Deshi | Desi | Quintal | Uttar Pradesh | Kanpur | 34600 | 34500 | 33000 |
| Fish | Rohu | Quintal | NCT of Delhi | Delhi | 9600 | 7100 | 10500 |
| Fish | Pomphrets | Quintal | Tamil Nadu | Chennai | 33000 | 35000 | 28000 |
| Eggs | Madras | 1000 No. | West Bengal | Kolkata | 4250 | 3950 | 4200 |
| Tea | - | Quintal | Bihar | Patna | 21100 | 21100 | 21350 |
| Tea | Atti Kunna | Quintal | Tamil Nadu | Coimbatore | 33000 | 33000 | 13000 |
| Coffee | Plant-A | Quintal | Tamil Nadu | Coimbatore | 31000 | 31000 | 30000 |
| Coffee | Rubusta | Quintal | Tamil Nadu | Coimbatore | 13000 | 13000 | 15500 |
| Tobacco | Kampila | Quintal | Uttar Pradesh | Farukhabad | 4500 | 4500 | 4750 |
| Tobacco | Raisa | Quintal | Uttar Pradesh | Farukhabad | 3560 | 3500 | 3600 |
| Tobacco | Bidi Tobacco | Quintal | West Bengal | Kolkata | 3900 | 3900 | 3900 |
| Rubber | - | Quintal | Kerala | Kottayam | 9800 | 9800 | 10400 |
| Arecanut | Pheton | Quintal | Tamil Nadu | Chennai | 31500 | 31500 | 29800 |

