FARMER CENTRIC ISSUES IN AGRICULTURE AND ALLIED SECTORS

Eight groups of Secretaries and 16 Groups of Joint Secretaries were constituted by the Cabinet Secretariat on eight important themes. One of the Groups was on ' Farmer Centric Issues in Agriculture and Allied Sectors'. The following was the composition of the Group, with Secretary Rural Development as the Rapporteur:

1. **Secretary Rural Dev - Rapporteur**	**Shri J K Mohapatra**	**IAS (OR:79)**		Assisted by AS RD Amarjeet Sinha	
2. Secretary Agriculture	Shri Siraj Hussain	IAS (UP:79)		Assisted by team of Officers from Department of Agriculture namely, Shri Avinash Shrivastava (SS), Ashok Dalwai (AS), Sanjay Lohia (JS) and Narendra Bhooshan (JS)	
3. Secretary Consumer Affairs	Shri C. Viswanath	IAS (AP:81)			
4. Secretary Space	Shri A.S. Kiran Kumar	Scientist			
5. Secretary Panchayati Raj	Shri S.M. Vijayanand	IAS (JK:81)			
6. Secretary Bio-Technology	Shri K. Vijayraghavan	Scientist		Assisted by team of Scientists	
7. Secretary DARE	Dr S. Ayyappan	Scientist		Assisted by CSIR Scientists	
8. Secretary Land Resources	Shri V S Madan	IAS (UT:81)		Assisted by AS DoLR Dr. K. P. Krishnan	
9. Secretary Animal Husbandry	Shri A K Angurana	IAS (JK:80)		Assisted by officials of the Department, namely Rajni Sekhri Sibal, Bhoosa Reddy.	
10. Secretary Food Processing Ind.	Shri Rangalal Jamuda Represented by AS J.P. Meena	IAS (OR:81)			
11. Secretary S. & Ind. Research	Shri Girish Sahani	Scientist			
12. Secretary Nat. Comm. For SCs	Dr. Vinod Agrawal	IAS (JH:80)			

The Group was assisted by two Groups of Joint Secretaries with Ms. Rajni Sekhri Sibal and Shri Alok Tandon, Joint Secretaries, as the Rapporteurs. The composition of these groups is annexed.

In his presentation to the Secretaries on 31st December 2015, Hon'ble Prime Minister indicated that the groups should deliberate and come out with low cost solutions to solve problems. He also emphasised the need for improving efficiency and effectiveness of the current spend and to explore innovative methods of financing without putting pressure on Budget allocations.

The Group of Secretaries had a series of meetings in Krishi Bhawan. It would like to record its gratitude to Shri P. K. Mishra, Additional Principal Secretary to the Prime Minister for taking time out to attend the deliberations of the Group in two of its meetings and giving valuable suggestions. THE Group would also like to specially acknowledge valuable inputs received from the Chairman WRDA, Chairman FSSAI, CMD FCI, Shri Amarjit Singh Special Secretary Department of Water Resources, CMDDNABARD and Deputy MD NABARD Shri H.R. Dave. The Group benefitted from the deliberations of the two Groups of Joint Secretaries whose key recommendations were presented to the Group of Secretaries by the respective Rapporteurs.

I - SOME KEY STATISTICS

Agriculture Productivity (2013-14) (Qtl./ha)

	Rice	Wheat	Maize	Arhar
World Average	**30.18**	**32.65**	**55.20**	**7.62**
India	**24.16**	**31.45**	**26.76**	**8.13**
Punjab	**39.52**	**50.17**	**39.00**	**8.97**
Bihar	**17.59**	**23.58**	**28.84**	**16.67**
UP	**24.47**	**30.38**	**17.03**	**9.00**
MP	**14.74**	**24.05**	**17.67**	**7.16**
Jharkhand	**22.38**	**21.23**	**20.12**	**10.43**

The above Table clearly brings out where we stand vis-a-vis the world as also the differences in productivity across States. While broadly we are closer to the global average in productivity of wheat and Arhar, we have a long way to go in improving productivity in rice and maize. The regional variations also facilitate the identification of challenges in farmer centric issues in agriculture in the regional context. While India has to strive harder to match global productivity in foodgrains, it has also to ensure a more rapid agricultural development of the Eastern region States that have better water resource potential.

II – THE ISSUES : FARMING – VIABLE, STEADY AND SUSTAINABLE

Based on a situation analysis of rural India, there are a few key issues that need attention in order to make farming viable, steady and sustainable. These are :

- Increase productivity, better inputs, technologies, and extension support.
- Remunerative prices and Market support.
- Risk Mitigation.
- Land rights, Land Records modernization and revisiting tenancy laws.
- Livelihoods diversification through allied activities.
- Second Green Revolution in the Eastern Region.

The Group decided to look at the key issues in some detail, identifying the problems and suggesting possible solutions without putting pressure on the Gross Budgetary Support. Innovative financing approaches, convergence, effective and efficient implementation, prioritization and outcome thrust with a one year and a three to four year time frame were broad approaches that the Group adopted to make recommendations in line with the mandate given to the Group by the Hon'ble Prime Minister.

III - INITIATIVES SO FAR

The present Government has already undertaken many farmer friendly initiatives. These are briefly described below:

A. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

Government of India is committed to accord high priority to water security. The objective behind **Pradhan Mantri Krishi Sinchai Yojana** is "Har Khet ko Pani". The PMKSY shall focus on creating sources of assured irrigation and harnessing rain water at micro level through "*Jal Sanchay and Jal Sinchan*." And also increase water use efficiency through promotion of Micro-irrigation ''Per drop More crop''.

The PMKSY will lay stress on end to end solution in irrigation supply chain viz. water sources, distribution network and farm level application. The budget line to achieve the synergy of resources has been created in the Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW), Ministry of Water Resources and Department of Land Resources to implement PMKSY.

B : Pradhan Mantri Fasal Bima Yojana (PMFBY)

PMFBY will provide a comprehensive insurance cover against failure of the crop thus helping in stabilizing the income of the farmers and encourage them for adoption of innovative practices. The Scheme can cover all Food & Oilseeds crops and Annual Commercial/Horticultural Crops for which past yield data is available and for which requisite number of Crop Cutting Experiments (CCEs) will be conducted being a part of the General Crop Estimation Survey (GCES). The scheme is compulsory for loanee farmer obtaining Crop Loan /KCC account for notified crops. However, it is voluntary for other/non loanee farmers who have insurable interest in the insured crop(s). The Maximum Premium payable by the farmers will be 2% for all Kharif Food & Oilseeds Crops, 1.5% for Rabi Food & Oilseeds crops and 5% for Annual Commercial/Horticultural Crops. The difference between premium and the rate of Insurance charges payable by farmers shall be shared equally by the Centre and State. The seasonality discipline shall be same for loanee and non-loanee farmers.

The scheme will be implemented by Agriculture Insurance Company(AIC) and other empanelled private general insurance companies. Selection of Implementing Agency (IA) will be done by the concerned State Government through bidding.

The existing State Level Co-ordination Committee on Crop Insurance (SLCCCI), Sub-Committee to SLCCCI, District Level Monitoring Committee (DLMC) shall be responsible for proper management of the Scheme.

C : Paramparagat Krishi Vikash Yojana (PKVY)

The government is committed to promote Organic Farming which improves soil Health and leads to better quality crops. From 2015-16, PKVY, a new scheme to develop organic clusters and make available chemical free inputs to farmers will be implemented. This is a major initiative taken by the government to give fillip to organic production system and to allocate substantial funds separately for this purpose. Group of fifty or more farmers having 50 acre of land would be motivated to take up organic farming under the scheme. In the next three years, it is proposed to form 10,000 clusters covering 5 lakh acre of area. Every farmer in a cluster will be provided an assistance of Rs. 20,000 per acre in three years towards conversion, adoption of organic farming and market assistance.

D : Soil Health Management (Soil Health Cards Scheme)

In order to promote soil Health Management, provides assistance to state governments for setting up soil testing laboratories, fertilizer testing laboratories as well as implementation of organic farming project across the across the country . A new scheme "Soil Health Card' for every farmer was inaugurated by Prime Minister on 19-02-2015 at Suratgarh, Rajasthan. The goal is to promote soil test based application of fertilizers in respect of all 14 crore holdings in the country and to implement uniform norms in sampling and testing of soil. Soil data and information will be made available to all farmers so that they can apply appropriate dosage of fertilizers to increase productivity and profitability. Demonstrations will be conducted for farmers to showcase balanced nutrient management. These Soil Health Cards will be renewed after every three years. A national programme will be implemented through the State governments to issue soil health cards and develop a database to improve service delivery.

E: Neem Coated Urea

Government of India has now made it mandatory for manufacturers to produce 100 per cent neem coated urea to discourage indiscriminate use of the urea in the country. In the neem coated urea, every granule has a coating of neem oil, which slows down the rate of dissolution of urea in soil and thus increases the availability of nitrogen for crops. Presence of neem also reduces the effects of insects/ pests present in the soil. Dosage of urea also gets reduced by 5-10 % due to high efficiency of neem coated urea.

F: **National Food Security Mission (NFSM): Pulses**

It is a centrally sponsored scheme that focuses on pulse production through utilization of rice fallows, rice bunds and intercropping of pulses with coarse cereals, oilseeds and commercial crops (sugarcane, cotton, jute). Promotion and extension of improved technologies i.e. seed, Integrated Nutrient management (INM) including micronutrients, soil amendments, Integrated Pest Management (IPM), input use efficiency and resource conservation technologies along with capacity building of the farmers/extension functionaries. All farmers entitled to avail assistance for various components of the Mission. From the year 2015-16, the mission is being implemented on 60:40 sharing basis between GOI and States (90:10 for NE region). All farmers entitled to avail assistance for various components of the Mission, limited to 5 hectares in a season.

