REPORT OF THE WORKING GROUP ON AGRICULTURE PRODUCTION

Report of
The Working Group
on
Agriculture Production

December, 2010

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FOREWORD

Agriculture is the mainstay of the people of India as more than 60% of rural households are still dependent on the agriculture and allied sectors for their livelihoods. Notably, the agriculture sector contributes 17% of our GDP. Tremendous progress has been made in the field of agriculture since independence resulting in attainment of self-sufficiency in foodgrain production. However, the present rate of increase in foodgrain production is not commensurate with the rate of growth in population. Growth in the agriculture sector has also decelerated over the last two years. Resultantly, this has escalated the prices of food items. Hence, there is need to increase food grain production to ensure food security for the teeming millions of our country.

There are wide yield gaps among various crops across the country. Foodgrain production can be increased substantially if this yield gap is narrowed by adopting technological and policy interventions on mission mode basis. Productivity of most of the crops, particularly paddy, is quite low in the eastern States of the country. This can easily be improved by adopting region-specific technological interventions. Cultivation of boro (winter) rice has huge potential in the eastern parts of the country and needs to be promoted. Likewise, production of maize can also be increased manifold by embracing hybrid maize cultivation and improved farm practices.

Special attention needs to be given to the seeds sector to ensure the availability of adequate quantity of quality seeds in time and enhancing seed replacement rate. There is also a need to revamp the extension system so that improved technologies percolate to the grass-root level.

Balanced use of fertilizers is another important area which needs focused attention. Easy availability of credit at reasonable rate of interest to the farmers is also the need of the hour. Promotion of farm mechanization is very crucial as this would reduce dependence on labour and improve input use efficiency. It will also go a long way in promoting optimum use of water. What is in fact needed is a technology mission on farm mechanization to overcome productivity barriers.

Water management is an important issue to be tackled first and foremost since water resources are depleting very fast. Various interventions like promotion of micro irrigation, underground pipeline systems (UGPL), cultivation of drought-resistant varieties of crops and judicious use of available water need to be promoted. Land labour related issues are required to be tackled on priority to revitalize the agriculture sector.

All these issues have been addressed in this report. Crop-wise strategies to improve agriculture production and productivity have been spelt out for the benefit of agriculture administrators and planners. It is hoped that this report will succeed in rejuvenating the agriculture sector and ensuring food security of the country on sustainable basis.

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Chief Minister, Haryana &
Chairman, Working Group on Agriculture Production

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Constitution of the Working Group, Terms of Reference and Deliberations

Preamble

Primary concern of the Government is to insulate the people of India, particularly the poor from rapid rise in prices of food and essential commodities while ensuring remunerative prices to farmers. To address this concern, first meeting of the "Core Group of Central Ministers and State Chief Ministers on Prices of Essential Commodities", constituted in the wake of large increasing in consumer prices, was held on April 8th, 2010 under the Chairmanship of the Prime Minister. In view of the ever-increasing population and degrading natural resource base, coupled with emerging concerns of climate change, an urgent need was recognized for devising agriculture production increasing strategies by bridging the yield gaps and increasing cropping intensity while ensuring sustainable use of natural resources. The core group realized that to ensure food and nutritional security in the country, on a sustainable basis, state/region specific strategies will need to be defined, developed and implemented. In view of this, three working Groups (WGs) were constituted: i) Working Group on Agriculture Production (WGAP), ii) Working Group on Consumer Affairs (WGCA) and iii) Working Group on Food and Public Distribution (WGFPD).

The Working Group on Agriculture Production was constituted under the Chairmanship of the Chief Minister, Haryana with Chief Ministers of Punjab, West Bengal and Bihar as members. Order constituting the Working Group on Agriculture Production dated May 17, 2010 is at Annexure I.

Terms of Reference (ToR)

The Working Group on Agriculture production was to deliberate on and recommend measures for increasing agriculture production and productivity, including on long-term policies required for sustained agricultural growth. This working Group was also to deliberate on the availability and management of various issues related to agriculture inputs viz. seeds, fertilizers, water, power, credit, machinery, labour. More specifically, ToR of the Group included making suggestions for strategies / action plan, inter alia, for:

(i) Bridging yield gaps

(ii) Defining crop and region specific strategies - special focus on pulses and oilseeds

(iii) Strengthening Input delivery mechanism - deliver inputs with knowledge through public-private partnerships

(iv) Mainstreaming extension system and establishing farm gate crop advisory services

(v) Marketing reforms: Strengthening post-harvest services, linking farmers to market and credit policies

(vi) Addressing land and labour related issues

Main Themes

The working group identified main themes to address major constraints and potential technological solutions/strategies for action. These are summarized below:-