3. MONTH END WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR 2015

| Commodity | Variety | Country | Centre | Unit | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|-------------------|---|----------------|----------|---------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| CARDAMOM | Guatemala Bold Green | U.K. | - | Dollar/MT | 12000.00 | 12000.00 | 12000.00 | 12000.00 | 12000.00 | 12000.00 | 12000.00 | 12000.00 | 12000.00 |
| | | | | Rs./Qtl | 74160.00 | 74100.00 | 75396.00 | 75948.00 | 76596.00 | 76212.00 | 76944.00 | 79272.00 | 79464.00 |
| CASHEW KERNELS | Spot U.K. 320s | U.K. | - | Dollar/lbs | 3.60 | 3.62 | 3.64 | 3.68 | 3.85 | 3.75 | 3.70 | 3.72 | 3.64 |
| | | | | Rs./Qtl | 49034.59 | 49267.11 | 50405.74 | 51332.75 | 54162.31 | 52491.02 | 52288.58 | 54161.80 | 53125.39 |
| | | | | Dollar/MT | 7877.32 | 7932.59 | 7644.65 | 8194.35 | 8431.63 | 8251.98 | 8257.78 | 8050.66 | 8015.47 |
| CASTOR OIL | Any Origin ex tank Rotterdam | Netherlands | - | Rs./Qtl | 48681.84 | 48983.74 | 48031.34 | 51862.04 | 53819.09 | 52408.32 | 52948.89 | 53182.66 | 53078.44 |
| | | | | Dollar/MT | 1700.00 | 1525.00 | 1434.00 | 1434.00 | 1434.00 | 1575.00 | 1539.00 | 1540.00 | 1500.00 |
| CHILLIES | Birds eye 2005 crop | Africa | - | Rs./Qtl | 10506.00 | 9416.88 | 9009.82 | 9075.79 | 9153.22 | 10002.83 | 9868.07 | 10173.24 | 9933.00 |
| | | | | Dollar/MT | 4100.00 | 4100.00 | 4100.00 | 4100.00 | 4100.00 | 4100.00 | 4100.00 | 4100.00 | 4100.00 |
| CLOVES | Singapore | Madagascar | - | Rs./Qtl | 25317.50 | 25760.30 | 25948.90 | 25948.90 | 26170.30 | 26039.10 | 26289.20 | 27084.60 | 27150.20 |
| | | | | Dollar/MT | 10500.00 | 10500.00 | 10500.00 | 10500.00 | 11200.00 | 11200.00 | 11200.00 | 11200.00 | 11200.00 |
| COCONUT OIL | Crude Phillipine/Indonesia, cif Rotterdam | Netherlands | - | Rs./Qtl | 64890.00 | 64837.50 | 65971.50 | 66454.50 | 71489.60 | 71131.20 | 71814.40 | 73987.20 | 74166.40 |
| | | | | Dollar/MT | 1080.00 | 1140.00 | 1040.00 | 1085.00 | 1125.00 | 1105.00 | 1070.00 | 950.00 | 1050.00 |
| COPRA | Phillipines cif Rotterdam | Phillipine | - | Rs./Qtl | 6674.40 | 7039.50 | 6534.32 | 6866.97 | 7180.88 | 7017.86 | 6860.84 | 6275.70 | 6953.10 |
| | | | | Dollar/MT | 679.50 | 726.00 | 657.00 | 682.50 | 714.00 | 701.50 | 679.50 | 597.00 | 652.50 |
| CORRIANDER | | India | - | Rs./Qtl | 4199.31 | 4483.05 | 4127.93 | 4319.54 | 4557.46 | 4455.23 | 4356.95 | 3943.78 | 4320.86 |
| | | | | Dollar/MT | 2000.00 | 2000.00 | 2000.00 | 2000.00 | 2000.00 | 2000.00 | 2000.00 | 2000.00 | 2000.00 |
| CUMMIN SEED | | India | - | Rs./Qtl | 12360.00 | 12350.00 | 12566.00 | 12658.00 | 12766.00 | 12702.00 | 12824.00 | 13212.00 | 13244.00 |
| | | | | Dollar/MT | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2380.00 | 2380.00 |
| GINGER | Split | Nigeria | - | Rs./Qtl | 13905.00 | 13893.75 | 14136.75 | 14240.25 | 14361.75 | 14289.75 | 14427.00 | 15722.28 | 15760.36 |
| | | | | Dollar/MT | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 |
| GROUNDNUT KERNELS | US 2005, 40/50 | European Ports | - | Rs./Qtl | 13905.00 | 13893.75 | 14136.75 | 14240.25 | 14361.75 | 14289.75 | 14427.00 | 15722.28 | 15760.36 |
| | | | | Dollar/MT | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 | 2250.00 |
| GROUNDNUT OIL | Crude Any Origin cif Rotterdam | U.K. | - | Dollar/MT | 1200.00 | 1200.00 | 1200.00 | 1200.00 | 1200.00 | 1200.00 | 1200.00 | 1200.00 | 1200.00 |
| | | | | Rs./Qtl | 7416.00 | 7410.00 | 7539.60 | 7594.80 | 7659.60 | 7621.20 | 7694.40 | 7927.20 | 7946.40 |
| MAIZE | | U.S.A. | Chicago | C/56 lbs | 373.25 | 375.75 | 395.00 | 372.50 | 349.50 | 366.50 | 367.75 | 361.75 | 383.25 |
| | | | | Rs./Qtl | 906.53 | 911.86 | 975.34 | 926.52 | 876.73 | 914.76 | 926.70 | 939.16 | 997.39 |
| OATS | | CANADA | Winnipeg | Dollar/MT | 365.75 | 341.64 | 352.54 | 315.21 | 297.89 | 313.24 | 325.14 | 286.62 | 302.46 |
| | | | | Rs./Qtl | 2260.34 | 2109.63 | 2215.01 | 1994.96 | 1901.43 | 1989.39 | 2084.80 | 1893.41 | 2002.89 |
| PALM KERNEL OIL | Crude Malaysia/Indonesia, cif Rotterdam | Netherlands | - | Dollar/MT | 945.00 | 1070.00 | 980.00 | 990.00 | 945.00 | 880.00 | 850.00 | 650.00 | 815.00 |
| | | | | Rs./Qtl | 5840.10 | 6607.25 | 6157.34 | 6265.71 | 6031.94 | 5588.88 | 5450.20 | 4293.90 | 5396.93 |
| PALM OIL | Crude Malaysian/Sumatra, cif Rotterdam | Netherlands | - | Dollar/MT | 630.00 | 678.00 | 658.00 | 655.00 | 648.00 | 670.00 | 625.00 | 480.00 | 533.00 |
| | | | | Rs./Qtl | 3893.40 | 4186.65 | 4134.21 | 4145.50 | 4136.18 | 4255.17 | 4007.50 | 3170.88 | 3529.53 |
| PEPPER (Black) | Sarawak Black lable | Malaysia | - | Dollar/MT | 10000.00 | 11000.00 | 11000.00 | 11000.00 | 12000.00 | 12000.00 | 12000.00 | 11200.00 | 11200.00 |
| | | | | Rs./Qtl | 61800.00 | 67925.00 | 69113.00 | 69619.00 | 76596.00 | 76212.00 | 76944.00 | 73987.20 | 74166.40 |
| RAPESEED | Canola | CANADA | Winnipeg | Can Dollar/MT | 449.80 | 458.50 | 460.60 | 445.10 | 468.90 | 511.90 | 493.30 | 469.70 | 466.30 |
| | | | | Rs./Qtl | 2204.02 | 2264.53 | 2319.12 | 2318.97 | 2408.74 | 2636.29 | 2431.97 | 2333.00 | 2314.71 |
| | | | | Pound/MT | 242.00 | 240.00 | 233.00 | 242.00 | 247.00 | 238.00 | 243.00 | 230.00 | 230.00 |
| RAPESEED OIL | UK delivered rapeseed, delivered Erith(buyer) | U.K. | - | Rs./Qtl | 2254.96 | 2285.04 | 2175.06 | 2305.29 | 2414.92 | 2380.00 | 2431.22 | 2352.21 | 2319.09 |
| | | | | Pound/MT | 577.00 | 586.00 | 601.00 | 587.00 | 607.00 | 639.00 | 611.00 | 565.00 | 599.00 |
| | | | | Rs./Qtl | 5376.49 | 5579.31 | 5610.34 | 5591.76 | 5934.64 | 6390.00 | 6113.06 | 5778.26 | 6039.72 |
| SOYABEAN MEAL | UK produced 49% oil & protein (hi-pro) ex-mill seaforth UK bulk | U.K. | - | Pound/MT | 334.00 | 319.00 | 317.00 | 306.00 | 294.00 | 280.00 | 278.00 | 273.00 | 263.00 |
| | | | | Rs./Qtl | 3112.21 | 3037.20 | 2959.20 | 2914.96 | 2874.44 | 2800.00 | 2781.39 | 2791.97 | 2651.83 |
| SOYABEAN OIL | | U.S.A. | - | C/lbs | 30.34 | 31.71 | 31.04 | 31.56 | 31.73 | 33.27 | 30.21 | 26.12 | 26.33 |
| | | | | Rs./Qtl | 4132.53 | 4315.64 | 4298.34 | 4402.34 | 4463.82 | 4657.00 | 4269.29 | 3802.97 | 3842.83 |
| | | | | Pound/MT | 756.00 | 611.00 | 593.00 | 558.00 | 590.00 | 564.00 | 564.00 | 539.00 | 569.00 |
| SOYABEANS | Refined bleached and deodorised ex-tanks, broker price | U.K. | - | Rs./Qtl | 7044.41 | 5817.33 | 5535.66 | 5315.51 | 5817.32 | 5900.00 | 5642.82 | 5512.35 | 5737.23 |
| | | | | C/60 lbs | 970.25 | 1007.75 | 978.75 | 970.50 | 927.00 | 981.75 | 983.00 | 877.75 | 863.75 |
| | | | | Rs./Qtl | 2200.59 | 2283.79 | 2256.86 | 2254.22 | 2171.55 | 2288.28 | 2313.20 | 2128.02 | 2099.15 |
| | | | | Dollar/MT | 420.90 | 409.40 | 418.00 | 392.80 | 380.90 | 397.30 | 387.20 | 363.80 | 363.40 |
| | | | | Rs./Qtl | 2601.16 | 2528.05 | 2626.29 | 2486.03 | 2431.28 | 2523.25 | 2482.73 | 2403.26 | 2406.43 |

