

# Agriculture and Food Management

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*Agriculture is not crop production as popular belief holds - it's the production of food and fibre from the world's land and waters. Without agriculture it is not possible to have a city, stock market, banks, university, church or army. Agriculture is the foundation of civilization and any stable economy.*

*Allan Savory*

*Agriculture and allied sector has a critical role in ensuring food security, reducing poverty and sustaining growth in India. To improve productivity in agriculture the focus has been on the critical inputs like irrigation, seeds, fertilisers and mechanization. The dynamics of agricultural growth reflect a reduction in the share of crop sector and an increase in the share of agricultural sub-sectors. As agriculture entails risks related to production, weather, prices and policy, capitalizing the structural changes in the agriculture sector by diversifying income generating activities can mitigate the risks and sustain growth of the economy.*

7.1 In a developing country like India, agriculture sector and rural economy have a significant role in providing livelihoods, ensuring food security and providing impetus to the growth of industries and service sectors. The process of development inter alia results in declining share of agriculture in Gross Value Added (GVA), which is being witnessed in India too. However, the declining share does not undermine the significance of the sector for employment, livelihood and food security. With structural changes in agriculture, there is greater scope to broaden the range of activities related to

agriculture to improve productivity and make way for sustainable growth.

## OVERVIEW OF AGRICULTURE AND ALLIED SECTORS

7.2 The growth rates of agriculture & allied sectors have been fluctuating at 1.5 per cent in 2012-13, 5.6 per cent in 2013-14, (-) 0.2 per cent in 2014-15, 0.7 per cent in 2015-16 and 4.9 per cent in 2016-17 (Table 1). The uncertainties in growth in agriculture are explained by the fact that more than 50 percent of agriculture in India is rainfall dependent which aggravate the production risks.

**Table 1 : Agriculture Sector – Key indicators**

Item	2012-13	2013-14	2014-15	2015-16	2016-17 PE
Growth in GVA in Agriculture & Allied Sectors at 2011-12 prices (in per cent)	1.5	5.6	-0.2	0.7	4.9
Share of Agriculture & Allied Sectors in total GVA (in per cent) at current prices	18.2	18.6	18.0	17.5	17.4
Share of Agriculture & Allied Sectors GCF in total Gross Capital Formation at current prices* (in per cent)	7.7	9.0	8.3	7.8	NA
Share of Crops*	6.5	7.7	6.9	6.5	NA
Share of Livestock*	0.8	0.9	0.8	0.8	NA
Share of Forestry and logging*	0.1	0.1	0.1	0.1	NA
Share of Fishing *	0.4	0.5	0.5	0.5	NA

**Source:** Central Statistics Office.

\* Calculations have been based on National Accounts Statistics, 2017. NA=Not Available

## GROSS CAPITAL FORMATION IN AGRICULTURE AND ALLIED SECTOR

7.3 The Gross Capital Formation (GCF) in Agriculture and Allied Sectors relative to GVA in this sector has been showing a fluctuating trend from 18.2

per cent in 2011-12 to 16.4 per cent in 2015-16 (Table 2). The Gross Capital Formation in agriculture and allied sectors as a proportion to the total GCF showed a decline from 8.3 per cent in 2014-2015 to 7.8 per cent in 2015-16. This decline can be attributed to reduction in private investment.

**Table 2 : Agriculture sector – Key indicators**

Period	GCF in Agriculture & Allied Sector(in Rs. Crore) at 2011-12 prices			GVA in Agriculture & Allied Sector(in Rs. Crore)	GCF in Agriculture & Allied Sectors as percentage of GVA of Agriculture & Allied Sector		
	Public	Private	Total		Public	Private	Total
2011-12	35696	238175	273870	1501947	2.4	15.9	18.2
2012-13	36019	215075	251094	1524288	2.4	14.1	16.5
2013-14	33925	250499	284424	1609198	2.1	15.6	17.7
2014-15	36714	240701	277415	1606140	2.3	15	17.3
2015-16*	44957	220081	265038	1617208	2.8	13.6	16.4

**Source:** Central Statistics Office(CSO), M/o Statistics & Programme Implementation.

\*As per provisional estimates of Annual National Income, 2016-17 and quarterly estimates of GDP for the 4<sup>th</sup> Quarter (Q4) of 2016-17 (latest available) released on 31<sup>st</sup> May 2017.

## PRODUCTION OF CROPS 2016-17

7.4 As per the Fourth Advance Estimates for 2016-17 released by Department of Agriculture, Cooperation and Farmer's Welfare, the country achieved a record production of food grains estimated at 275.7 million tonnes, which is higher by 10.6 million tonnes than the previous record production of food grains in 2013-14. The production of rice is estimated at 110.2 million tonnes during 2016-17 which is also a new record. Similarly, the production of wheat, estimated at 98.4 million tonnes is higher by 2.6 per cent than the previous record production achieved during 2013-14. Another significant achievement is in the production of pulses which is estimated at 23.0 million tonnes during 2016-17 and higher by 3.7 million tonnes than the previous record production achieved during 2013-14. The production of oilseeds and cotton registered a growth of 27 per

cent and 10.3 per cent respectively in 2016-17. This increase in production of food grains and other crops is mainly on account of very good rainfall during monsoon 2016-17 and various policy initiatives taken up by the Government. The details of area, production and productivity are summarized in table 3.

## KHARIF PRODUCTION 2017-18

7.5 As per the First Advance Estimates released on 22<sup>nd</sup> September, 2017, kharif food grains production during 2017-18 is estimated at 134.7 million tonnes which is expected to be lower by 3.9 million tonnes from the production of 138.5 million tonnes during 2016-17. The total production of rice during 2017-18 is estimated at 94.5 million tonnes vis-à-vis 96.4 million tonnes in 2016-17. The production of pulses during 2017-18 is estimated at 8.7 million tonnes, sugarcane at 337.7 million tonnes, oilseeds at 20.7 million tonnes and cotton at 32.3 million bales of 170 kgs each.

**Table 3 : Area, Production and Yield (2016-17\*)**

Group/Commodity	Area (Million ha)	Percentage change in area over 2015-16	Production (Million tonnes)	Percentage change in production over 2015-16	Yield (kg/ha)	Percentage change in yield over 2015-16
Foodgrains <sup>a</sup>	128.0	3.9	275.68	9.6	2153	5.5
Rice	43.2	-0.7	110.15	5.5	2550	6.3
Wheat	30.6	0.6	98.38	6.6	3216	6.0
Jowar	5.1	-15.4	4.57	7.9	889	27.5
Maize	9.9	12.0	26.26	16.4	2664	3.9
Bajra	7.5	4.8	9.80	21.5	1311	15.9
Pulses	29.5	18.3	22.95	40.4	779	18.7
Gram	9.6	14.1	9.33	32.1	973	15.8
Tur	5.4	36.3	4.78	86.6	885	36.9
Oilseeds	26.2	0.5	32.10	27.1	1225	26.5
Groundnut	5.3	15.6	7.56	12.4	1424	-2.8
Rapeseed and Mustard	6.0	4.8	7.98	17.4	1324	12.0
Cotton <sup>b</sup>	10.8	-11.8	33.09	10.3	519	25.0
Sugarcane	4.4	-10.9	306.72	-12.0	70#	-1.2

*Source:* Directorate of Economics & Statistics, Department of Agriculture, Cooperation and Farmers Welfare.

*Note:* \* : Fourth Advance Estimates; #: tonnes/ha, <sup>a</sup> :Includes cereals and pulses; <sup>b</sup> : Million Bales of 170 kg each.

## SOWING OF RABI CROPS 2017-18

7.6 The sowing of rabi crops is under progress. As per latest information available on sowing of crops from States, 617.8 lakh hectares of area has been covered under Rabi crops for 2017-18 as on 19<sup>th</sup> January 2018. The area coverage under rabi crops is above 98 per cent of the normal area. The details of area coverage under Rabi crops are given at table 4.

## DYNAMICS OF AGRICULTURAL GROWTH

7.7 The agricultural growth in India has been fluctuating since more than 50 per cent of agriculture in India is rainfall dependent as noted in the overview. However, the sector has been witnessing a gradual structural change in recent years. The share of livestock in GVA in agriculture has been rising gradually, the share of the crop