G : National Agriculture Market (NAM)

Agri Tech Infrastructure Fund (ATIF) is a **Central** Sector Scheme which envisages implementation of the **National Agriculture Market** by creation of a common electronic platform deployable in selected 585 regulated wholesale markets across the country during 2015-16 to 2017-18. Small Farmers Agribusiness Consortium (SFAC) will implement the national e-platform. Department of Agriculture, Cooperation& Farmers Welfare (DAC&FW) will meet expenses on software and its customisation for the States and provide it free of cost to the States and UTs. DAC will also give grant as one time fixed cost subject to the ceiling of Rs.30.00 lakhs per Mandi (other than to the private mandis) for related equipment / infrastructure in 585 regulated mandis, for installation of the e-market platform. Big private mandis will also be allowed access to the e-platform for purposes of price discovery, however they will not be supported with any funds for equipment / infrastructure. State Governments will suggest names of APMCs where this project would be initiated. DAC&FW's assistance will be towards setting up e-platforms (Grading and Assaying Laboratories, IT infrastructure for e-market platform, training of market participants and other miscellaneous/ contingency expenditure).

For integration with the e-platform, the States/UTs will need to undertake prior reforms in respect of

- ✓ a single license to be valid across the State,
- ✓ single point levy of market fee, and
- ✓ provision for electronic auction as a mode for price discovery.

Only those States/UTs that have completed these three pre-requisites will be eligible for assistance under the scheme.

H. National Gokul Mission

Keeping in view the urgent need to take up a specific programme for the development and conservation of indigenous bovine breeds, the "Rastriya Gokul Mission" a new initiative has been launched for the first time, with a view to conserve and develop indigenous bovine breeds in a focussed manner. The `Mission also envisages establishment of integrated cattle development centers "Gokul Gram" in a native breeding tract and near metropolitan cities for housing of urban cattle.

G. Blue Revolution (Fisheries)

The new Government at the Centre has initiated "*Blue Revolution*" to take forward the fishery sector as it will contribute to the betterment of livelihood of fishermen, fisher women and aquaculture fish farmers, besides providing high energy proteins for tackling protein malnutrition, healthy Omega-3 oil supplementation and creation of rural employment through ancillary industries as packaging, transportation, ice manufacturing and processing etc.

The Group took note of the large number initiatives already taken by the present government. In developing its recommendations it did not repeat what has already been initiated but only tried to develop a more effective implementation strategy for the decisions already taken. It also tried to work out prioritization and convergence wherever required to make the initiative more effective in improving the viability, profitability, and sustainability of farming.

IV – DROUGHT PROOFING AGRICULTURE – PMKSY IN IRRIGATED AREAS

The Problem

Only 45% of the area under agriculture is irrigated in India. Water being so critical to the agricultural and allied operations, the Group felt that innovative ways of financing efforts to augment the surface irrigation acreage ought to be developed. Given the growing dark zones as mapped by the Central Ground Water Board, the development of surface irrigation has become an imperative. Large surface irrigation Projects require large upfront investment in order to reap the benefits of higher productivity. There is also the challenge of bridging the 23% gap between irrigation potential created and actually utilized. A lot of the unutilized irrigation potential has often to do with inadequate command area development and monitoring. The Accelerated Irrigation Programme (AIBP) suffers due to severe inadequacy of provision of resources annually for many large Projects. Against a requirement f Rs. 29000 crores for completion of 46 Projects that are near completion, the annual budgetary allocation is a mere Rs. 3000 Crores under AIBP.

The Solution

Clearly, a faster completion of the 46 projects requires an extra budgetary resource provision with the repayment of the extra budgetary resource through annual allocations in the Budget over a period of time. This is possible by creating a dedicated fund in NABARD through tax free bonds earmarked for projects related to the development and conservation of water resources. Central Government, State Governments and their designated agencies may be enabled to avail long term loans (tenure of 10-15 years with moratorium of 2-4 years) for these projects and use provisions under PMKSY for repayment of the loan. Such an upfront provision of financial resources through the NABARD financing mechanism can help in creating an additional 1.1. million hectare irrigation in one year and an additional 3.4 million hectares over the next three years.

Similarly, replication of the Madhya Pradesh model of web based monitoring of utilization of irrigated area, will help in bridging the 23% gap between irrigation potential and irrigation use.

It is also possible to develop Space applications for validating utilization of the irrigation potential created. The solutions suggested are within the broad parameters suggested by the Hon'ble Prime Minister.

V – DROUGHT PROOFING AGRICULTURE – PMKSY IN RAINFED AREAS

The Problem

The advances in agriculture have led to the unbridled use of water, thereby depleting the ground water resources even in irrigated areas. Also, in the rain fed regions, major breakthroughs in sustainable farmer centric agriculture and allied activities through multiple livelihoods, requires harvesting of rain water as and where it falls. The growing dark regions of depleting water reserve pose a challenge for sustainable agriculture and productivity. The crop diversification and breakthrough in rainfed regions are critically dependent on our ability to harness rainwater as and where it falls.

The Solution:

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) undertakes public works to provide wage employment during the lean period to poor rural households. Without any additional budgetary resources, 5 lakh farm ponds and dugwells can be constructed under the MGNREGS every year in a focused manner and after through technical assessment of feasibility. This is expected to cost nearly Rs. 8000 crores that can come from the current budgetary allocations under the programme.

Likewise, solar pump sets with micro irrigation can be provided in the not so depleted regions of the country, to demonstrate effective and efficient water use in a sustainable way. With the simultaneous thrust on rainwater harvesting through farm ponds and watershed related interventions, it will be possible to support sustainably, 2 lakh solar pumps with micro irrigation. By convergently utilizing 30% subsidy from MNRE and 65% loan from the power company, a meagre 5% farmer contribution can provide access to sustainable water for enhancing productivity.

VI - Harnessing Modern Technology for Extension

The Problem

Agriculture Extension in India can be said to have at best mixed record. Public provision has overall fallen short of expectation. The extension system has been weak and the use of technology has been limited so far.

The Solution:

The wonderful technology of Mobile and internet has provided an opportunity to reach even the poorest of poor farmer and fulfil his information needs on anytime anywhere basis. Some of the interventions having high potentials are described as follows:

Mobile Apps & Radio Bultoo for Farmers

<u>Mobile Apps</u>

1. With the penetration of internet and mobile technologies in rural parts of India, useful information regarding crops, soils, climate, cultivation practices, financing, storage of produce and marketing in the farming communities, can be easily obtained today. However, most of the farmers are still not able to access this because of non availability of suitable web enabled systems like Laptops, PCs & Tablets etc.

2. Affordable Mobile internet technologies along with their deep penetration in rural parts of the country have provided an excellent opportunity for creating mobile based solutions such as mobile apps to meet information needs of farmer round the clock. The emphasis in ICT penetration in agriculture has thus to shift on making every bit of farmer centric information, available through easy to handle, platform agnostic and freely available mobile apps. It is also considered as continuation of Government of India initiative under “Digital India”.

3. Ministry of Agriculture & Farmers Welfare has therefore decided to develop suitable mobile apps so that complete information which is presently being made available through web based applications and portals is also made available to the farmers and all other stakeholders through mobile apps. Accordingly it is targeted to develop 500 apps in the first year and take this number to 2000 over a period of next three years. These will cover wide ranging subjects related to Agriculture, Horticulture, Animal Husbandry, Fisheries and include both production and post production issues in English, Hindi and regional languages.

4. It is proposed to get these developed through multiple channels i.e. Government departments at Centre & States/UTs, ICAR, Agriculture Universities and crowd sourcing. Innovative methods like Open Challenge and payments based on number of downloads linked with popularity rating etc. will be used for encouraging free lance development. It will be endeavoured to provide maximum government data as open data for development of these apps. Present availability of funds under different ICT initiatives is considered sufficient to meet requirements during current FY. Next year additional funds will be requested under NEGP-A/Digital agriculture scheme

Radio Bultoo

5. Another important technology which will be used for making information in local languages available to the farmers is "Blue Tooth". This is a wireless technology standard for exchanging data over short distances. This technology is being successfully used in some of the remote districts of Chhattisgarh.

6. The 'Radio Bultoo' enables the rural public to use their ordinary mobile to make their point in their own language, and to record their songs and messages, on the internet. These are converted to Internet-based radio programmes and transmitted to all gram panchayats that have broadband facilities. These are converted to Internet-based radio programmes and transmitted to all gram panchayats that have broadband facilities. Every morning, one representative of each village visits their gram panchayat office to download these radio programmes onto their Bluetooth-enabled mobile handsets, and carries them back to their village for sharing them through Bluetooth, free of charge, with other villagers.

6. All States and UTs will be encouraged to use 'Radio Bultoo' concept for carrying useful information in the form of Audio, text or video formats. This concept can be extensively used even at the places where internet connectivity is an issue. Further, at the places where internet is available, this information and the mobile apps will also be made available through "Whatsapp" groups at village level.

Jal-Mitras: A key village level resource for rural development

A proposed Initiative by Department of Land Resources

There is a deeply felt need to provide a platform by leveraging available technology for the efficient delivery of various rural services, in a transparent manner and with public participation and ownership, as there is a lack of connectivity between farmers and scientific methods and technology, and also as farmers find it difficult to get the information locally. To provide this connectivity through a local resource person, who is not a government employee, and through a self-sustaining model that does not depend entirely on government funding, and with water as the focal point in view of its critical role in success of various rural development schemes, it is proposed to train and build the capacity of about 50,000 persons, most of them belonging to the local area, who are readily available with about 8000 ongoing watershed development projects in the country. These persons are already given training in various elements of soil and water conservation, NRM activities like farm forestry, livelihood activities, social mobilization, and agricultural activities. In utilizing their services, due

consideration will be given to the watershed boundaries in addition to political and administrative boundaries.