3. MONTH END WHOLESALE PRICES OF SOME IMPORTANT AGRICULTURAL COMMODITIES IN INTERNATIONAL MARKETS DURING YEAR 2015—CONTD.

| Commodity | Variety | Country | Centre | Unit | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|--------------------|--|---------|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| SUNFLOWER SEED OIL | Refined bleached and deodorised ex-tanks, broker price | U.K. | - | Pound/MT | 664.00 | 656.00 | 665.00 | 672.00 | 715.00 | 694.00 | 686.00 | 700.00 | 680.00 |
| | | | | Rs./Qtl | 6187.15 | 6245.78 | 6207.78 | 6401.47 | 6990.56 | 6940.00 | 6863.43 | 7158.90 | 6856.44 |
| TALLOW | High grade delivered | U.K. | London | Pound/MT | 295.00 | 295.00 | 290.00 | 330.00 | 335.00 | 335.00 | 350.00 | 310.00 | 300.00 |
| | | | | Rs./Qtl | 2748.81 | 2808.70 | 2707.15 | 3143.58 | 3275.30 | 3350.00 | 3501.75 | 3170.37 | 3024.90 |
| Wheat | | U.S.A. | Chicago | C/60 lbs | 505.25 | 497.75 | 519.00 | 498.75 | 487.75 | 518.00 | 496.25 | 489.75 | 507.50 |
| | | | | Rs./Qtl | 1145.94 | 1128.01 | 1196.74 | 1158.47 | 1142.58 | 1207.36 | 1167.78 | 1187.35 | 1233.36 |