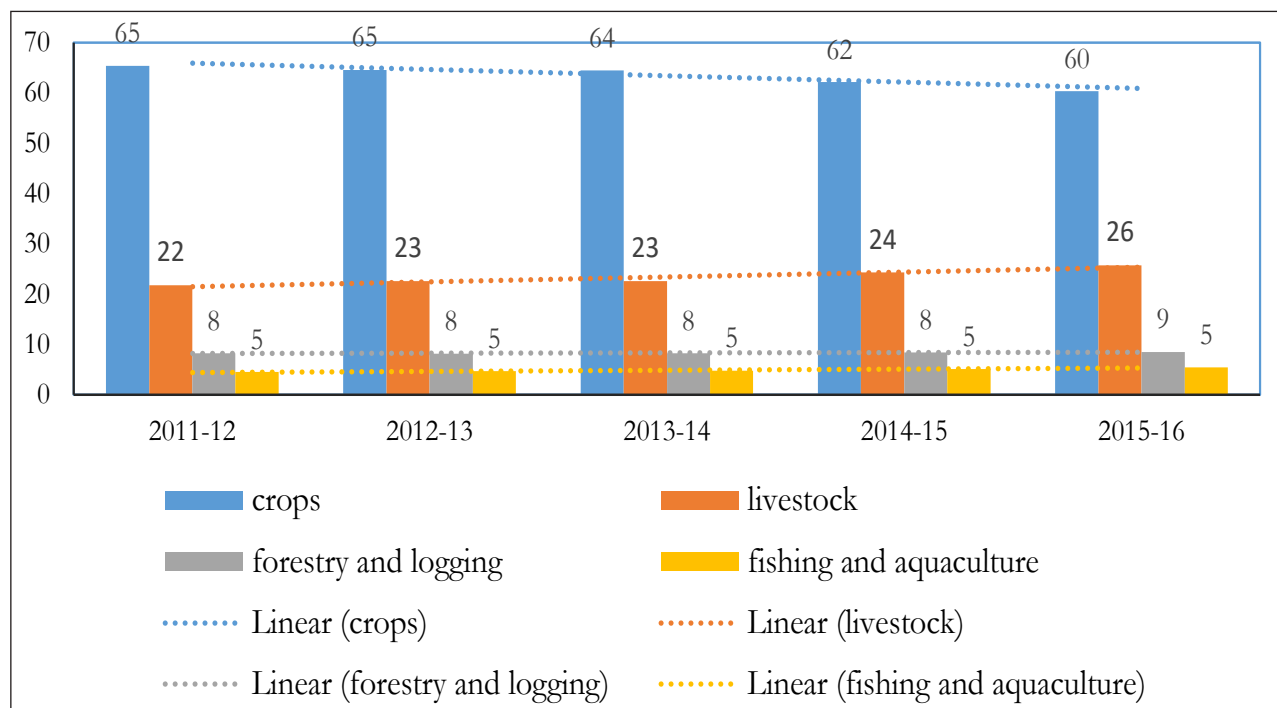
**Table 4 : Area under Rabi crops as on 19-01-2018**

Crop	Area sown 2017-18(lakh hectares)	Area sown 2016-17 (lakh hectares)	% change over 2016-17
Wheat	298.7	311.2	-4.0
Rice	22.3	16.0	39.6
Pulses	163.1	155.8	4.7
Coarse Cereals	54.6	56.0	-2.5
Oilseeds	79.1	82.1	-3.6
<b>Total</b>	<b>617.8</b>	<b>621.0</b>	<b>-0.5</b>

*Source:* Crops Division, Department of Agriculture, Cooperation and Farmers Welfare.

*Note:* All figures are tentative and eye estimated by the States.

**Figure 1 : Share of Agriculture and allied sectors in Gross Value Added (in %)**



*Source:* National Accounts Statistics 2017

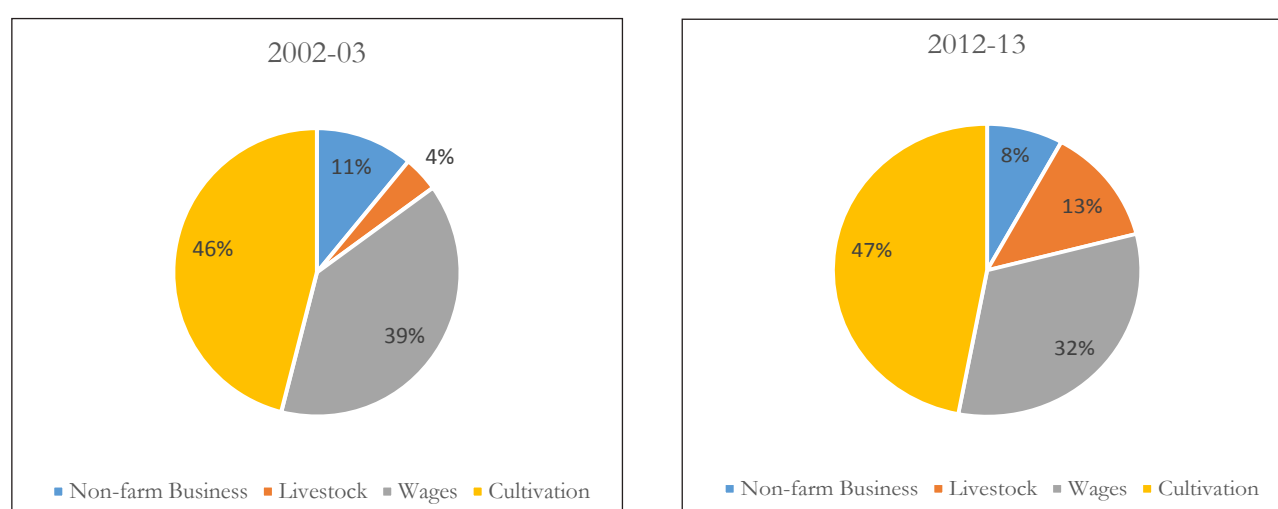
sector in GVA has been on the decline from 65 per cent in 2011-12 to 60 per cent in 2015-16.

7.8 The structural changes that are being witnessed by the agriculture sector in India necessitates re-orientation in policies towards this sector in terms of strengthening the agricultural value chain by focusing on allied activities like dairying and livestock development along with gender-specific interventions (Box 7.1). The

structural transformation is also manifested in the farm incomes of the households.

7.9 The decrease in share of crop sector in the total gross value added of the agriculture and allied sector has impacted the sources of incomes of the farm households. As can be seen from Figure 2 in 2002-03 the share of livestock in total farm incomes was just 4 per cent which increased to 13 per cent by 2012-13.

**Figure 2 : Sources of Farm Incomes, 2002-03 and 2012-13**



**Source:** National Sample Survey Organisation, 2002-03 and 2012-13.

#### Box 7.1 : Policy for Women Farmers

Women play a significant and crucial role in agricultural development and allied fields including in the main crop production, livestock production, horticulture, post-harvest operations, agro/social forestry, fisheries, etc. is a fact long taken for granted (NCW, 2001). For sustainable development of the agriculture and rural economy, the contribution of women to agriculture and food production cannot be ignored. As per Census 2011, out of total female main workers, 55 per cent were agricultural labourers and 24 per cent were cultivators. However, only 12.8 per cent of the operational holdings were owned by women, which reflect the gender disparity in ownership of landholdings in agriculture (Table 1). Moreover, there is concentration of operational holdings (25.7 per cent) by women in the marginal and small holdings categories.

**Table 1 : Percentage of operational holdings owned by women**

Size Group	2000-01	2005-06	2010-11
Marginal (Below 1.00 ha.)	11.8	12.6	13.6
Small (1.00-2.00 ha.)	10.3	11.1	12.2
Semi-Medium (2.00-4.00 ha.)	8.7	9.6	10.5
Medium (4.00-10.00 ha.)	6.9	7.8	8.5
Large (Above 10.00 ha.)	5.2	6.0	6.8
All Size Groups	10.8	11.7	12.8

**Source:** Agriculture Census, 2010-11.

With growing rural to urban migration by men, there is 'feminisation' of agriculture sector, with increasing number of women in multiple roles as cultivators, entrepreneurs, and labourers. Globally, there is empirical evidence that women have a decisive role in ensuring food security and preserving local agro-biodiversity. Rural women are responsible for the integrated management and use of diverse natural resources to meet the daily household needs (FAO, 2011). This requires that women farmers should have enhanced access to resources like land, water, credit, technology and training which warrants critical analysis in the context of India. In addition, the entitlements of women farmers will be the key to improve agriculture productivity. The differential access of women to resources like land, credit, water, seeds and markets needs to be addressed. Towards this, Government has been implementing various schemes which help improve the entitlements of women farmers, which will prove to be advantageous in bridging the policy gaps which exist in the sector. The following measures have been taken to ensure mainstreaming of women in agriculture sector:

- Earmarking at least 30 per cent of the budget allocation for women beneficiaries in all ongoing schemes/programmes and development activities.
- Initiating women centric activities to ensure benefits of various beneficiary-oriented programs/schemes reach them.
- Focusing on women self-help group (SHG) to connect them to micro-credit through capacity building activities and to provide information and ensuring their representation in different decision-making bodies.
- Recognising the critical role of women in agriculture, the Ministry of Agriculture and Farmers Welfare has declared 15th October of every year as Women Farmer's Day.

With women predominant at all levels- production, pre-harvest, post-harvest processing, packaging, marketing- of the agricultural value chain, to increase productivity in agriculture, it is imperative to adopt gender specific interventions. An 'inclusive transformative agricultural policy' should aim at gender-specific interventions to raise productivity of small farm holdings, integrate women as active agents in rural transformation, and engage men and women in extension services with gender expertise.

7.10 The significance and contribution of allied sectors like animal husbandry, dairying and fisheries have been highlighted in Chapter 7 of the Economic Survey 2016-17, Vol.II released in August 2017.

## CROPPING PATTERN IN INDIAN AGRICULTURE

7.11 India ranks first, with 179.8 Mha (9.6 percent of the global net cropland area) of net cropland area according to United States Geological Survey 2017. The pattern of cropping is determined by various factors like agro-climatic conditions, farm size, prices, profitability and government policies. A diversified cropping pattern will help in mitigating the risks faced by

farmers in terms of price shocks and production/harvest losses. With 9.6 per cent of the global net cropland area, India has tremendous potential for crop diversification and to make farming a sustainable and profitable economic activity. In the following paragraph, it is examined whether there has been adequate crop diversification in India over time.

7.12 The Index of Crop Diversification<sup>1</sup> has been computed for major States and All India to examine whether there has been major changes in the cropping patterns across States. The index value ranges between 0 and 1 and higher the value, greater the diversification. It is evident from the Table 5 that there is a declining inter-temporal

<sup>1</sup> Gibbs and Martin's Method for Demarcating Crop Diversification has been used to compute Index of Crop Diversification. Index of Crop Diversification =  $1 - \frac{[\sum x^2]}{(\sum x)^2}$  where X is the percentage of total cropped area under an individual crop.

behaviour in crop diversification for the States like Chhattisgarh, Haryana, Madhya Pradesh, Odisha, Punjab and Uttar Pradesh. Among these States, the decline in the index has been sharp for Odisha. The index for the State declined from 0.740 in 1994-95 to 0.703 in 2005-06. The year 2010-11 saw a steeper decline in the index

for the State as it fell to 0.380 and subsequently to 0.340 in 2014-15. Two of the States Himachal Pradesh and Jharkhand have shown increasing values in crop diversification. The crop diversification scenario for India as a whole appears to be almost stable throughout the periods.