Jal-Mitras are working at the village level for leveraging available technology with water as the focal point. It has been proposed to train 50,000 persons for 3 months, give them a modest remuneration of Rs.1800 during the first year, reduce it gradually in the subsequent years - Rs.1000 (during 2nd year) and Rs.800 (during 3rd year) and make them function as self sustaining village level functionaries who provide technical information on various elements of soil & water conservation, NRM activities like farm forestry, livelihood activities, social mobilization and agricultural activities. These persons who have been imparted skills on watershed management will help the rural folk in getting access to hydrological data, tools for water audit & budgeting and act as a bridge for transfer of information on latest trends in water management, agriculture, animal husbandry and related areas, in addition to the duties assigned to them under the IWMP programme.

It is proposed to provide Jal-Mitras with a smart phone and support for basic data enabled mobile connection, and also to facilitate grant of a bank-loan to provide them with a motorcycle. In addition to the regular wages, they will also be provided with the stipend, if any, as per the provisions of the training programme concerned, e.g., under the National Programme for Bovine Breeding and Dairy Development (NPBBDD) of the Department of Animal Husbandry, Dairying & Fisheries, MAITRI (Multi-task Artificial Insemination Technicians in Rural India).

VII – ENHANCING MARKET ACCESS

The Problem:

The Agriculture markets in India are fragmented with barriers to movement even within States. There are restrictive regulatory provisions and multiple levies and licensing requirements. Farmers have limited access to alternative markets other than Mandis.

The Solution:

A time bound roll out of the National Agriculture Market by 2017-18 covering 585 Madis along with the electronic trading platform will greatly benefit the farmers. Work on the National Agriculture Market has already begun and this would be of help in improving market access. The augmentation of physical infrastructure of the Mandis, especially with regard to storage, seed and soil testing facilities will also benefit the farmers. Improved road connectivity from the farm to the market through the expanding outreach of rural all weather roads under the PMGSY will improve access for farmers' produce. Creation of a conducive eco - system for Farmers' Producers' Organization (FPOs) will also be a farmer centric initiative. This could include initiatives like provision of matching start up capital to FPOs, collateral free loans, credit guarantee funds for FPOs, and window of venture capital support. The support under the Rashtriya Krishi Vikas Yojana should be linked to a minimal set of key policy reforms in the APMC Act.

VIII – FLOW OF CREDIT TO SMALL AND MARGINAL FARMERS

The Problem:

Only 6% of Net Bank credit in India goes to Small and Marginal Farmers. Farmers' indebtedness is a major cause of suicides. Only 42% Small and Marginal Farmers have access to Crop Insurance.

1. Priority Sector Guidelines: As per the revised Priority Sector Guidelines issued by RBI, all Domestic Scheduled Commercial Banks and foreign banks with 20 and above branches have been mandated to earmark 18% of their Adjusted Net Bank Credit (ANBC) or Credit Equivalent amount of Off-Balance Sheet Exposure (OBE), whichever is higher, as on the corresponding date of the previous

year, for lending to Agriculture. Within the 18 percent target for agriculture, a target of 8 percent of ANBC or Credit Equivalent Amount of Off-Balance Sheet Exposure, whichever is higher is prescribed for Small and Marginal Farmers, to be achieved in a phased manner *i.e.*, 7 per cent by March 2016 and 8 per cent by March 2017.

2. Agricultural Credit Target: The Government of India has been setting an annual target for the flow of credit to the agriculture sector. These targets have been surpassed by banks over the years. The details of targets and the achievement, since 2007-08, are as under:

(Amount in Rs Crore)

Year	Target	Achievement
2007-08	2,25,000	2,54,657
2008-09	2,80,000	3,01,908
2009-10	3,25,000	3,84,514
2010-11	3,75,000	4,68,291
2011-12	4,75,000	5,11,029
2012-13	5,75,000	6,07,376
2013-14	7,00,000	7,30,122.62
2014-15	8,00,000	8,45, 328.23(provisional)

The details of agri credit target for 2015-16 and achievement upto 30th September, 2015 are as under:

(Rs. in crore)

Particulars	**Target for 2015-16**	**Achievement upto 30.09.2015 (provisional)**	**% achievement upto 30.09.2015**
Short Term Agr. Loan (Crop Loan)	5,95,000	3,76,427.74	63.27%
Agr Term Loan (Investment Credit)	2,55,000	1,27,470.16	49.99%
TOTAL AGR CREDIT	**8,50,000**	**5,03,897.90**	**59.28%**

The Solution:

- Ensure 8% of Net Bank Credit to SMF in 2 years.
- Increase coverage of SMF by 10 % every year.
- Computerize 63000 viable Primary Agriculture Coperative Societies in next three years.

3. Measures for hassle-free loan to small and marginal farmers: Government, RBI and NABARD have taken several measures to ensure the proper availability of credit to small and marginal farmers, which include:

- The Government provides interest subvention since 2006-07 to make short-term crop loans upto Rs.3 lakh available to farmers at the interest rate of 7% per annum and in case of prompt repayment, the same gets reduced to 4%.

- Under the Interest Subvention Scheme of Government, post-harvest loans against Negotiable Warehouse Receipts (NWRs) provided by banks to Small Farmers/Marginal Farmers having Kisan Credit Card (KCC), are also available at the interest rate of 7% per annum for a period of upto six months, so as to discourage distress sale of produce by small and marginal farmers.

- Government has introduced the Kisan Credit Card (KCC) Scheme, which enables them to purchase agricultural inputs such as seeds, fertilisers, pesticides, etc. and draw cash to satisfy their consumption needs. The KCC Scheme has since been simplified which has the provision of ATM enabled debit card with, inter alia, facilities of one-time documentation, built-in cost escalation in the limit, any number of drawals within the limit, etc.

- To bring small, marginal, tenant farmers, oral lessees, etc. into the fold of institutional credit, Joint Liability Groups (JLGs) have been promoted by banks.

- Banks have been advised by Reserve Bank of India (RBI) to waive margin/security requirements of agricultural loans upto Rs.1,00,000/-.

- RBI has issued Standing Guidelines for Relief Measures to be provided by respective lending institutions in areas affected by natural calamities which, inter alia, include identification of beneficiaries, restructuring of existing loans, extending fresh loans, relaxed security and margin norms, moratorium, etc.

4. Share of SF/MF in agriculture credit disbursement: During 2014-15, the number of accounts to which agriculture credit was disbursed was at 853.55 lakh, of which 486.03 lakh accounts (56.94%) belonged to small and marginal farmers. In terms of amount, out of the total agriculture credit of Rs.8,45,328.23 crore disbursed during 2014-15, Rs.3,46,666.32 crore (41.01%) was extended to small and marginal farmers.

5. Computerization of Primary Agricultural Credit Societies: The short term cooperative credit structure (STCCS) continues to be an important segment of the rural banking framework, having a membership base of about 13 crore at the Primary Agricultural Credit Societies (PACS) level. Due to their large outreach to small and marginal farmers, PACS are important class of agricultural credit purveying institutions. As on date, there are about 93,500 PACS, of which nearly 66,000 are functional. PACS are also involved in providing agri-inputs to farmers, running PDS outlets, acting as multi-service centres for farmers, etc.

Though the State Cooperative Banks and District Central Cooperative Banks (except for 23 unlicensed DCCBs) are on CBS platform, PACS continue to operate mostly in non-computerized environment for want of adequate resources at their disposal.

NABARD has estimated that an amount of Rs.1900 crore would be required as capital expenditure for dizitization of about 63,000 potentially viable PACS in the country which can be shared in the ratio of 50%, 45% and 5% by the GoI, State Governments and the Cooperative Credit Structure respectively. **The total share of GoI, thus, would work out to Rs.950 crore.** The proposed 63,000 PACS can be computerized in a phased manner in the next 3 years, i.e.2016-17, 2017-18 and 2018-19. During the years 2016-17, 2017-18 and 2018-19, GoI's contribution is proposed to be at Rs.200 crore, Rs.300 crore and Rs.450 crore respectively.

Since the above proposal envisages contribution from respective State Governments and Cooperative Credit Structure(CCS), NABARD has been requested by DFS to seek consent from the State Governments and CCS.

IX - Note on Land leasing &conclusive titling

1. Land leasing:

Problem statement:

Immediately after independence, practically all states in India legislated on tenancy and effectively prohibited it except in exceptional circumstances. Over a period of time, it has been found that a thriving informal land lease system in agriculture has developed but operates in a completely unregulated manner leading to suboptimal outcomes. In particular lessees are not recognized as "farmers" leading to their being denied access to bank credit, institutional inputs and government benefits.

Proposed solution:
GOI to circulate, within the next six months, a model lease law for adoption by states. This law will endeavor toprotect ownership of lessors and recognize lessees for access to institutional inputs, credit and government benefits etc.

2. **Conclusive titling:**

Problem statement:
Non-updation of land records and inadequate integration of various arms of the land administration has led to a situation of lack of clarity in land titling. As a result, the enormous values locked in land are not being monetized for productive use in the economy. In addition, this lack of clarity in land titles, is an important reason for the large pendency in the Indian courts.

Proposed solution:
To address this, the long term goal is to move towards a conclusive title system in 10 years.

In the interim, by the end of year 1, DoLR will complete preparation of legislative and organizational frameworks for the titling work, get revised state DILRMP action plans focusing on titling and initiate Person-Parcel-Pixel (PPP) linkage in one district per State/UT as well as initiate full scale pilot implementation in one UT.

By end of year 3, DoLR will launch two pilots in each state and ensure coverage of all UTs besides establishing P-P-P linkage in 150 districts. By this time, implementation of organizational structure in states will be completed and title indemnity on a pilot basis will have been launched.

X - Soil Health Card (SHC) Scheme – Way Forward

Problem:

Time bound delivery of the 14 crore Soil Heath Cards through analyzing 2.53 crore samples for each cycle in two years due to inadequacy of existing soil testing labs.