Source- Public Ledger

Foreign Exchange Rates

| Currency | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|-----------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| CanDollar | 49.00 | 49.39 | 50.35 | 52.10 | 52.93 | 51.50 | 49.30 | 50.06 | 49.64 |
| UKPound | 93.18 | 95.21 | 93.35 | 95.26 | 98.73 | 100.00 | 100.05 | 102.71 | 100.83 |
| USDollar | 61.80 | 61.75 | 62.83 | 63.29 | 64.08 | 63.51 | 64.12 | 66.06 | 66.22 |

CROP PRODUCTION

3 SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF NOVEMBER, 2015

| State | Sowing | Harvesting |
|------------------|--|--|
| 1 | 2 | 3 |
| Andhra Pradesh | Paddy, Jowar (In some areas), Bengal Gram, horsegram, condiment, spices and potato | Kharif paddy, ragi, other Kharif cereals ginger and groundnut |
| Assam | Rabi paddy, gram, mustard, winter vegetables and potato | Kharif paddy, jute, tea and winter potato |
| Bihar | Wheat, Barley, Gram, rapeseed & mustard & sweet potato | Kharif paddy and Potato |
| Gujarat | Paddy, wheat, gram pulses and potato | Paddy, Kharif, jowar, groundnut, bajra and cotton |
| Himachal Pradesh | Wheat, barley and gram | Winter paddy, rabi kharif, sugarcane, ginger (dry), chillies (dry), tobacco, cotton, tumeric and sannhemp |
| Jammu & Kashmir | Wheat (in Kashmir), barley, Linseed, rapeseed and mustard | Maize (in Jammu) |
| Karnataka | Bengal gram, potato and rabi paddy | Kharif paddy, jowar, bajra, ragi, groundnut and sweet potato |
| Kerala | Paddy, pulses & Sweet Potato | Kharif paddy, sugarcane, ginger and tapioca |
| Madhya Pradesh | Wheat, barley, gram, rabi pulses, potato, rapeseed, mustard and castored | Kharif paddy, jowar, bajra, ragi, kharif, pulses, potato, chillies, tobacco, cotton sweet potato and turmeric |
| Maharashtra | Wheat, gram, barley, jowar and pulses | Kharif paddy, jowar, groundnut, bajra, cotton and sugarcane |
| Manipur | | Winter paddy, tur, groundnut, sesamum, sweet potato and tumeric |
| Orissa | Wheat, sugarcane, tobacco, mustard gram and linseed | Kharif paddy, groundnut, sugarcane, cotton and sannhemp |
| Punjab | Wheat, Barley, gram & linseed | Jowar, bajra, maize, cotton and sugarcane |
| Rajasthan | Wheat, Barley, gram, potato, tobacco, rapeseed, mustard and lineseed. | Paddy, jowar, bajra, sugarcane and cotton |
| Tamil Nadu | Rabi paddy, jowar, cotton tobacco, horsegram, chillies, rapeseed and mustard | Kharif paddy, kharif jowar, cumbu ragi, maize, groundnut (unirrigated), cotton varagu, samai, tapioca & ginger |
| Tripura | Pulses, potato, rapeseed and mustard | Winter rice |
| Uttar Pradesh | Wheat, barley, gram, lineseed and cotton | Kharif paddy, jowar, bajra, sugarcane, Groundnut, cotton, tobacco and sannhemp |
| West Bengal | Wheat paddy, wheat, barley, linseed, rapeseed, mustard and potato | Winterpaddy, sugarcane, sesamum and cotton |
| Delhi | Wheat, barley, gram, pulses, tobacco, lineseed, rapeseed and mustard | Jowar, Kharif pulses, sugarcane, Sesamum and sweet potato |
| (K)-Kharif | (R)-Rabi | |