**Table 5 : Index of Crop Diversification**

Index of Crop Diversification				
States	1994-95	2005-06	2010-11	2014-15
Andhra Pradesh	0.870	0.870	0.852	0.864
Bihar	0.700	0.719	0.743	0.726
Chhattisgarh	na	0.531	0.503	0.491
Goa	0.770	0.771	0.762	0.769
Gujarat	0.910	0.908	0.899	0.900
Haryana	0.830	0.808	0.788	0.774
Himachal Pradesh	0.740	0.743	0.741	0.754
Jammu & Kashmir	0.800	0.797	0.801	0.798
Jharkhand	na	0.473	0.537	0.578
Karnataka	0.920	0.932	0.937	0.938
Kerala	0.850	0.856	0.852	0.845
Madhya Pradesh	0.880	0.871	0.859	0.835
Maharashtra	0.890	0.905	0.904	0.903
Odisha	0.740	0.703	0.380	0.340
Punjab	0.710	0.682	0.664	0.658
Rajasthan	0.870	0.874	0.891	0.884
Tamil Nadu	0.860	0.853	0.859	0.870
Uttar Pradesh	0.810	0.794	0.786	0.782
Uttarakhand	na	0.820	0.814	0.819
West Bengal	0.550	0.613	0.663	0.654
<b>All India</b>	<b>0.905</b>	<b>0.907</b>	<b>0.907</b>	<b>0.899</b>

*Source:* In-house computation based on data from Land Use Statistics.



7.13 In Odisha, by 2014-15, 80 per cent of the cropped area has been under rice, around 10 per cent under other pulses and around 4 percent under other food crops. In Punjab too, wheat and paddy cover 83 per cent of the cultivable area of the State. The issues related to mono-culture as witnessed in Odisha and Punjab are declining productivity, lower fertilizer response ratio, degradation of soil health and declining profitability of cultivation.

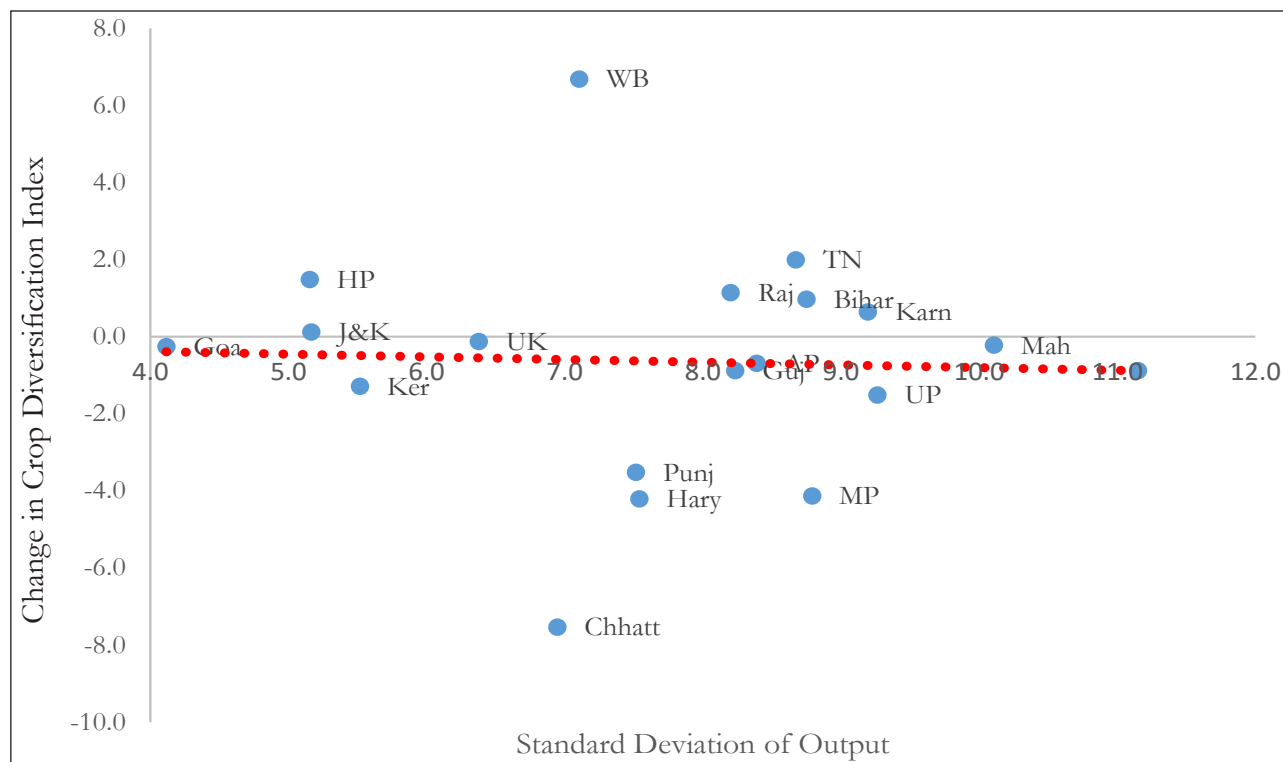
7.14 Crop diversification needs to be encouraged to improve soil health, productivity and thereby profitability of cultivation. The inverse relationship between change in crop diversification index and variability of output can be seen in the plot of States (excluding outliers Odisha and Jharkhand) in Figure 3.

7.15 There is a need to diversify into high value crops and horticulture crops for which Government has taken several measures. Crops Diversification Programme is being implemented by the Government in original green revolution states viz. Punjab, Haryana and in Western UP to diversify paddy area towards less water requiring crops like oilseeds, pulses, coarse cereal, agro-forestry and shifting of tobacco farmers to alternative crops/cropping system in tobacco growing States viz. Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal.

### INPUT MANAGEMENT IN AGRICULTURE

7.16 Agricultural productivity is determined by the appropriate use of critical inputs like

**Figure 3 : Change in Crop Diversification and Variability of Output (%)**  
(Excluding Odisha and Jharkhand)



Source: In-house computation based on data from Land Use Statistics



irrigation, seeds, fertilisers, credit, machines, technology and extension services. For instance, the Green Revolution in India which brought about self-sufficiency in food production was driven by the use of high yielding varieties (HYVs) of seeds, intensive use of fertilisers and irrigation. Managing the inputs in appropriate combinations for specific crops can improve the productivity in agriculture without losing soil fertility and causing environmental damages. In this context, the significance of extension services and capacity of farmers to adopt new innovations, technologies and inputs for improving productivity become pertinent.

### ***Operational Holdings by Educational status***

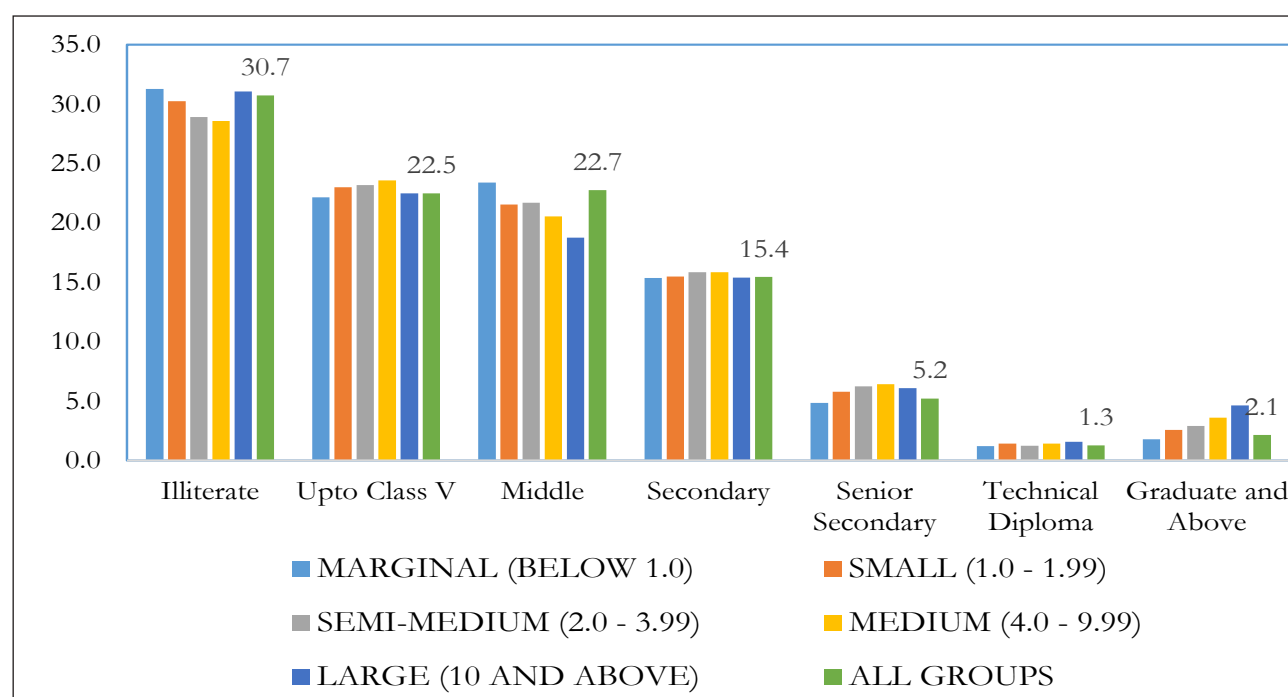
7.17 As indicated above, the educational level of farmers has a significant impact on the capacity of farmers to adopt and inculcate new methods of cultivation and input management. The percentage distribution of operational holdings in each size group by educational status are given in Figure. 4

7.18 As per Input Survey 2011-12 (with an estimated 138.11 million operational holders), about 69.3 percent were literate with 22.5 percent studied up to class V, 22.7 percent up to middle class, 15.4 percent up to secondary, 5.2 percent up to senior secondary, 1.3 percent technical diploma holders below degree level and rest 2.1 percent has graduation and above. However, 30 per cent among marginal and small farmers were illiterate. With predominance of small and marginal farm holdings, it is necessary to improve the educational status of farmers to increase their capacity to absorb technologies, and adopt risk mitigating measures.