Solution:

In order to develop a network of soil laboratories across the country, both in public and private sectors, guidelines are issued for implementation through State Governments and Capital Investment Subsidy Scheme (CISS) through NABARD. Modalities for use of College &school labs have also been issued under this scheme.

It is proposed to set up 3000 model retail outlets at Block level in 3 years through Fertilizer Companies with soil, seed, and fertilizer testing facility. A total of 500 outlets will be started in 2016-17.

Development of innovative handheld devices through start-ups: With the launching of a vibrant eco-system for start ups, it should be our endeavour to develop cost effective and affordable handheld devices, with capability of onsite soil testing, through an innovation challenge. Availability of such devices would facilitate renewal of Soil Health Cards at periodic intervals as a sustainable business model.

Employment potential will be created for 30000 Skilled Samplers and 10,000 Skilled Technicians and Lab. Assistants through skill development modules.

XI - Strengthening supply chain of fertilisers

The Problem:

India is the second largest consumer and third largest producer of chemical fertilisers in the world. However, our import dependence for meeting the domestic requirements is quite heavy. Against the domestic consumption of 30.45 million MT (MMT) of urea in 2013-14, domestic production was only 22.7 MMT. Similarly, against domestic consumption of 20.5 MMT of P&NK fertilisers, our domestic production was only 14.7 MMT. Thus, while, our domestic dependence in urea is around 25 per cent, in respect of P&NK our import dependence is almost 100 per cent, taking into consideration import of final goods as well as intermediate inputs. While import of P&NK has been decanalised, import of urea is still canalised and handled by three state designated agencies. Decisions regarding imports by State designated agencies follow the Standard Operating Procedures which often lead to mismatch between the requirement and contracted imports. Furthermore, the contracted imports are also often not delivered on time leading to shortages in the consumption centres. Thus, our heavy dependence on imports on the one hand and canalisation of urea imports often makes timely availability a challenging exercise. Secondly, since pricing of urea continues to be heavily subsidised under the control regime, pricing of P&NK fertilisers has been decontrolled and only Nutrient Based Subsidy (NBS) is provided for these fertilisers. As a result, prices of P&NK fertilisers have registered sharp increase since 2009, while price of urea continues to be very low as compared to the international prices, including price of urea in bordering countries like Nepal and Pakistan. This distortion in relative prices of urea vis-a-vis P&NK fertilisers have compounded the problem of imbalanced use. In many States against recommended dose of 4:2:1, the actual N-P-K ratio is heavily distorted, particularly in the States of Punjab, Haryana and Rajasthan. Therefore, we need to address the twin problem of ensuring timely availability and promoting balanced use of primary nutrients.

Solution:

Decanalisation of urea imports as a policy option.

Chief Economic Advisor has already carried out a fair amount of work on the pros and cons of decanalisation of urea imports as a policy option. The underlying rationale of dismantling of canalisation is that free import of urea will ensure better price discovery as well as timely availability in adequate quantity. As a matter of fact, an Expert Committee set up by the Department of Fertilisers under the Chairmanship of Dr. Y.K. Alagh, eminent Economist, had in his report in 2006, inter alia, recommended decanalisation of urea imports after due examination of its ramifications. There are some outstanding issues which still need to be resolved with regard to taking a final view in the matter. However, the Department of Fertilisers could resolve these issues with technical support of NITI Ayog and the Chief Economic Advisor and consider decanlisation of urea import in the course of the year 2016-17. In the scenario of falling gas prices across different regional markets in the world and excess capacity is available in China, world market for urea is currently 'soft' and it is therefore, perhaps the right time to take a decision on this issue.

Promotion of organic compost under MGNREGA

Composting of organic waste and agricultural waste in the rural areas is an eligible item under MGNREGA. Given the thrust of the Government on promotion of organic farming, it is proposed to take up one million compost pits under MGNREGA annually over the next five years. Since, there are nearly 2.5 lakh Gram Panchayats in the country, it would actually amount to taking up on an average four compost pits in each Gram Panchayat which is a highly doable proposition. Cost of each compost pit is estimated to be around Rs.10,000 and each unit will produce around 1.5 tonne of compost. Accordingly, the total output of one million compost pits is estimated at 1.5 MMT of compost which sufficient for 5 lakh hectares of cropped area, at the rate of 3MT per hectare which will reduce the use of chemical fertilisers by around 20 per cent. The total capital cost of construction

can be met under MGNREGA, while agricultural extension machinery at field level including Krishi Vigyan Kendras (KVKs) may provide technical support for this programme.

Urea Plant at Chabahar in Iran.

Since domestic gas for production of urea is quiet limited, it would be desirable to look for overseas locations for investment in urea plants, where the supply of gas can be tied up under a long term contract at reasonable prices, for meeting domestic demand/supply gap. Our Joint Venture Urea Plant in Oman between the Oman Oil Corporation and IFFCO/Kribhco has been a outstanding success in this regard. It is estimated that the country has benefited to the extent of Rs.14,700 crore in the last ten year in term of total foreign exchange saving. Following this approach, Department of Fertilisers has been negotiating for a similar Joint Venture Urea Plant at Chabahar in Iran. A fair amount of ground work has been completed in this regard and due diligence has been carried out for the selection of the prospective Joint Venture partner. However, firm commitment from Government of Iran regarding supply of gas for proposed investment and range of prices at which gas could be made available remains outstanding issues. With the lifting of sanctions on Iran, time is now ripe to fast forward this process and use our diplomatic relations to finalise the agreement for the proposed Joint Venture. This would make 1.3 MMT urea available at a discount over the prevailing international prices over the long term and bridge the domestic demand/supply gap.

Direct Benefit Transfer (DBT) of subsidy of P&NK fertilisers.

With the decontrol of P&NK fertilisers and provision of Nutrient Based Subsidy for these fertilisers, we are now ready to pilot DBT of subsidy on P&NK fertilisers to accounts of Aadhar linked PMJDY accounts of the actual users. It is proposed that DBT of this subsidy should be piloted in around 20 districts of the country in 2016-17 with a view to firming up the operations modalities. Full scale roll out of DBT of this subsidy would potentially make around Rs.25,000 crore available for transfer directly to the accounts of around 7-8 crore farmers.

XII – Towards self sufficiency in pulses

The Problem:

India is the largest producer of pulses in the world with a production of over 17.19 million ton in 2014-15. It is also the biggest consumer of pulses with a domestic consumption of around 22 million ton per annum. This leaves the country with an annual deficit of around 3-4 million ton which is usually met from imports from other pulse producing countries.

The main issues affecting pulses production are (a) lack of high yielding varieties, (b) mostly grown in rainfed areas; and (c) poor price realization. There has been no quantum jump in productivity of pulses varieties that have been developed over the past few decades. Besides, with the lack of procurement of pulses, farmers often do not get commensurate prices for their produce.

The Solution:

DAC&FW in consultation with ICAR has identified gaps in the present strategy to increase production of pulses and has identified lack of availability of new varieties of seeds as an important hindrance in increasing productivity of pulses. In addition more focus has to be given on Integrated Nutrient Management, Integrated Pest Management and Farm Mechanisation. ICAR has come forward to support seed production of new varieties of pulses. It is proposed to implement additional intervention under NFSM from 2016-17 onwards for which additional allocation of around Rs.1000 crore under NFSM will be required over and above existing allocation.

ICAR has informed that they will be able to release 55 days maturity variety of moong and 110 days maturity variety of arhar within next two years. 55 days maturity variety of moong will enable spread of cultivation of summer moong between paddy and wheat crop in many parts of the country. 110 days maturity variety of arhar will enable spread of arhar to those parts of the country

where presently arhar is not grown because of its long duration which does not allow sowing of rabi crop at present.

With the above interventions, it is proposed to target production of 21 million tons of pulses in 2017-18 and 24 million tons of pulses in 2020-21.

However, apart from efforts on increasing production it is necessary to assure remunerative prices to the farmers. If farmers are not convinced that government will intervene in case prices fall below MSP levels, farmers are not going to take up pulses production on significant scale. Therefore, it is necessary to create credible mechanisms for procurement of pulses at MSP and spread awareness amongst farmers that government will procure pulses at MSP if prices fall below MSP. This awareness creation should be taken up before sowing starts for next kharif season. Otherwise it will not be possible to achieve the targets.

XIII – BRINGING GREEN REVOLUTION TO EASTERN INDIA

The Problem:

India has achieved self sufficiency in food grains production primarily on the strength of green revolution in the north western states of Punjab, Haryana and Western UP. However these states have now reached plateau in productivity. The eastern region of the country which has abundant rainfall can be a source of additional food grain requirement in the country. However, the region is plagued with a number of problems. The eastern region has an average productivity of rice of around 2500 kg/hectare compared to around 4000 kg/hectare in Punjab. Only 32% area is irrigated in this region. There is low of offtake of bank credit by farmers in this region and farmers are slow in adopting new technologies including new varieties of seeds. The region has around 8 million hectare rice fallow area, which can be utilised for production of oilseeds and pulses. The region has severe constraints in terms of storage capacity for food grains and marketing of agriculture produce which results in low price realization for the farmers.

The Solution:

The Government is implementing Bringing Green Revolution in Eastern India (BGREI) since 2010-11. The scheme focuses on increasing production and productivity of rice in the region. From 2015-16 the guidelines of the scheme have been modified to promote production and distribution of new varieties of paddy seeds and bringing rice fallow areas under cultivation of oilseeds, pulses and other crops. The scheme has an annual allocation of Rs.1000 crore. It is proposed to focus on variety replacement of paddy and pulses. The System of Rice Intensification (SRI) techniques have shown good results in this region. Therefore it is also proposed to focus on promoting SRI technique wherever feasible.