### ***Use of Inputs by Agricultural Holdings***

7.19 The use of inputs like fertilisers, hybrid seeds and organic manure are critical in increasing productivity in agriculture. As reported in Input Survey, out of total operational holding only 9.4 percent used certified seeds while 27 percent used seeds of notified variety and only 9.8

**Figure 4 : Percentage of Operational Holdings by Educational Status**

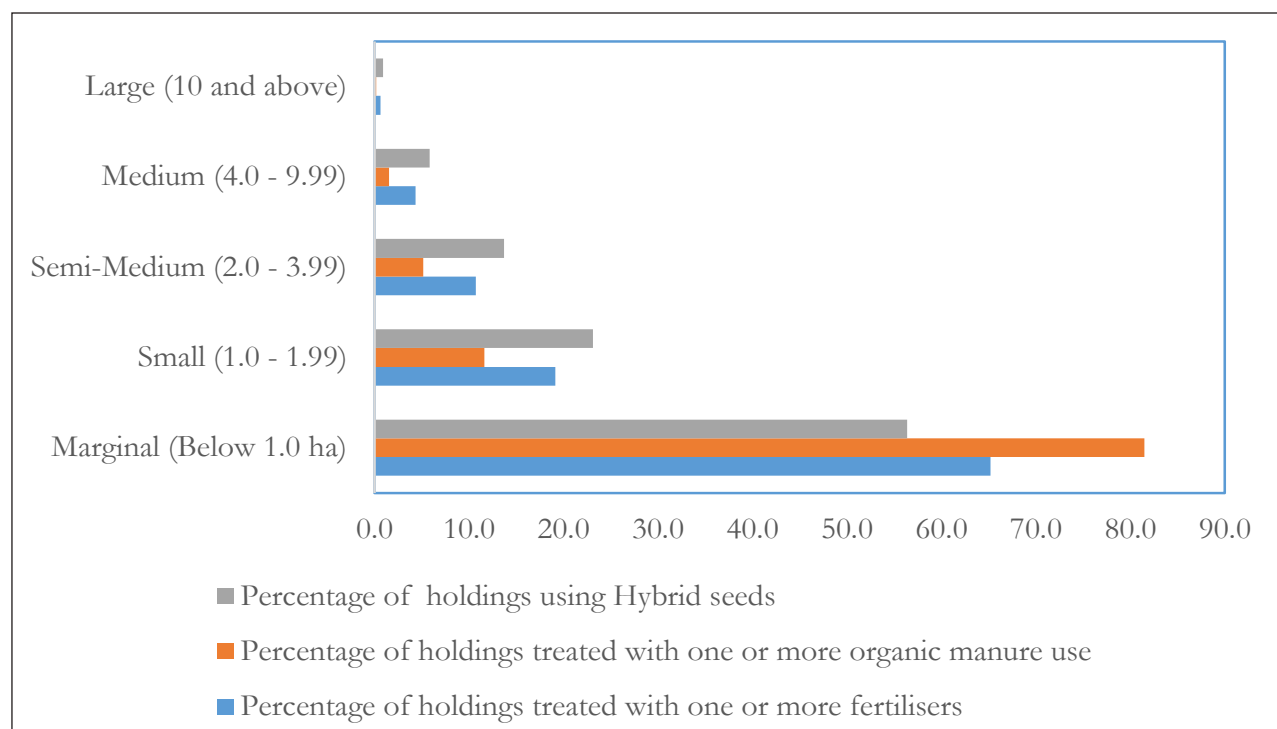


Source: Input Survey, 2011-12, Department of Agriculture and Cooperation

percent used hybrid seeds. It can be evidenced from Figure 5 that the small and marginal farmers use these inputs, with more than 80 per cent of agricultural holdings in the marginal size category using organic manure which increases soil fertility.

7.20 The percentage of small holdings which use hybrid seeds and fertilisers are also lower in comparison to marginal holdings. Recognising the significance of quality of seeds in improving the crop yields, the Government has taken several measures.

**Figure 5 : All India use of inputs by agricultural holdings by size group**



**Source:** Input Survey, 2011-12, Department of Agriculture and Cooperation

#### **Box 7.2 : Direct Benefit Transfer in Fertiliser sector**

The Government of India has introduced Direct Benefit Transfer (DBT) system for fertilizer subsidy on Pilot Basis with effect from October, 2016. Under the proposed fertilizer DBT system, 100 per cent subsidy on various fertilizer grades shall be released to the fertilizer companies on the basis of actual sales made by the retailers to the beneficiaries. The Sale of all subsidized fertilizers to farmers/buyers will be made through Point of Sale (PoS) devices installed at each retailer shop and the beneficiaries will be identified through Aadhar Card, KCC, Voter Identity Card etc.

The implementation of the DBT Scheme requires development of PoS devices at every retailer shop, training of retailers for using PoS device, Stock initialization in the PoS device after verifying the physical stock at retail point, before making sales transactions. Presently, the DBT scheme is under implementation in 17 pilot districts. Based on the deployment of PoS device in different States, preparedness of State Government, Lead fertilizer Suppliers/Fertilizer companies, the Department has drawn up a detailed action plan to extend the DBT Scheme to other States in a phased manner. As on 22nd December, 2017, 14 States/UTs have been brought under DBT Framework.

The benefits of the DBT Scheme are: (a) The proposed DBT framework is a beneficiary driven subsidy payment mechanism being initiated at national level. (b) It creates Aadhaar seeded data base of beneficiaries and provides transaction visibility at the level of buyers. (c) By linking the actual sales to subsidy payments, it facilitates a more transparent and faster tracking of funds along the value chain i.e. from manufacturers to beneficiaries. (d) Diversion of fertilizers is expected to be minimized.

7.21 During 2016-17, total breeder seed production in field crops has been 121989 quintals, comprising cereal crops 70093, Pulses 20578 and Oilseeds 30288, fibre crops 131 and forage crops 898 quintals. In order to promote Seed Replacement Rate (SRR) and Varietal Replacement Rate (VRR), Seed Project entitled, “Seed Production in Agricultural Crops” is being implemented. During the year 2016-17, total production of quality seed including all classes was 620743 quintals against the target of 462404 quintals. In addition, 239 lakh planting material and 1.9 lakh tissue culture plantlets were also produced.

7.22 However, the use of fertilizers and hybrid seeds can bring about better yields if there is adequate coverage of irrigation since agriculture in India is largely rainfed.

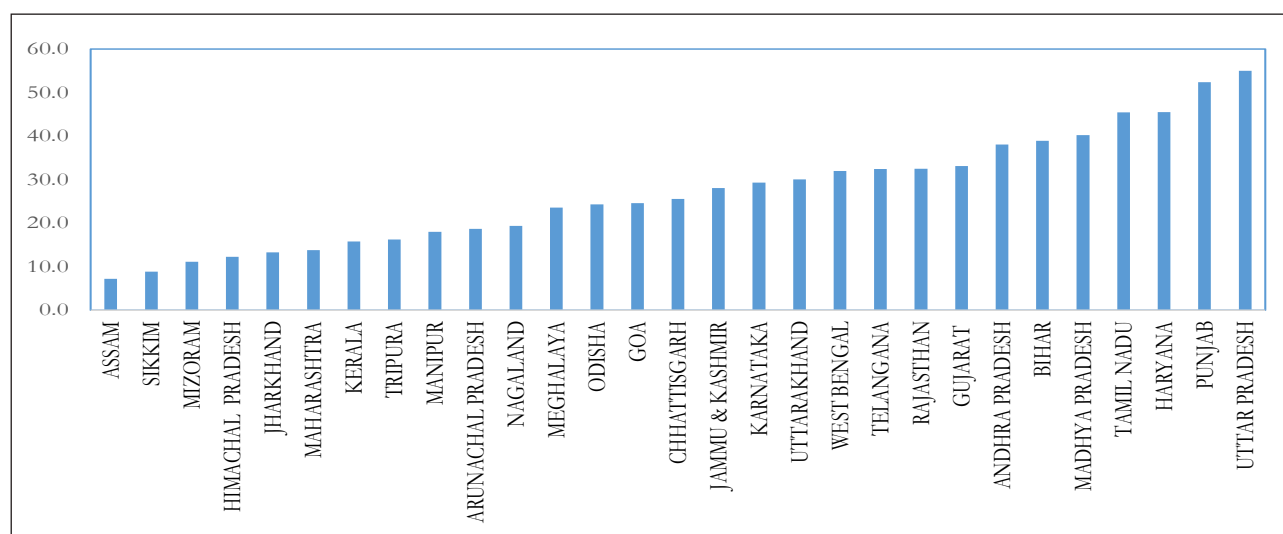
### ***Irrigation***

7.23 The all India percentage of net irrigated area to total cropped area was 34.5 per cent, which makes a large segment of cultivation dependent on rainfall. The State-wise percentage distribution of net irrigated area to total cropped area shows that only two States, Punjab and Uttar Pradesh

have more than 50 per cent net irrigated area to total cropped area and only seven states have above 34 percent in 2014-15 (Figure 6).

7.24 There is tremendous potential to increase the coverage of irrigated area for which the Government launched the Prime Minister’s Krishi Sinchayee Yojana (PMKSY) in 2015. PMKSY has been approved for implementation across the country with an outlay of Rs.50,000 crore in five years. During the year 2016-17, Rs.1991.2 crores was allocated for Per Drop More Crop under PMKSY which is 28 per cent, more than Rs. 1,556.7 crore allocated in the year 2015-16. In 2015-16, 5.7 lakh hectare area was brought under micro-irrigation, while 8.4 lakh hectare area was brought under micro irrigation during 2016-17, which is the highest so far. An amount of Rs. 3400 crore has been allocated for Per Drop More Crop scheme for the year 2017-18, and till September, Rs.1601.4 crore has been released. The target is to bring 12 lakh hectare area under micro-irrigation during 2017-18. PMKSY Scheme is being implemented in the mission mode with the help of Command Area Development to complete 99 major and medium irrigation projects

**Figure 6 : Percentage of Net Irrigated Area to Total Cropped Area, 2014-15**



**Source:** Directorate of Economics and Statistics.

**Note:** Net Irrigated Area is Gross Irrigated Area minus Area irrigated more than once.

covering 76.0 lakh hectares in a phased manner by December 2019.

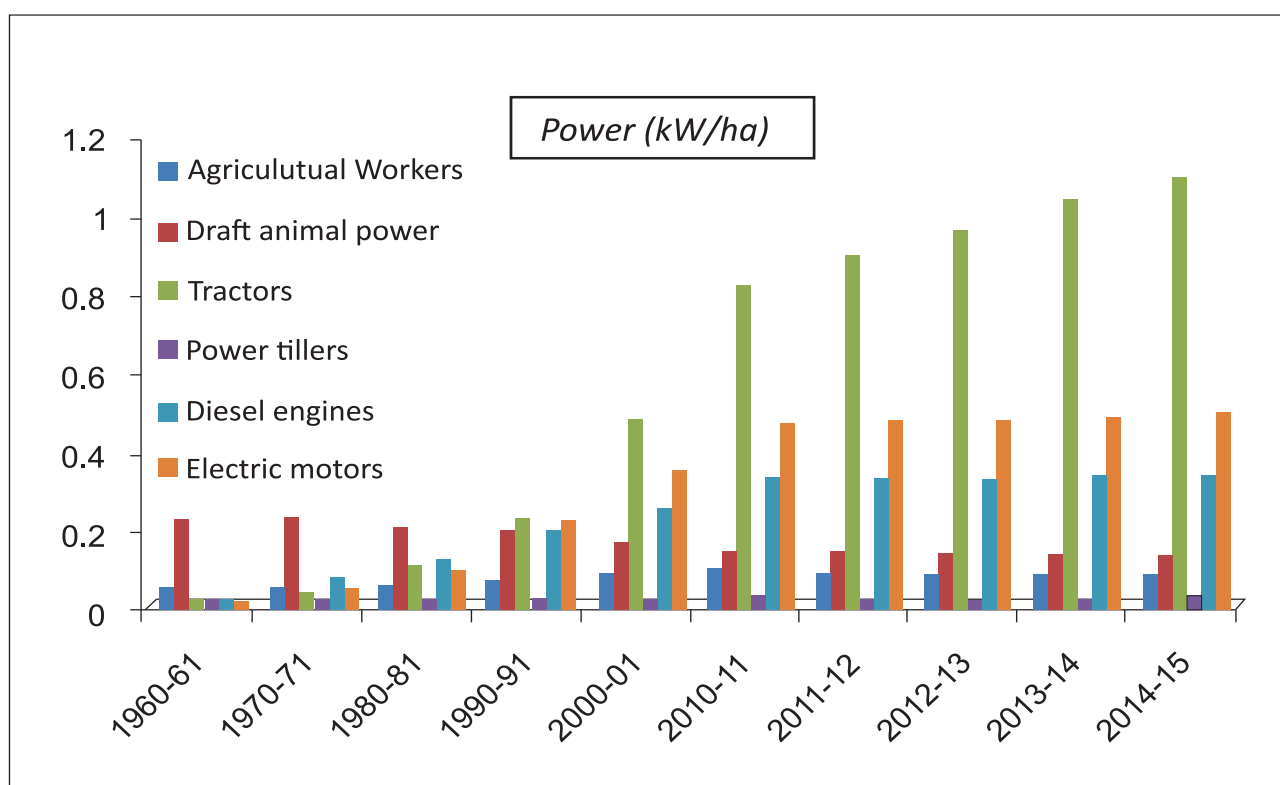
### ***Agricultural Mechanization***

7.25 Farm mechanization and crop productivity has a direct correlation as farm mechanization saves time and labour, reduces drudgery, cut down production cost in the long run, reduces post-harvest losses and boosts crop output and farm income. Use of improved implements has potential to increase productivity up to 30 per cent and reduce the cost of cultivation up to 20 per cent. At present, Indian farmers are adapting farm mechanization at a faster rate in comparison to recent past. Although, the sale of tractors in India cannot be taken as the only measure of farm mechanization but to a great extent it reflects the level of mechanization. Indian tractor industries have emerged as the largest in the world and account for about one-third of total global tractor production.

7.26 According to the World Bank estimates, half of the Indian population would be urban by the year 2050. It is estimated that percentage of agricultural workers of total work force would drop to 25.7 per cent by 2050 from 58.2 per cent in 2001. Thus, there is a need to enhance the level of farm mechanization in the country. Due to intensive involvement of labour in different farm operations, the cost of production of many crops is quite high. Human power availability in agriculture also increased from about 0.043 KW/ha in 1960-61 to about 0.077 KW/ha in 2014-15 (Figure 7). However, as compared to tractor growth, increase in human power in agriculture is quite slow.

7.27 Over the years, the shift has been towards the use of mechanical and electrical sources of power. In 1960-61, about 93 per cent farm power

**Figure 7 : Power available from different power sources on Indian farms**



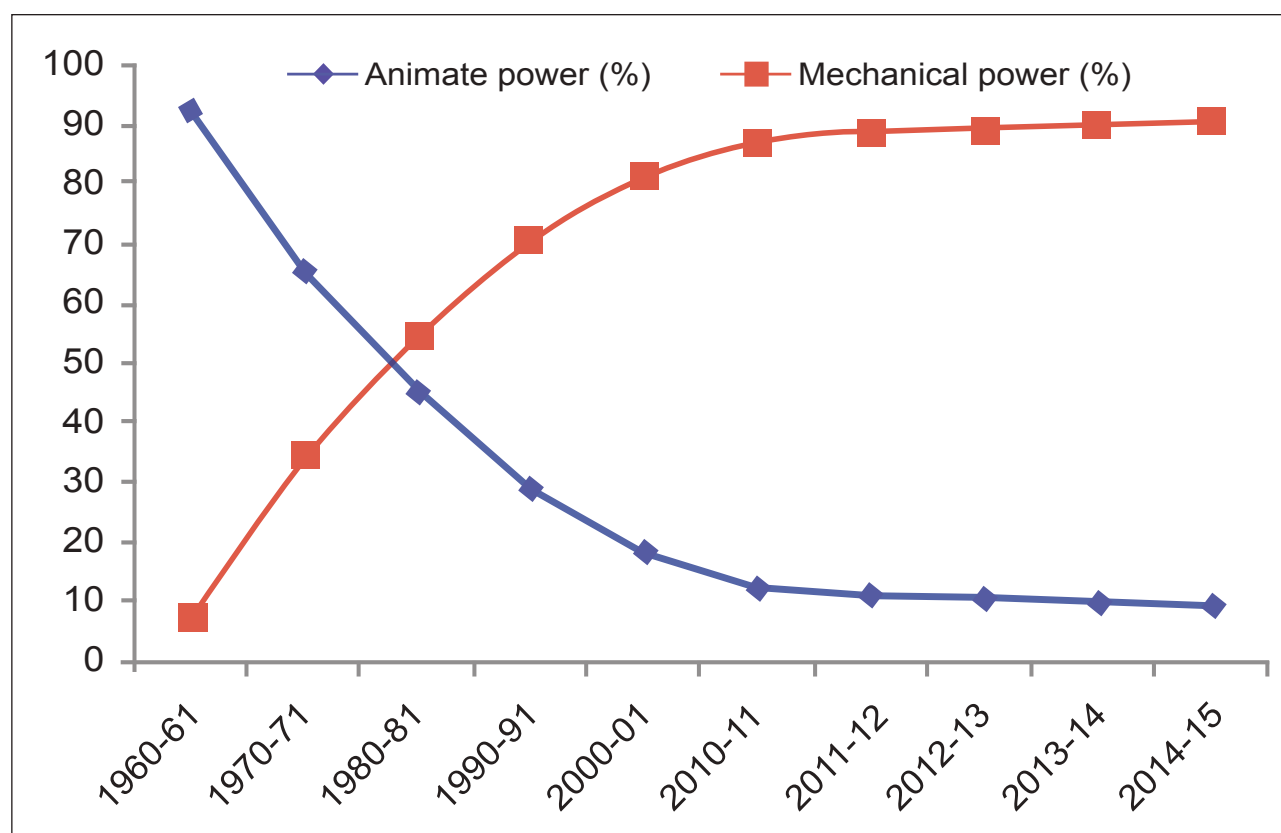
Source: Indian Council of Agricultural Research

was coming from animate sources, which has reduced to about 10 per cent in 2014-15 (Figure 8). On the other hand, mechanical and electrical sources of power have increased from 7 per cent to about 90 per cent during the same period.