In order to increase flow of bank credit in this region which has mostly small and marginal farmers, more focus will be given to small and marginal farmers. In order to increase irrigation facilities in this area, it is proposed to complete ongoing irrigation projects and promote solar based pumpsets. As a result, around 6 lakh hectare area will be brought under irrigation. With all these measures, apart from increasing productivity of rice in the region, it is targeted to bring one million hectare rice fallow area under oilseeds and pulses in the next three years.

However, all efforts to increase production and productivity in the region cannot succeed unless the mechanism of procurement of paddy in the region is strengthened. One major feature of green revolution in north west India is almost universal system of procurement of paddy and wheat. Unless steps are taken to improve procurement of rice in Eastern India we cannot expect green revolution in this part. Further we need to assure remunerative price for oilseeds and pulses in this region to bring rice fallow areas under cultivation.

XIV – BUILDING ON INDIA'S SUCCESS IN DAIRY SECTOR

ANIMAL WELLNESS SCHEME - 'SANJEEVANI'.

Problem:

(i) At present 85 million animals are in milk while records on breeding, productivity, treatment and vaccination are not properly maintained by State Animal Husbandry Departments as system for maintaining records on the above aspects is not yet evolved in the country.

(ii) Due to absence of records, it is impossible to separate diseased animals from healthy ones. This is a major cause of concern with regard to spread of diseases among animal population as well as spread of zoonotic diseases among human beings.

(iii) Lack of awareness regarding need for and requisite dates of essential vaccinations is a major cause for spread of contagious diseases like Foot and Mouth Disease and Brucellosis.

(iv) A secondary effect of lack of animal identification and traceability is it's adverse impact on exports. In the absence of health records, it is difficult to trace and distinguish products obtained from healthy animals as against products obtained from diseased animals. Traceability is a major sanitary requirement insisted upon by most countries as a precondition to import of animal products.

(v) Most of the veterinary hospitals and dispensaries are stationary and veterinary services are not available at farmers' doorstep.

(vi) Emergency facility in the form of dedicated helpline is not available to livestock owners.

Solution:

Launch of Animal Wellness Programme "*Pashu Sanjivani*"- with the components:

a) *Nakul* Swasthya Patra (Health cards),

b) Emergency Help Line and

c) MAITRIs at Farmers doorstep

Major Activities

Following major activities are proposed to be covered under the Pashu Sanjeevni scheme:

i) Animal identification and traceability using polyurethane tags with unique identification number (UID);

ii) Upgrading Information Network on Animal Productivity and Health (INAPH) to National Data Base;

iii) Uploading data on national database on regular basis;

iv) Creation of dedicated helpline and

v) MAITRIs for delivery of services at farmers' doorstep.

Fund required for implementation of project:

Amount of Rs 147 crore will be required to cover 85 million animals 'in milk', in the first phase, under animal identification and traceability and issue of "Nakul Swasthya Patra" during the next three years.

Major Outcomes:

Major outcomes of the scheme will be:

i) Control on spread of animal diseases;

ii) Scientific management of animals

iii) Enhanced production and productivity;

iv) Improvement in quality of livestock & livestock products and

v) Increase in trade of livestock and animal products.

SEX SORTED SEMEN TECHNOLOGY TO INCREASE BOVINE FEMALE POPULATION.

Problem:

(i) At present out of 300 million bovines only 85 million are 'in milk' leaving large unproductive animals, including 84 million male bovines.
(ii) Due to increase mechanization in agriculture, economic utility of male bovines as draught animal and for transportation has reduced.
(iii) Increased stress on finite resources available
(iv) Since more than 71% of the cattle & buffaloes are reared by landless, small & marginal farmers, their inability to rear unproductive male calves adds to the growing population of abandoned and stray bovines.

Solution:

Promotion of sex sorted semen to increase female population with high genetic merit, thereby making milk production more remunerative to farmers engaged in dairying.

Present Sex Sorted Semen Production Technique:

The sorting of sperm is based on the principle of difference in DNA content of X and Y chromosome. X chromosome is having 4% more DNA than the Y chromosome. Thus through the machine X chromosome bearing sperm cell is separated from the Y chromosome bearing sperm cell. Nozzle of the FACS machine plays an important role in sperm sorting. Machine has the capacity to produce 14 sex sorted semen doses per hour. In a year about 2 lakh semen doses are produced from one machine. This technique for producing sex sorted semen is developed in United States and is patented by Sexing Technologies. Technology for production of sex sorted semen has been developed for exotic breeds mainly Holstein Friesian & Jersey. Therefore, we have to standardize sex sorted semen technology for our indigenous breeds like Sahiwal, Hariana, Red Sindhi, Rathi, Gir etc.

Major Activities:

Major activities for promoting sex sorted semen in the country are:
i)Introduction of sex sorted semen technology at major A graded semen stations(CFSP&TI, Mattupatty, Haringhata, Patan, Hissar, Nabha, ABC Salon, SAG Bidaj, Nandyal & Bhopal).;
ii) Research & Development activities for standardizing sex sorted semen technology for our indigenous breeds and developing cost effective sex sorted semen production technology.

Outcomes:

Major Outcomes: i) Increase in milk production and productivity; ii) less stress on resources available with farmers; iii) increased availability high genetic merit females; iv) addition of 6 million improved females annually to national milch herd; v) milk production increased by 18 million tones after 3 years.

"E- PASHUDHAN HAAT"- e-MARKET FOR BOVINE GERMPLASM

Problem:

(i) At present there is no authentic market in the country for quality- disease free germplasm in the form of: semen; embryos; calves; heifers and adult bovines available with different agencies/stake holders.
(ii) Most of the animals are sold in unorganized markets controlled by middlemen.
(iii) Poor quality of germplasm with unknown genetic merit and disease status is usually sold in this market.
(iv) Breed wise information on availability of bovine germplasm is not available

(v) Nakul Swasthya Patra and UID will be made mandatory for sale of bovine germplasm through e- Pashudhan Haat.

Solution:

Electronic platform for trading of germplasm- e-Pashudhan Haat

Major Activities:

Major activities for creating electronic platform for trading of bovine germplasm are

i) creation of "E- Pashu Haat": the e- market portal for bovine germplasm;
ii) connecting breeders state agencies and stake holders with "E- Pashu Haat"
iii) real time data on availability of germplasm uploaded periodically; and
iv) maintaining identification and traceability of germplasm sold through the e- market.

Funds required for establishment of E-Pashu Haat

Rs two crores will be required for establishment and operating e –Pashudhan Haat in the country.

Major Outcomes:

Major outcomes of the scheme are:

i) propogation of quality controlled germplasm;
ii) availability of disease free germplasm with known genetic merit
iii) price evaluation available to buyer;
iv) one stop portal for bovine breeders
v)no involvement of middlemen in sale and purchase of animals
vi) sale only of tagged animal with animal wellness card
vii)propagation of indigenous bovine breeds in the country
viii) increase in milk production and productivity

XV –REDUCE POST – HARVEST LOSSES AND PROMOTE FOOD PROCESSING

The Problem:

Post – harvest losses range from 4% to 16%. The Food processing industry is constrained by FSSAI Regulation. The backward linkages are weak.

I. Up-scaling the Scheme of Cold Chain Value Addition & Preservation Infrastructure:

In a repeat study conducted by the Central Institute of Post Harvest Engineering & Technology (CIPHET), Ludhiana during 2012-14, average range of losses of agri-produce were found to be between 4% to 16% resulting in annual loss of about Rs.92,651 crore at 2014 prices. One of the main reasons for these high losses is the absence of adequate and efficient cold chain infrastructure right from the farm gate to the consumers.

2. A Task Force under the Chairmanship of Secretary, Ministry of Food Processing Industries was set up by the Prime Minister's Office with a view to re-visiting the strategies, financials and incentives of all cold storage/ cold chain related schemes and recommended institutional mechanism for enhancing capacity of cold chain in the country. The Task Force in their report dated 31.10.2014 have inter alia, recommended that the Government should aim at creating an additional capacity of 7.5 million tonnes over the next 5 years, out of which 5 million tones may be created under Mission for Integrated Development of Horticulture (MIDH) scheme of Department of Agriculture and Cooperation and 2.5 million tonnes under the scheme of MoFPI.

The Solution:

3. In order to achieve aforementioned objective, the Ministry proposes for up-scaling the Scheme of Cold Chain, Value Addition and Preservation Infrastructure under the Central Sector Scheme of Infrastructure Development for taking up around 500 cold chain projects with an additional allocation of Rs. 4000 crore to create capacity of 2.5 million MT in the next 5 years. The existing scheme of financing cold storages in the PPP mode with VGF support has elicited lukewarm response. There is, thus, an urgent need to comprehensively review and revise the scheme factoring in the feedback of the prospective investors in order to facilitate adequate private investment to achieve this capacity creation which could serve as the backbone of the food processing industry.

4. The proposed investment will result in:

- Preservation of 7.5 million MT of perishable agro-produce valuing Rs.23000 crore annually.
- Value addition of approximately Rs.2400 crore every year.
- Employment generation of 1.5 lakh persons.

Timeframe for creation of additional cold chain capacity:

Time frame	Sanction of projects	Capacity created (Million MT)	Cumulative capacity created (Million MT)
1st year	100		
2nd year	150		
3rd year	150	0.50	0.50
4th year	100	0.75	1.25
5th year		0.75	2.00
6th year		0.50	2.50

Keeping GST Rates low on processed food and linking food park and cold chain projects to Farmers' Producers' Organizations, will also benefit the farmer. The overall objective should be to reduce post harvest losses by at least 5%.

FSSAI has notified on 13th January 2016 that product approval is not needed for proprietary food products. This measure should spur private investment in food processing.