## MITIGATING RISKS IN AGRICULTURE: CROP INSURANCE AND CROP LOSS

7.29 The NSSO Report (July 2012 – June 2013) had indicated that a very small share of agricultural

**Figure 8 : Animate and mechanical power scenario in Indian agriculture**



*Source:* Indian Council of Agricultural Research

7.28 There is predominance of small operational holdings in Indian agriculture. It is, therefore, needed to consolidate the land holdings to reap the benefits of agricultural mechanization. There is a need to innovate custom service or a rental model by institutionalization for high cost farm machinery such as combine harvester, sugarcane harvester, potato combine, paddy transplanter, laser guided land leveller, rotavator etc. to reduce the cost of operation and it can be adopted by private players or State or Central Organizations in major production hubs.

households engaged in crop production activities was insuring their crops. In respect of wheat and paddy, the two most harvested cereals in the country, less than 5 per cent of the cultivating agricultural households insured their crops. The share of households opted for crop insurance in the case of cotton, groundnut and soybean was slightly higher compared to the other selected crops harvested during the two halves of the agricultural year July 2012-June, 2013.

**Table 6 : Share of agricultural households not insuring crops by reasons for not insuring**

		Agricultural households not insuring by reason for (July 2012 to Dec 2012) (in %)		
Reasons for not insuring		Paddy	Arhar	Groundnut
1.	Not aware about crop insurance	43	41	49
2.	Not aware about availability of facility	19	16	18
3.	Not interested/not felt the need to insure	20	18	19
4.	Insurance facility not available	6	9	5
5.	Lack of resources for premium payment	4	6	3
6.	Complex procedures	3	2	1
7.	Delay in claim payment	0.9	0.7	0.2

**Source:** NSS Report No.573, Some aspects of farming in India, 2012-13.

7.30 The reasons for not insuring for selected crops as highlighted in Table 6 reflect that ‘Not aware about the crop insurance’ was the most prominent reason reported by the cultivating agricultural households for not insuring their crops during the two halves of the agricultural year July 2012-June 2013. The lack of awareness about the availability of the facility for the harvested crop was the second highest reported reason for not insuring the crops. Barring this 20 percent of households which were either not interested in insuring their crops or not felt the need for insuring their crops, majority of the agricultural households did not insure their crop due to reasons that can be attributed to lack of awareness, improper coverage and reach and complicated procedures and lack of resources etc. To enhance the coverage and rate of crop insurance among agricultural households, proper awareness needs to be generated along with enhanced geographical coverage and simplification of procedures.

7.31 In this context, it is noteworthy that the Pradhan Mantri Fasal Bima Yojana (PMFBY), which is a yield index based crop insurance scheme launched in 2016, has made substantial progress with more ground coverage compared to erstwhile schemes. During Kharif 2016 season 23 States implemented PMFBY and

during Rabi 2016-17, 25 States/Union Territories implemented PMFBY.

7.32 During 2016-17, the target of 30 percent of the Gross Cropped Area (GCA) in the country for PMFBY has been achieved. In 2016-17, for a gross premium of Rs. 22,004 crore, overall coverage was 571 lakh farmer applications and 554 lakh ha. area insured for a sum of Rs. 20,2145 crore. As on December 2017, under PMFBY, total claims of Rs. 13,292 crores have been approved for 116 lakh farmers (applications) and Rs. 12,020 crores have been paid. Loanee and non-loanee coverage stood at 435 lakh and 136 lakh respectively. As compared to 2015-16, there is about 18.3 per cent increase in farmer applications, 10.8 per cent increase in area insured and about 76 per cent increase in sum insured under the scheme. The coverage of non-loanee farmers has also been increased by 123.5 per cent during 2016-17 over previous year i.e. 2015-16. The target for 2017-18 has been kept at 40 per cent of GCA. During Kharif 2017, the scheme is being implemented by 25 States/UTs.

7.33 PMFBY provides comprehensive coverage of risks from pre-sowing to post harvest against natural non-preventable risks. The insurance premium is to be paid to companies on actuarial basis, with however very low share to be paid by farmers on a uniform basis across the country (2



per cent & 1.5 per cent for food & oilseed crops for Kharif & Rabi seasons respectively and 5 per cent for annual commercial/horticultural crops) and balance premium to be paid upfront and shared equally by Central and State Governments. It provides better protection for the farmers in terms of sum insured which has been made equal to the scale of finance.

### ***Reasons for Crop Loss***

7.34 Among the agricultural households which experienced crop loss during the two halves of the agricultural year July, 2012-June, 2013, reason for the crop loss and the average total loss were ascertained with respect to each major crop reported by the households. Inadequate rainfall/drought was most reported reason for crop loss for all the selected crops except coconut and urad during the first half of the agricultural year. In respect of coconut and urad, the highest reported single reason for crop loss during this period was “disease/insect/animal”. The highest average total loss was reported for cotton (Rs. 43046) followed by sugarcane (Rs. 42887) and groundnut (Rs. 28721) during July 2012-December, 2012.

7.35 Within an agricultural year, the reasons for crop loss will vary substantially in rainfed agriculture, which is highly dependent on weather conditions for cultivation of crops. Compared to

the period July 2012-December 2012, “disease /insect/animal” was the most reported reason for crop loss for more number of crops during the period January, 2013-June 2013. Other natural calamities also happened to be one of the major reasons reported by households which experienced loss of crops like gram, potato, rapeseed/mustard during this period. During the period January-June 2013, the agricultural households that cultivated sugarcane reported to have incurred highest average total loss (Rs. 36290) followed by cotton (Rs. 22,785) and onion (Rs. 18,860).

7.36 The significance of adopting climate resilient agriculture is increasing with rapid environmental changes occurring due to climate change factors (Box 7.3).

### **AGRICULTURAL CREDIT AND MARKETING INITIATIVES**

7.37 Credit is a critical input in achieving high productivity and overall production in the agricultural sector. A sum of Rs.20,339 crore has been approved by the Government of India in 2017-18 to meet various obligations arising from interest subvention being provided to the farmers on short term crop loans, as also loans on post-harvest storages meets an important input requirement of the farmers in the country

#### **Box 7.3 : Policy to Promote Climate Smart Agriculture (CSA)**

Climate change incidence on agriculture can be in the form of increased variability in temperature and rainfall and intensity of extreme weather events like drought and flood ultimately creating disturbance to agro-ecosystems, thereby impacting farmers and farming community. This necessitates the need to address adaptation and rural development in an integrated manner, so as to achieve climate resilient development. It is in this context that there is emergence of the concept and significance of ‘Climate Smart Agriculture (CSA).

#### **Climate Smart Agriculture (CSA)**

Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions wherever possible.

CSA is an approach for developing agricultural strategies to secure sustainable food security under climate change. CSA provides the means to help stakeholders identify agricultural strategies suitable to their local conditions.



**Mainstreaming CSA**

Mainstreaming CSA and Climate Change Adaptation (CCA) policies in India are still at its nascent stage. In order to address the risk associated with Climate variability and climate change, climate resilient technologies are being demonstrated in 153 model villages under KVK covering 23 states under “National Innovations on Climate Resilient Agriculture” (NICRA). In addition, 623 contingency plans have been prepared so far and hosted on ICAR /DAC websites (<http://farmer.gov.in/>, <http://agricoop.nic.in/acp.html>, <http://crida.in/>) and circulated to all state agriculture departments to manage various weather aberrations such as droughts, floods, cyclones, hailstorms, heat and cold waves. The contingency plans are useful for preparedness and real time implementation towards sustainability of agriculture production system in the events of weather aberrations and extreme climatic events.

(Box 7.4 on Interest Subvention Scheme), especially small and marginal farmers who are the major borrowers. (Table 7) This institutional credit will help in delinking the farmers from non-institutional sources of credit, where they are compelled to borrow at usurious rates of interest. Since the crop insurance under Pradhan Mantri Fasal Bima Yojana (PMFBY) is linked to availing of crop loans, the farmers would stand to benefit from both farmer oriented initiatives of the Government, by accessing the crop loans.

undertake on-line trade, it is also important that they avail themselves of post-harvest loans by storing their produce in the accredited warehouses. The loans are available to Kisan Credit Card (KCC) holding small and marginal farmers at interest subvention of 2 per cent on such storages for a period of upto six months. This will help the farmers to sell when they find the market is buoyant, and avoid distress sale. It is, therefore, needful for the small and marginal farmers to keep their KCCs alive.

**Table 7 : Coverage of Small and Marginal Farmers (SMF) in Agriculture Ground level credit (GLC) flow in the last 3 years**

Number of Accounts for GLC	2013-14	2014-15	2015-16
Total No. of accounts (all farmers) (in crores)	8.05	8.53	8.99
No. of Accounts of SMF (in crore)	5.05	4.86	5.40
% Coverage of SMFs	62.7	57.0	60.1

*Source: Standing Committee on Agriculture, March 2017.*

7.38 The Government has been undertaking market reforms with a view to ensuring that the farmers benefit from remunerative prices for their produce in the market. The electronic National Agriculture Market (e-NAM) that was launched by Government on April, 2016 aims at integrating the dispersed APMCs through an electronic platform and enable price discovery in a competitive manner, to the advantage of the farmers. While the farmers are advised to

7.39 The Government is keen to double the income of the farmers by 2022, for which it has launched several new initiatives that encompass activities from seed to marketing. The credit from institutional sources will complement all such government initiatives like Soil Health Card, Input Management, Per Drop More Crop in Pradhan Mantri Krishi Sinchai Yojana (PMKSY), PMFBY, e-NAM, etc.