XVI – CLIMATE RESILIENT AGRICULTURE

The Problem:

Global studies indicate the impending change in climate and its likely impacts on agriculture, particularly in the later part of this century. The 4th assessment report of IPCC has unambiguously stated that 'warming of climate system is now unequivocal, as is evident from observations of increases in global air and ocean temperatures, widespread melting of snow and ice, and rising global sea level'. Recent studies in India carried out by ICAR and several other organizations also indicate the vulnerability of Indian agriculture to climate change with business as usual scenario and the urgent need for investing on adaptation and mitigation. For instance, modelling studies indicate a significant rise in temperature in India (upto $4^{o}C$) by 2080 and a moderate increase in rainfall across the country. Similar, crop simulation studies suggest that future impacts on crops vary depending on the season and the geographical location with crops like wheat, rice and maize projected to record decreased yields due to rise in temperatures while legumes like soybean, groundnut and chickpea may gain in most regions due to increased CO_2 and rainfall.

The Solution:

For a developing country like India with a large farm economy, the challenge lies in ensuring enough food for our population by adapting our agriculture to climate variability while contributing to global mitigation efforts. Adaptation and mitigation which form the core of climate resilient agriculture are complementary activities. In this endeavour, deployment of new technologies and policy reforms play equal role. Mitigation can have a direct effect on climate change *per se*, adaptation can combat the severity of the impacts. Judicious natural resource management in vulnerable areas such as coastal zones, drought and flood prone and hilly regions would be the first step towards promoting climate resilient agriculture. Efficient use of adapted germplasm and resource conservation based technologies with focus on water conservation and increasing crop water use efficiency are the essential pillars of climate resilient agriculture in the country.

Resilience to climate change refers to the ability to endure harsh and unpredictable environment and effectively bounce back from the negative effects at the earliest. Eventually, the resilient agriculture will essentially involve judicious and improved management of natural resources viz., land, water, soil and genetic resources through adoption of the best bet practices. Enhanced physical infrastructure can afford some protection against climatic phenomena like floods, heavy rainfall or coastal erosion.

Adoption of new crop varieties and innovative agricultural practices can neutralise the impacts of changes in temperature and water availability. Improved weather forecasting and better communications can assist in contingency planning. Education, training and efficient rural extension services can help in adaptation at the community level. In other words, investments on physical and social capital are required to neutralize the impacts of climate change on agriculture.

ICAR is all set to move forward by strengthening research and development on climate resilient agriculture to minimize risks to farmers and reduce the impacts of year to year climate variability on food production at national level. The outputs of strategic research and technology demonstration are being mainstreamed into the National Mission on Sustainable Agriculture to contribute to the overall national goal of sustainable agriculture in the context of changing climate.

Impacts of climate change on Indian agriculture

Climate change impacts agriculture both directly and indirectly. The type and magnitude of impacts vary depending on the degree of change in climate, geographical region and the type of production system. Impacts are assessed both through controlled experimentation and simulation modeling. Experimental results obtained are extrapolated on regional basis in relation to the projected climate change under different scenarios. The main direct effects are due to change in crop duration, which is shortened by increase in temperature. In case of annual crops, the shortening of crop duration can vary between 2-3 weeks, adversely impacting productivity. Another direct effect is on the reproduction, pollination and fertilization processes that are highly sensitive to temperature. The indirect effects operate through changes in water availability due to inadequate or excess rainfall and warming effects on pest and disease proliferation.

Modeling studies indicate that changing climate will reduce yields in major crops like wheat, rice maize, while on the other hand the impacts could be neutral to positive in others like groundnut, soybean and chickpea. Climate change is likely to impact the economic viability and production of livestock systems. Heat stress to animals is of primary concern in India and heat stress expressed as Thermal Humidity Index (THI) has strong influence of livestock performance.

Changes in fish distribution in response to climate variations have been observed, generally consisting of pole-ward expansions of warmer-water species and pole-ward contraction of colder-water species. The abundance and species diversity of riverine fish are predicted to be particularly sensitive to climatic disturbances, since lower dry season water levels may reduce the number of individuals able to spawn successfully.

Extreme Climatic Events on Agriculture

Impacts of recent extreme climatic events in India: Frequency of extreme climatic events in the recent past is increasing. Continuous droughts in 2014 (early season droughts) and 2015 (mid-season droughts) with overall rainfall deficiency of 12% and 14% respectively (overall country) impacted cropping area negatively and overall food production in India. Frequency and intensity hailstorm events in the states of Maharashtra and others states resulted in heavy damage to horticulture crops such as grapes, papaya, banana etc. Hudhud cyclone in North coastal Andhra Pradesh and Odissa resulted in heavy losses to agriculture and other infrastructure. Traditional rainfed dryland regions are experiencing with cyclones and floods. Recent cyclones and floods in Tamil Nadu and Southern Andhra Pradesh are such examples.

Preparedness for *kharif*, 2016

ICAR-CRIDA has developed 600 district agriculture contingency plans, and updating of these plans with recent experiences of weather aberrations and extreme events is going towards preparedness for kharif, 2016. Based on rainfall prediction by IMD in April, 2016, sensitizing workshops will be held with the partnership of various State Governments involving departmental machinery, district officials, KVKs and Mandal level officers to implement these plans at ground level. Large scale awareness among farmers through Rhythu Chaitanya Yatras, towards contingency seeds, inputs, crop and variety change, mid-season drought management strategies, fodder needs of livestock during droughts and extreme events, poultry and fishery sector management during water stress and heavy rains are important strategies to be implemented for adapting agriculture sector in the event of deficient monsoon and other extreme events, if faced during kharif, 2016.

Efforts for climate resilient agriculture to ensure food security

Responding to the challenges faced by Indian agriculture due to climate change, ICAR launched a major research initiative '**National Initiative on Climate Resilient Agriculture'** (NICRA) during 2010-11 with the objective to enhance the resilience of Indian agriculture to climatic variability and climate change which is being implemented as **National Innovations on Climate Resilient Agriculture** (NICRA) during XII Plan period. The major emphasis of this project is to address food security through development of appropriate adaptation and mitigation strategies covering all the sectors of Indian agriculture. Enhancing the resilience of Indian Agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies; demonstrating site specific technology packages on farmers' fields for adapting to current climate risks; and capacity building of scientists and other stakeholders in climate resilient agricultural research and its application are the major objectives of NICRA.

The strategic research is being conducted at 40 ICAR Institutes in a network mode covering crops, horticulture, livestock, natural resource management and fisheries sectors. To begin with, the project focused on crops like wheat, rice, maize, pigeonpea, groundnut, tomato, mango and banana; cattle, buffalo and small ruminants among livestock and both marine and freshwater fish species of economic importance. In the technology demonstration component, the technologies with a potential to cope with climate variability are being demonstrated in 121 most vulnerable districts selected across the country through Krishi Vigyan Kendras (KVKs). The interventions are based on four modules, (i) crop production, (ii) resource management, (iii) livestock & fisheries and (iv) institutional interventions. Under the capacity building component, nearly 50,000 to 60,000 farmers every year are being trained to create awareness to cope with climate variability and change. These demonstrations are quite successful and have attracted the attention of development departments in several states and triggered horizontal dissemination on a significant scale.

To support the district administration to act upon in the event of weather aberrations, ICAR-CRIDA in association with state agricultural universities and KVKs prepared district-level contingency plans for agriculture and allied sectors like horticulture, livestock, poultry and fishery covering all the major weather related aberrations including extreme events viz., droughts, floods,

heat wave, cold wave, untimely and high intensity rainfall, frost, hailstorm, pest and disease outbreaks using a common template across the country. The uniformity in format is necessary so that it can be computerized in future with options to retrieve information for any district and at the same time accommodate the regional variations in climate and cropping patterns. The template consists of two parts viz.,

1) District agricultural profile with information on resource endowments such as rainfall, land use, soil types, irrigation sources, five most dominant crops and cropping systems and their sowing windows; livestock, poultry and fisheries resources; production and productivity statistics; major contingencies faced by the district and digital soil and rainfall maps, and

2) Detailed strategies for weather related contingencies in the case of crops/cropping systems starting with delay in onset of monsoon and mid-season breaks resulting in drought both in rainfed and irrigated situations, and strategies for untimely rains, floods, extreme events. This is followed by strategies for contingency situations, in the case of livestock, poultry and fisheries.

Implementation of the contingency plans requires extensive planning both at the district and state level which need to be coordinated and facilitated by Government of India. The current efforts are basically to save the crop season and minimize the losses with some broad interventions at the agro-climatic zone or district level. For instance, we have updated the 600 district level Contingency Plans and also organized fifteen workshops in different agro-climatic zones for effective centre-state coordination for extending scientific outreach to farmers. With advance planning and organizing inputs in time, these contingency plans can help to reduce the losses in the affected areas.

Apart from technological solutions, sound policy framework addressing the issues of redesigning the social sector with focus on vulnerable areas/populations, introduction of new credit instruments with deferred repayment liabilities during extreme weather events, and weather insurance are essential for building the resilience of farming community to face climate variability and climate change.

Scaling up of Climate Resilient Models

In view of the widespread impacts of climate variability, there is a need to enhance the adaptive capacity and to impart resilience to agricultural production systems against climate risks. The technology demonstration component of NICRA is involved in demonstrating best bet technologies in 151 climatically most vulnerable districts of the country. These 151 villages will act as Climate Resilient Village Models and learning sites to upscale climate resilient villages to larger number of villages. These demonstrations have become successful models in imparting the resilience at the household level and have attracted the attention of farmers and development departments alike in several states and triggered horizontal dissemination on a significant scale. It is proposed to further scale up these models to 1000 villages across the country.

It is proposed to enhance resilience through participatory field interventions. The emphasis will be on enhancing the preparedness and adaptive capacity of farming communities to climate variability with appropriate contingency responses in identified production systems viz., crops, livestock and fisheries in vulnerable regions of the country, enhancing the resilience to production systems through natural resource conservation and efficient management and to enhance the capacity of the communities through establishment of custom hiring service centers to facilitate timely farm operations, skill and entrepreneurship development and promotion of other livelihood opportunities through community based approaches.