### Box 7.4 : Interest Subvention Scheme (ISS)

The Interest Subvention Scheme (ISS) has been operational since 2006-07. Under this scheme, the farmers can avail concessional crop loans of upto Rs.3 lakh at 7 per cent rate of interest. It also provides for an additional subvention of 3 per cent for prompt repayment within a period of one year from the date of advance. The scheme for 2017-18 will help farmers to avail of short term crop loans up to Rs. 3 lakh payable within one year at only 4 per cent per annum.

As a measure to check distress sale, post-harvest loans for storage in accredited warehouses against Negotiable Warehouse Receipts (NWRs) are available for upto 6 months for KCC holding small & marginal farmers. The Interest Subvention Scheme will continue for one year and it will be implemented by NABARD and RBI.

The interest subvention will be given to Public Sector Banks (PSBs), Private Sector Banks, Cooperative Banks and Regional Rural Banks (RRBs) on use of own funds and to NABARD for refinance to RRBs and Cooperative Banks. The salient features of the scheme are as follows:

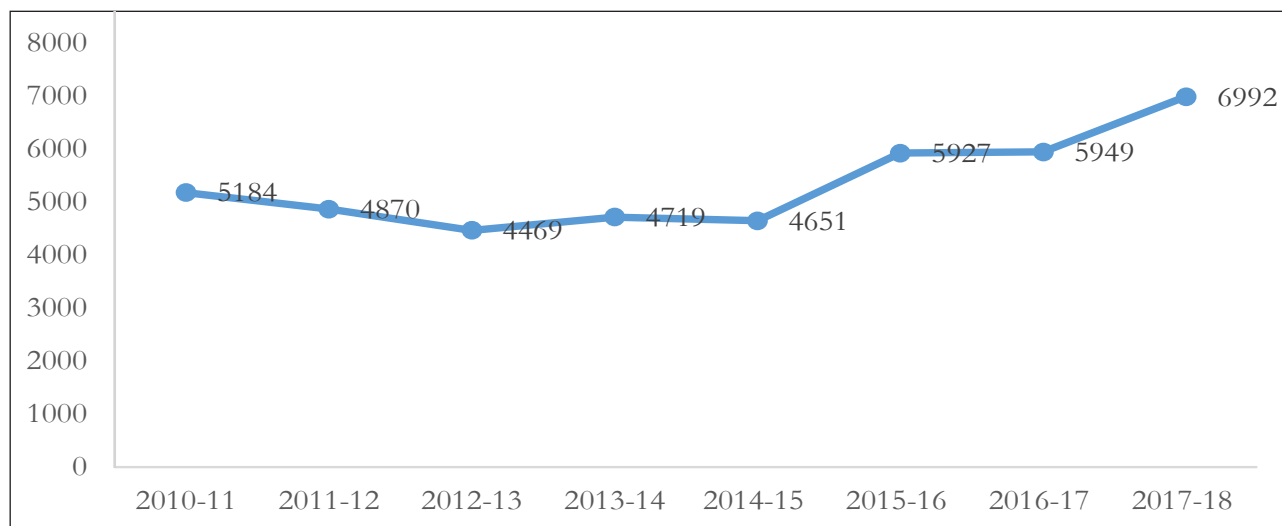
- The Central Government will provide interest subvention of 5 per cent per annum to all prompt payee farmers for short term crop loan upto one year for loan upto Rs. 3 lakhs borrowed by them during the year 2017-18. Farmers will thus have to effectively pay only 4 per cent as interest. In case farmers do not repay the short term crop loan in time they would be eligible for interest subvention of 2 per cent as against 5 per cent available above.
- The Central Government will provide approximately Rs. 20,339 crore as interest subvention for 2017-18.
- In order to give relief to small and marginal farmers who would have to borrow at 9 per cent for the post-harvest storage of their produce, the Central Government has approved an interest subvention of 2 per cent i.e. an effective interest rate of 7 per cent for loans upto 6 months.
- To provide relief to the farmers affected by natural calamities, the interest subvention of 2 per cent will be provided to Banks for the first year on the restructured amount.
- In case farmers do not repay the short term crop loan in time they would be eligible for interest subvention of 2 per cent as against available above.

The ISS is to make available at ground level, agricultural credit for Short Term crop loans at an affordable rate to give a boost to agricultural productivity and production in the country.

## AGRICULTURE RESEARCH AND DEVELOPMENT

7.40 Agricultural R&D is the main source of innovation, which is needed to sustain agricultural productivity growth in the long-term (FAO, 2012). The actual expenditure of DARE/ICAR has increased from Rs. 5393 crore in 2010-11 to Rs. 6800(BE) crore during 2017-18. The compound annual growth rate of expenditure has been 4.2 percent over the years and in recent years' expenditure has been on higher side (Figure 9). During the current year (2017-18), investment in

Agriculture Research and Education protected new agricultural innovations by filing 45 patent applications at Indian Patent Office (IPO) and the cumulative patent applications has now risen to 1,025. 10 copyright and 12 trademark applications were filed by ICAR for products and processes. After the Protection of Plant Varieties and Farmers' Rights Authority notified new genera, applications for 135 varieties were filed at the Registry and 155 high-yielding varieties/ hybrids of cereals were released for cultivation in different agro-ecologies of the country during 2016.

**Figure 9 : Actual expenditure of DARE/ICAR (Rs. Crore)**

**Source:** Indian Council of Agricultural Research

**Note:** Year 2017-18 figure is Budget Estimate, Year 2016-17 Revised Estimate.

7.41 A total 209 new varieties/hybrids tolerant to various biotic and abiotic stresses with enhanced quality have been developed for Cereals, Pulses, Oilseeds, Commercial and Forage crops.

7.42 **Cereals :** 117 high yielding varieties/hybrids of cereals comprising 65 of rice, 14 of wheat, 24 of maize, 5 of finger millet, 3 of pearl millet, 1 each of sorghum, barley, foxtail millet, kodo millet, little millet and proso millet were released for cultivation in different agro-ecologies of the country during 2017

7.43 **Oilseeds:** 28 high yielding oilseeds varieties comprising 8 of rapeseed-mustard, 5 of soybean, 4 each of groundnut and linseed, 3 of sunflower, 2 each of castor and niger were released for different agro-ecological regions.

7.44 **Pulses:** 32 high-yielding varieties of pulses comprising 10 of chickpea, 6 of lentil, 4 of cowpea, 3 of mungbean, 2 each of pigeonpea, horse gram and field pea, 1 each of urdbean, rajmash and faba bean were released for different agro-ecological region

7.45 **Commercial crops:** 24 high-yielding varieties of commercial crops including 13 of cotton, 8 of sugarcane and 3 of jute were

released for different agro-ecological regions.

7.46 **Forage crops:** 8 high yielding varieties/hybrids of forage crops comprising 3 of oats, 1 each of bajra, napier hybrid, forage sorghum, grain amaranthus, forage cowpea and marvel grass were released for cultivation in different agro-ecologies.

## FOOD MANAGEMENT

7.47 The food security system in India is managed by intertwined organizational framework between Centre and States that involves centralized and decentralised procurement of foodgrains through price support operations, allocation and distribution of foodgrains at reasonable prices to consumers/beneficiaries through TPDS (Targeted Public Distribution System) and the maintenance of buffer stocks for price stabilization. There are multiple objectives to be achieved through the system of procurement operations as implemented in India in terms of providing fair price to farmers, making foodgrains affordable to low income consumers, provisioning for contingencies/shortages by maintaining buffer stocks and to reduce food price volatility.

7.48 The procurement at MSP is open-ended, while distribution is governed by the scale of allocation and its offtake by the beneficiaries. The offtake of foodgrains is primarily under the National Food Security Act, 2013 (NFSA) and other welfare schemes of the Government of India. During the financial Year 2017-18 (upto 27.11.2017), Rs.2785 crore has been released to State Governments as Central assistance to meet the expenditure incurred on intra-State movement of foodgrains and fair price shop dealers' margins. The quantum of food subsidy released by the government is given in Table 8.

**Table 8 : Quantum of food subsidies released by Government**

Year	Food subsidy (Rs. in crore)	Annual growth (%)
2010-11	62929.56	8.1
2011-12	72370.90	15.0
2012-13	84554.00	16.8
2013-14	89740.02	6.1
2014-15	113171.16	26.1
2015-16	134919.00	19.2
2016-17	105672.96	-21.7
2017-18*	134988.83	

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

**Note:** \*As on 28.11.2017

7.49 With a view to make receipt of foodgrains under TPDS a legal right, Government of India has enacted NFSA which came into force w.e.f. 5<sup>th</sup> July, 2013. The Act provides for coverage of upto 75 per cent of the rural population and upto 50 per cent of the urban population for receiving subsidized foodgrains under Targeted Public Distribution System (TPDS), thus covering about two-third of the population. The eligible persons

identified by the States/UTs are entitled to receive 5 kg of foodgrains per person per month at subsidized prices of Rs.3/2/1 per kg for rice/wheat/nutri-grains (coarse grains). The existing Antyodaya Anna Yojana (AAY) households, which constitute the poorest of the poor, continue to receive 35 kg of foodgrains per household per month. As on 1<sup>st</sup> November, 2016 NFSA has been implemented in all the 36 States/UTs and they are receiving monthly allocation of foodgrains under NFSA. During the year 2017-18, Government of India has so far allocated 606.43 lakh tons of foodgrains to States/UTs/Other Welfare Scheme (OWS) etc. as per break up given in Table 9.

**Table 9 : Foodgrains allocation under NFSA/Non NFSA (2017-18)**

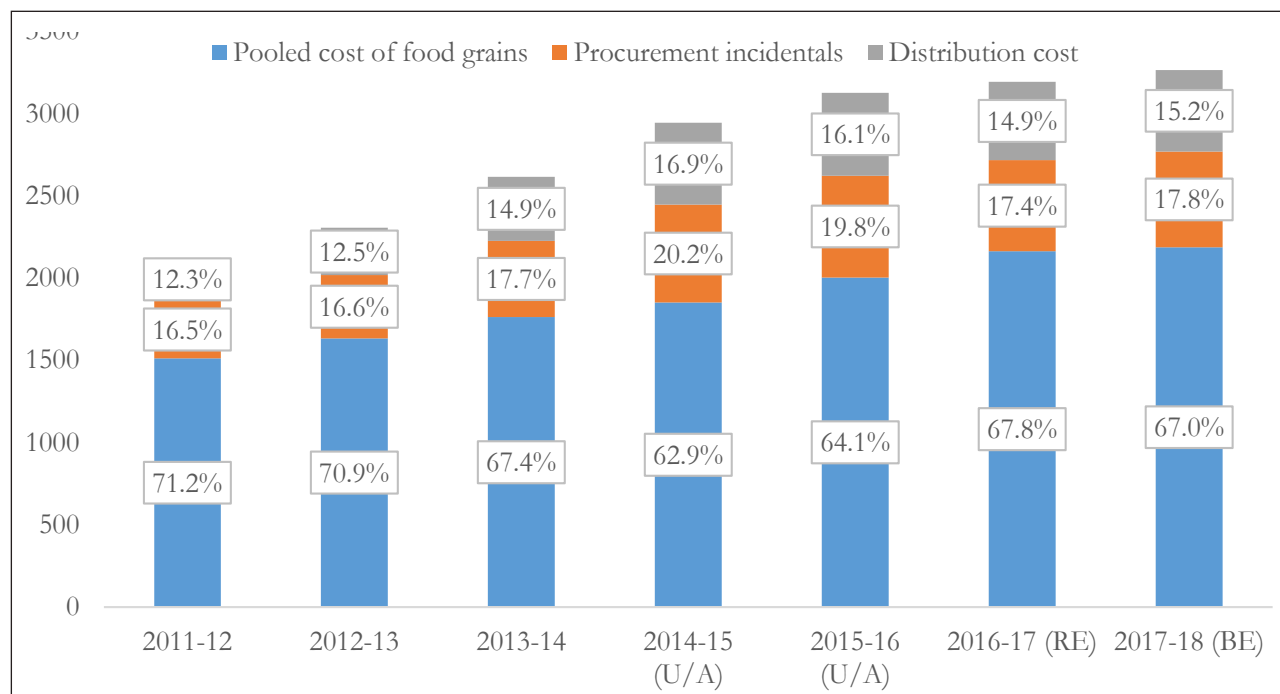
Sl.No.	Category	Quantity (in lakh tons)
1	NFSA	552.86
2	Festival calamity etc.	4.48
3	Other Welfare schemes	49.09
<b>Total</b>		<b>606.43</b>

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

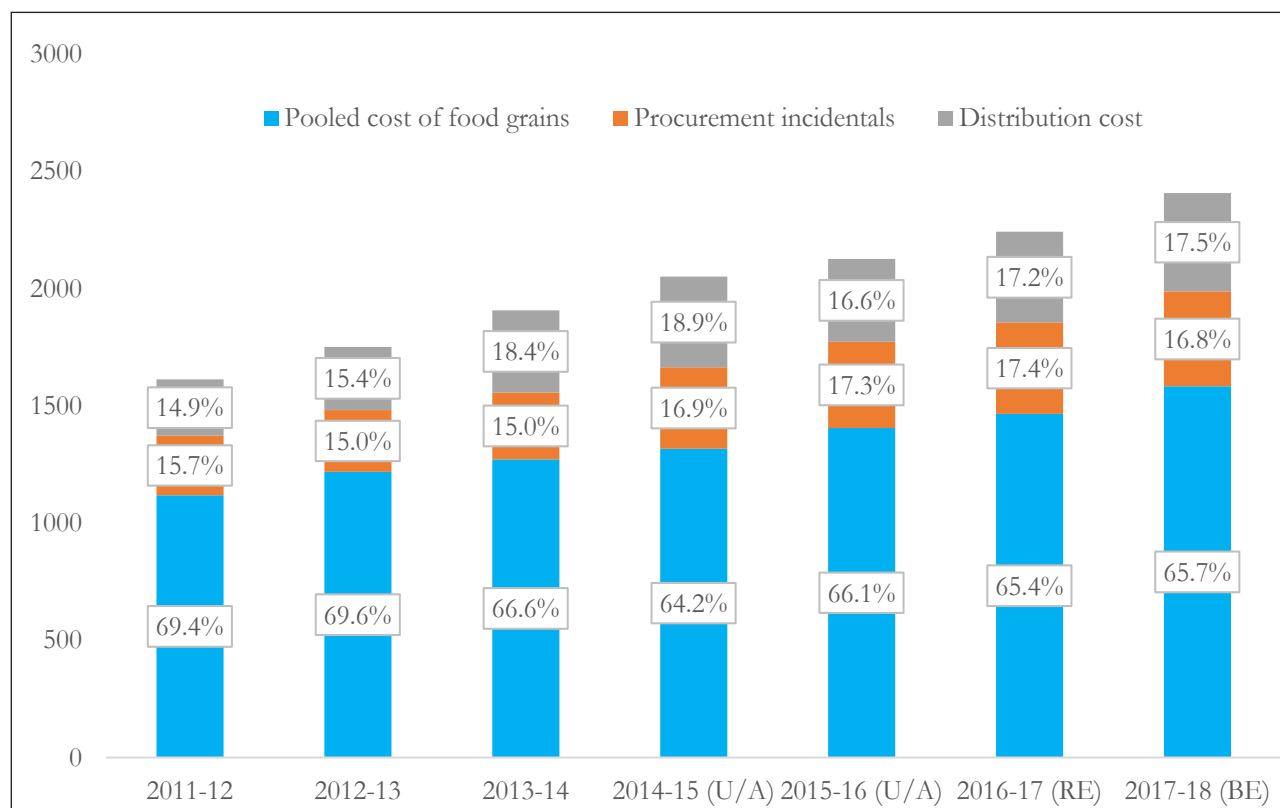
### ***Economic Costs of Foodgrains to FCI***

7.50 The Economic Cost of foodgrains consists of three components, namely, pooled cost of grains, procurement incidentals and the cost of distribution. Pooled cost of food grains is the weighted MSP of the stock of foodgrains available with FCI at the time of calculating the economic cost.

7.51 The economic cost for both wheat and rice witnessed significant increase during the last few years due to increase in MSPs and proportionate increase in the incidentals (Figure 10 and Figure11).

**Figure 10 Component-wise economic cost of rice (Rs./Quintal)**

Source: Department of Food & Public Distribution

**Figure 11. Component-wise economic cost of wheat (Rs./Quintal)**

Source: Department of Food & Public Distribution

### ***Open Market Sale Scheme (Domestic)***

7.52 In addition to maintaining buffer stocks and for making a provision for meeting the requirement of the Targeted Public Distribution System (TPDS) and Other Welfare Schemes (OWS), FCI on the instructions from the Government sells excess stocks out of Central Pool through Open Market Sale Scheme (Domestic) [OMSS (D)] in the open market from time to time at predetermined prices to achieve the following objectives:-

- To enhance the supply of food grains during the lean season and deficit regions
- To moderate the open market prices
- To offload the excess stocks
- To reduce the carrying cost of food grains

### ***Sale of Wheat and Rice under OMSS (Domestic) during 2017-18***

7.53 A target of 53 Lakh MT of wheat and 20 Lakh MT of 'A' Grade rice has been set for sale by FCI out of Central Pool in the open market under OMSS (D) during 2017-18. Reserve price for the bulk sale of wheat under OMSS (D) in 2017-18 to private bulk buyers / traders has been kept at Rs. 1,790/- per quintal, which includes loading and handling charges for all types of sales including dedicated movement. For sale of wheat under OMSS (D) in the states of Punjab, Haryana and Madhya Pradesh, the reserve price of wheat is Rs. 1,790 per quintal. The overall reserve price for sale of Grade 'A' rice under OMSS (D) has been kept at Rs. 2,500/- per quintal for 2017-18. The quantities of wheat and rice sold under the OMSS (D) during the last 5 years and current year are at table 10.

**Table 10 : Quantities of wheat and rice sold under OMSS (D)**

Qty. in lakh MT

Year	Wheat	Rice
2012-13	68.7	1.0
2013-14	61.2	1.7
2014-15	42.4	Nil*
2015-16	70.8	1.1
2016-17	45.7	1.8
2017-18**	5.7	2.6

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

**Note:** \*Sale of rice was not conducted in 2014-15.

\*\*Upto 4<sup>th</sup> week of November 2017

### **THE WAY FORWARD**

7.54 The agriculture sector in India is experiencing structural changes which are opening up new challenges and opportunities. The Government has initiated reforms in the field of agricultural marketing, given a big push to the use of technology in agriculture, and also adopted Direct Benefit Transfer (DBT) mode for timely delivery of extension services, credit and other inputs to small and marginal farmers. The central priority of the government will be to provide opportunities for farmers to diversify their income generating opportunities to reduce the various risks by facilitating the development of agricultural sub-sectors like livestock and fisheries.

7.55 The transformation of agriculture and allied sector is imminent by way of appropriate policy interventions related to prices, trade, adoption of Climate Smart Agriculture, increased focus on small, marginal and women farmers. Though the share of agriculture and allied sector in GVA is on the decline, in the quest for inclusive economic development in India, agriculture sector will remain an engine of broad based growth which will reduce inequalities and provide food security.