A cluster approach will be adopted by expanding the existing 151 NICRA villages and involving 6-7 adjacent and contiguous villages (village clusters) identified based on climate vulnerability and

executed through 121 Krishi Vigyan Kendras (KVKs) and 23 dryland centers and 9 ICAR research institutes spread across agro-ecological zones in the country. Active convergence with the developmental programs and liasoning with the State Government officials at the district and mandal will be ensured to expand the interventions to cover as many households as possible with similar resource endowments. Large scale awareness among farmers about the proven interventions, viz., towards resilient crops, varieties, systems, water harvesting and efficient use, mid-season drought management strategies, soil health management, fodder needs of livestock during droughts and extreme events, etc. will be taken up.

The capacity built in the existing NICRA villages will be fully utilized and the village organizations established such as custom hiring centers, village climate risk management committees are expanded by involving the representatives from the adjoining villages and the awareness created on climate change and the capacity built in the village committees will be utilized for the expansion of the interventions in the entire cluster. A detailed plan will be formulated to saturate the entire cluster with the resilient interventions and will be implemented in association with the communities in the cluster. Budget provision is needed to expand these Climate Resilient Village Models to expand horizontally, may be with additional funding in NICRA or Green Climate Fund provided under National Adaption Fund.

XVII – HARNESSING SCIENCE AND TECHNOLOGY

The Problem:

- Conventional interventions have plateaued.
- New problems due to Climate Change, pests, imbalanced use of fertilizers.
- High Post Harvest losses.

Solution:
Resolve regulatory issues of GGM and gene editing;
Fast track bio safety regulatory level I (BRL – I) trials.
Develop processable varieties
Promote aromatic and medicinal plants..

Proposal I – Reforms in Biotechnology Regulations

1.0 The export, import, research and commercial use of genetically engineered crops, veterinary biologicals, human vaccine and biologicals are regulated under Rules 1989 of Environmental Protection Act 1986. The statutory bodies namely Genetic Engineering Appraisal Committee (GEAC) administered by Ministry of Environment, Forests and Climate Change (MoEF&CC) ; the Review Committee for Genetic Manipulation (RCGM) serviced by Department of Biotechnology, Ministry of Science & Technology, Government of India are operational for biosafety and risk assessment as well as approval for environmental release of genetically engineered products.

2.0 From time to time, the expert committees constituted by Ministry of Agriculture and MoEF&CC, the then Planning Commission and the Committee constituted by Supreme Court have been suggesting to establish the separate autonomous, scientific regulatory authority.

3.0 Accordingly, DBT has prepared a Bill "The Biotechnology Regulatory Authority of India (BRAI)" and the same was introduced in Lok Sabha in April 2013 after extensive stakeholder consultations, inter-ministerial comments, Cabinet approval as per the legislative process. The Bill lapse along with the cessation of Lok Sabha. The bill is currently revisited for reintroduction as per the legislative process again.

4.0 Meanwhile, the in a meeting at the PMO it was decided to establish an office of biotechnology regulation through executive order taking into consideration of the best practices of the

current regulatory system, required non-statutory elements of the Bill introduced in the Parliament within the existing laws of biotechnology regulation under EPA 1986. Such an office could be established jointly between MoEF&CC; and MoS&T in collaboration with DAC, MoA&FW; MoH&FW etc. As a part of these efforts DBT has already established a risk assessment unit of multidisciplinary scientists of agriculture and biopharma for case by case regulatory assessment of applications received by the RCGM and GEAC.

Proposal : To establish a separate Office of Biotechnology Regulations (OBR) jointly between MoEF&CC and MoS&T.

Total Cost : Rs. 100.00 Crores to be met from DBT funds
Duration : 18 months

Proposal – II : Second Green Revolution through Establishment of Crop Genetic Enhancement Network for Improving Crop Yield and Farm Productivity through Genomic Technology

1.0 The present proposal is for "Establishment of Crop Genetic Enhancement Network" (CG Net) at an estimated cost of Rs. 500.00 Crores to be met from DBT resources. The CG Net will pool global knowledge and develop tools for improvement in crop yield which would significantly improve farm productivity through integrated molecular research and advanced breeding practices. With this initiative, Indian agriculture would become globally competitive as compared to nations such as China, Australia, Canada and Brazil in terms of foodgrains productivity and also go a long way in accomplishing food and nutritional security.

2.0 The CG Net envisages three major structural units namely Core Research and Service Facility (CRSF) with two genomic platforms i.e. Crop Specific Centre (CSC) and Phenotypes Specific Centres (PSC). The CRSF would provide scientific and technical leadership for the development and execution of state of the art molecular breeding strategy in crops and works in unison with specific CSCs. The CSCs would be located at nine strategic locations (six in the first year) while three PSC have been proposed in the first year.

3.0 **The key partners are :** Department of Biotechnology; Indian council of agricultural research (ICAR), Department of Agriculture and Cooperation.

4.0 **Participating institutions are :** State Agriculture Universities and Colleges; Indian Private Seed Sector Companies; Non-governmental Organisation in Agriculture Research; State Seed Corporations; State Departments of Agriculture; and progressive farmers.

5.0 The **important crops** that will be considered on priority include black grams, green gram, mustard, ground nuts, pigeon pea, chickpea, finger millet, wheat and rice.

6.0 The **deliverables** will start from third year onwards and have long term impact for at least 10 to 15 years contributing towards second green revaluation.

Proposal III - Bridging the gap in production and demand of Pulses : Promotion and time bound deregulation of genetically engineered insect resistant (Bt.) pulses

1.0 India is predominantly dependent on Pulses as the source of protein, given the food habit comprising of largely vegetarian diet in the food mix. India is the largest producer of pulses at about 18 to 19 Million Mt per annum and also the largest consumer of this crop. In the recent years, with the raising income levels, the demand for pulses has been increasing. Current demand is estimated at about 23 million Mt per annum. However, the production is not keeping pace with demand, resulting in increasing imports to meet the demand –supply gap. Annual cost of imports of pulses is between INR 12000 to 16000 Cr in the last few years. Given below are the area, production and imports during last three years :

Year	Area (Mn Ha)	Prodn (Mn. Mt)	Imports (Mn. Mt)
2012-13	23.2	18.34	4.01
2013-14	25.2	19.25	3.65
2014-15	23.9	17.20	4.58

2.0 While India imports shortfall in its domestic supplies from a range of countries – Canada, Australia, Myanmar, Malawi, etc., there is no single country growing pulses in major way to help our domestic demand -supply gap fully. Given this, if our domestic production does not move up with the increasing demand, Indian consumers will be subjected to galloping prices of this essential food item in the coming years. In fact, prices of the pulses have been on the boil for the last couple of years, reflecting the growing demand supply gap. Retail Prices of almost all pulses have gone up by over 50% in the last one year, making pulses a status food. It has also lead to severe distress among consumers.

3.0 Over 92% of the Pulses are cultivated in the rain fed area with fluctuating yield levels depending on the environmental factors. Current level of average yield of 780 kg per hectare of pulses is lower than the global average. Changing the relative economics of pulses cultivation would be central to any strategy to improve our domestic production. This will require a range of approaches starting with better planting materials, increased intensity of inputs in cultivation, increased minimum support prices, and an institutional mechanism to execute the support pricing policy.

4.0 Estimated demand for Pulses by Indian Institute of Pulses Research in its Vision 2050 document is 39 Million Mt by 2050. This will require an annual growth in India's production by 2.14%. Vision document 2050 of Indian Institute Pulses Research (referred earlier) recommends that India needs to deploy advanced technologies of genetics amongst other measures to improve the productivity of pulses. One such application is already available after the promising green house and one season field trials, to enter in regulatory trials.

Specific Proposal : Promotion and time bound deregulation of genetically engineered insect resistant pulses : Bt. Chickpea and Pigeonpea and undertaking the genome sequencing of specific pulses (Budget support from Biotechnology)

5.0 Chickpea is the largest pulse crop with a cultivated area of 10.2 million Ha. The average productivity is 967 kg per Ha. Chickpea is largely grown in dry land by small holdings farmers. *Helicoverpa spp.* (pod borer) pest on this crop, causes yield damage up to 50-90% in severe cases.

6.0 Insect-resistant Bt Chickpea has been developed by Assam Agriculture University. The same can be deployed under its public private partnership with Sungro Seeds Ltd for improving the productivity of Chickpea. Bt Chickpea effectively protects the crop by controlling *Helicoverpa spp.* The technology has shown an yield gain of 20-25% in green house trials/field trials by minimizing the damage by the pod borer. Apart from this yield increase, reduction in cost of chemical pesticides application by 50% would add to the profitability of the farmer. An improvement of 20 to 25 % yield would give an additional production of 2 million Mt equivalent to about half of India's current pulse import. Apart from helping to reduce the import dependence, it would benefit over 4 million small farmers, by increasing production, and saving on pesticides costs.

Similar technology for application in Pigeon pea is being developed by ICRISAT. An increase of 20% to 25% in yield of Pigeon pea can potentially reduce the import of pulses by another 0.75 million Mt per annum.

More importantly, a significant productivity increase in these two crops would make them relatively more attractive for the farmers to increase the cultivation area under these two crops, and also use more of modern inputs. As is seen in case of Cotton, where the Bt Cotton introduction helped to

increase the acreage under Cotton cultivation, and make the country a net exporter from being net importer of cotton, the technology can be a game changer for this crop too.

Action : Both Crops are under regulatory pipeline as per biosafety process under Rules 1989 of Environmental Protection Act, 1986.
In addition, genomic sequencing of specific pulses will be undertaken and the results fed-back into breeding programmes to see effect within the thirds year of start.

XVIII - Animal Resources, Multiple Livelihoods, Diversification

Proposal I : Large Scale Demonstration of Brucella Disease Free Villages of Livestock in States and Union Territories

1.0 Brucellosis caused by several species of bacteria – *Brucella spp.* is a serious public health issue for both livestock and human who are associated in handling the infected animals in India total losses associated with brucellosis in livestock (affecting sheep, goat, cattle, buffalo and pig) is of the order of Rs. 22500 Crores (excluding disease burden in human). The disease in cattle and buffalo accounts for 95.60% of the total losses occurring due to brucellosis in livestock population. These losses are additional to the economic and social consequences of the disease in humans. The results suggest that the disease causes significant economic losses in the country and should be controlled on a priority basis.

2.0 The Department of Biotechnology is implementing a National Network Research Programme on understanding epidemiology of this disease at molecular level, development of new generation human and animal vaccines and range of easy to use diagnostic kits at farmer's level. The network involves 8 universities (including two from North-Eastern Region) and two ICAR institutions, a medical hospital and private sector. In total 50 regular Scientist and more than 46 research personal are involved at a total project cost of Rs. 20.00 Crores. The network at the end of third year has yielded rich dividends in terms of diagnostic kits and animal vaccine along with a good knowledge based on occurrence of brucellosis at all India level.

3.0 A diverse range of risk factors related to animal husbandry practices, movement of animals, environmental conditions, intensive dairy farming, etc., are responsible for spreading and maintenance of brucellosis in any given geographical area. Developed countries have controlled/eliminated bovine brucellosis by implementing three basic principles: (1) test and slaughter, (2) maintaining sanitary conditions, and (3) vaccination of animals.

4.0 However, in India, the policy of test and slaughter of cows cannot be implemented due to religious sentiments, and the positive testing animals cannot be culled for economic considerations. Maintaining sanitary conditions and mass vaccination along with point of care diagnostics at including at resource limited areas can be achieved through diligent government policies and programs. A village level programme on scale is proposed here for implementation based on results on DBT research network.

Proposal specific Aims:

1. Adopting village by village for Brucella eradication program.
2. Involving NGOs like Gopalamithra to educate the rural area farmers and State, Central and local Animal Husbandry Departments.
3. Test all the animals in the village using RBT, Rapid and ELISA coupled with Handheld ELISA reader at the Pen-side..
4. Differentiate and mark vaccinated to infected animals from history and clinical/preclinical symptoms.

5. Immunize whole village herd and follow up after 25 days to test the efficacy of the vaccine by simple ELISA.
6. This can be clubbed with other diseases like Bovine Tuberculosis, Mastitis etc as required.
7. Educate the Farmers about brucellosis and economics behind the issue.

Pilot Program : Targeting 100 villages from each state including Union territories (total 36 units) accounts for 3600 villages and each village with average 2000 animals per village. A total of 72,00,000 (72 lakhs animals) will be tested. Once village is screened and positive/infected animals are identified, they will be segregated with physical marking of the ownership for milking. These animals should be prevented from breeding and calving. Milk should be pasteurized before use.

Technology Cost per animal: Rs. 100/- {RBT (2 Rs.); Rapid (20 Rs.); ELISA (20 Rs.); travel and communication (48 Rs.); and overheads (10 Rs.)}

Total cost of the project including administration, rehabilitation of infected animals, isolation facilities, education and outreach : Rs. 500.00 Crores (within DBT budget)

Proposal - II : Utilisation of Genomic Technology for Genetic Upgradation of Indigenous Dairy Cattle (*Bos Indicus*) breeds like Sahiwal, Gir, Tharparkar and others

1.0 The current practice of promoting use of exotic breeds for genetic improvement of Indian cattle populations is largely found to be not suitable due to input intensive management costs, affordability, and survival of the animal in harsh environment along with increase the susceptibility to tropical diseases.

In India, animal husbandry to be sustainable, use of indigenous cattle and buffalo have to be improved and bred for productivity while enjoying the same level of resistant to teach and disease as the original breed. Further, these animals have religious / cultural significance for large number of Indians and with strict ban on culling it becomes imperative to improve both their performance and welfare. For this purpose, to have an accelerated breeding strategy, it is important to utilise advanced genomic technology platform for development of DNA markers and genomic chips for breeding.

2.0 Technically, the project involves field work of phenotyping animals from an endogamous population of cattle which can be Sahiwal / Gir / Cross Bred (since most of them have cattle genotype) and then doing the genotype on them.

Phenotyping will be done at three complimentary levels : Nucleus Breeding Herds (Military Dairy Farms); Recordings with Farmers Herds; On cattle populations maintained in progressive Gaushalas, particularly for disease resistance phenotyping. Identifying Alleles of Interest unique to cattle along with alleles common to cattle to populate the cattle chip. Validation of the cattle chip and for multiplication of high merit cattle animals found.

3.0 The output : Farmers will have access to affordable indigenous cattle with improved productivity and resistance to diseases.

4.0 Participating Institutions : Resources and farm infrastructure under the Ministry of Animal Husbandry, Dairying and Fisheries, Government of India; Institutional Farms of ICAR and State Agricultural Universities; Animal Hostels (being pioneered by Govt. of Gujarat) may be incorporated in the proposed mission on case-to-case basis. Some of the scientifically managed Gaushalas can also make a valuable addition.

Total Project Cost : 500.00 crores (from DBT budget)
Duration : 3 to 5 Years
XIX – Concluding Recommendations

The preceding sections have looked at a series of measures that can be managed with existing or marginally increased Budgetary allocations or by innovative financing arrangements. In line with the broad framework set by the Hon'ble Prime Minister, the Group has tried to improve efficiency and effectiveness of existing interventions. It has also tried to explore new financing arrangements and innovative delivery mechanisms. Priority to the farmer centric issues in agriculture and allied sectors listed above, along with an effective roll out of the new decisions already taken, has the potential to transform the farmers' well-being and make farming viable, steady and sustainable.

In very specific terms, by following the strategy and interventions listed above, these will be the specific quantifiable gains –

a. Creation of 1.1 million hectare of additional irrigation potential in one year and another 3.4 million hectare over the next three years.
b. 6-8 lakh hectares per year irriagation potential through interventions like farm ponds/dug wells and solar pumps in rainfed areas.
c. Fast tracking of technology use marketing and farm enterprise throughharnessing modern technology for extension.
d. Electronic trading platform to farmers in 585 Mandis through roll out of the National Agriculture Markets by 2017-18.
e. Rs. 50,000 core fresh credit for Smalll and Marginal Farmers.
f. Enable lessees to access credit and crop insurance and augment long term investment in agriculture.
g. Employment potential for 30000 skilled Samplers and 10,000 Skilled Technicians and Lab Assistants through access to universal Soil Health Cards.
h. Promotion of sustainable, need based and affordable fertilizer use and pilot DBT of subsidy for P & K fertilizers in 2016-17 in 20 districts.
i. 21 million tonnes pulses production in 2017-18 and 24 million tonnes in 2020-21.
j. Breakthrough in Eastern Region bringing 6 lakh hectares area under irrigation in 3 years, diversifying new crops, including credit flow.
k. 18 million tones increase in milk production over 3 years and an additional 6 million upgraded heifers per annum.
l. Reduction of Post – harvest losses by about 5%.
m. Technological breakthroughs including scientific assessment based approach to introduction of GM crops.
n. Solution to Brucellosis and Foot and Mouth Disease among animals through breakthroughs in bio technology.

ANNEX-I

Farmer-Centric Initiatives in Agriculture and Allied Sectors

Groups of Joint Secrertaries

Group 1

1.	**Rajni Sibal - Rapporteur**	**IAS (HY:86)**	**Animal Husbandry, D & F**
2.	U K S Chauhan	IAS (KL:86)	Food & PD
3.	Sudhanshu Pandey	IAS (JK:87)	Commerce
4.	Sandeep Dave	IAS (KN:87)	Land Res.
5.	Parag Gupta	IAS (OR:88)	Food Processing Ind.
6.	G Anupama	IAS (HY:91)	DSIR
7.	Sanjay Lohiya	IAS (AM:94)	Agri., Coop. & FW
8.	V. Shashank Shekhar	IAS (NL:96)	MHA
9.	Subhashish Panda	IAS (HP:97)	Food & PD
10.	Mustafa Mohammad	IAS (UP:95)	DFS
11.	Alok Kumar	IAS (TR:90)	MHA
12.	C.P Goyal	IFS (UP:86)	Bio-Technology
13.	Dvijendra Kumar Sharma	IFS (MT:88)	Panchayati Raj
14.	Venkat Rama Sastry P	IPS (UP:89)	Consumer Affairs
15.	Smita Shailendra Choudhary	IA&AS (XX:90)	

Group 2

1.	**Alok Tandon- Rapporteur**	**IAS (UP:86)**	**DFS**
2.	Bipin Bihari Mallick	IAS (MH:86)	Labour
3.	T. K. Manojkumar	IAS (KL:87)	Overseas Indian Aff.
4.	Shailendra Singh	IAS (MP:88)	DIPP
5.	Rohit Kumar Singh	IAS (RJ:89)	RTH
6.	Prashant Trivedi	IAS (UP:89)	Food &PD.
7.	Pankaj Rag	IAS (MP:90)	Culture
8.	Manish Kumar Gupta	IAS (UT:91)	Labour
9.	Bishwanath Sinha	IAS (KL:92)	Env. Forest & CC
10.	A.K. Kaluaram Meena	IAS (OR:93)	Defence
11.	Sanjay Garg	IAS (KL:94)	Defence Prod.
12.	Manish Singh	IAS (MP:97)	Disinvestment
13.	Sukhbir Singh Sandhu	IAS (UD:88)	Higher Edu.
14.	A.K. Ganeriwala	IFS (SK:86)	AYUSH
15.	Mukesh Mittal	IRS (IT) (XX:87)	MHA

Shri Tuhin Kanta Pandey, IAS (OR:87), JS, Cabinet Secretariat
Shri Mayur Maheshwari, IAS (UP:03), DS, PMO