S.No.	Themes to be addressed	Strategies/Thrust Areas for Action
1.	**Bridging the yield gaps**	• To ensure increased food grain production. • Recommend strategy, especially for states registering low productivity. • Specific thrust on Integrated Natural Resource Management (INRM).
2.	**Strategies for increasing specifically pulses and oilseeds production**	• Special thrust on pulses and oilseeds to address nutrition security. • Major recommendations on increasing their production and availability.
3.	**Strengthening input delivery mechanism for seeds, nutrients, water, credit, power, etc.**	• Improving input delivery mechanism including incentives for their use in States having low productivity. • Emphasis on water use efficiency, higher seed replacement rate, efficient and need based fertilizer use, use of bio-energy and bio-fertilizers etc. • Encouraging Public-Private Partnerships (PPP)
4.	**Gearing up extension system**	• Framework of recommendations on making extension services more effective and efficient in reaching the farmers. • Building a system of Agri-Clinic and cadre of Technology Agents for making custom hire services available to the farmers.
5.	**Marketing and credit reforms**	• Minimum support price of all important crops as an incentive to farmers. • Linking farmers to markets and institutions of credit for higher income. • Building infrastructure for rural markets and storage systems.
6.	**Addressing land and labour related issues**	• Accelerating land reform process in States lagging behind in production and productivity. • Ensuring labour availability during peak seasons. • Required emphasis on farm mechanization.

Related Themes

Working Group believes that the issue of sustainable agricultural growth should also be addressed by this Group. Simultaneously, there are several cross-cutting issues with respect to administering agriculture development programmes. Accordingly, the Group developed two additional themes as under:

S.No.	Themes to be addressed	Strategies/Thrust Areas for Action
1.	**Sustainable agricultural growth**	Long term strategy for conserving agro-biodiversity and other natural resources (land, water). Adaptation (and mitigation) to climate change. Risk management. Additional support for R & D institutions/universities.
2.	**General & Administrative Issues**	Statistical and administrative measures Plan Schemes and consolidation

Meetings of the Group

The first meeting of the Working Group was held on 7th June, 2010 at Chandigarh under the Chairmanship of Chief Minister, Haryana to discuss broad themes, the base paper recommendations and related issues. Hon'ble Chief Minister, Punjab, Finance Minister, West Bengal and Agriculture Minister, Bihar also attended this meeting along with Secretary, Agriculture and other officers of GOI. Govt. of India revised the base paper and prepared a set of 103 recommendations on the basis of discussions held in the first meeting of the Working Group. The comments of all the States and other stakeholders were invited on these recommendations. The recommendations and the comments were thereupon reviewed thrice internally by the Chairman. The inputs received from Dr. R.S. Paroda, Chairman, State Farmers' Commission, Haryana, Dr. K.S. Khokhar, Vice-Chancellor, Chaudhary Charan Singh Haryana Agricultural University, Hisar and those from some of the States were also examined and appropriately incorporated in a Draft Report. The draft report was presented before the Working Group for consideration and finalization of the recommendations in their second meeting at Chandigarh on 30th August, 2010. Working Group considered the Draft Report, made some additional recommendations and authorized the Chairman to approve the Final Report, taking into account views further expressed by the States in the second meeting. Minutes of both the meetings are at Annexure II and Annexure III respectively. Notice inviting comments and views of all stakeholders and the list of the newspapers this notice was published in are in Annexure IV.

Emerging Challenges and Opportunities

India has made great strides in increasing foodgrain production since the Green Revolution era of the late sixties. During the last one decade, production of maize and cotton has doubled. In the recent past, the growth rates in horticulture, livestock and fishery sectors have been impressive and have contributed significantly towards agricultural gross domestic product (Ag. GDP). The average agriculture sector growth during 2006-09 remained around 4.7%. However, the worst drought since 1972 experienced in 2009-10 has brought down the rate of growth in Eleventh Plan to less than 3% per annum. Declining total factor productivity, diminishing and degrading natural resources, and stagnating farm incomes have become

major concerns. The impact of trade liberalization on agriculture and the global climate change are new challenges. At the same time, new opportunities are emerging for Indian agriculture. Commercialization of agriculture, diversification towards high-value commodities and integration with the global markets offer new opportunities. It appears that the Indian agriculture, being at the cross-roads, is currently face to face with both unprecedented challenges and unparalleled opportunities.

The key challenges to be addressed are: (i) weakening of input delivery and local agri-governance systems; (ii) increasing risk in agriculture due to weather, prices and trade policies, including the impact of globalization; (iii) small, declining and fragmented holdings; (iv) growing marketing inefficiencies and increasing agri-waste; and (v) limited employment opportunities in non-farm sector. These challenges can have serious implications on the farm income and the future of Indian agriculture. In many ways, these can even neutralize the contributions made through various technological breakthroughs. Neglecting these challenges at this juncture could adversely affect the national food and livelihood security, especially for the resource poor farmers and consumers. Appropriate policy and institutional responses are, therefore, needed to address these challenges by up-scaling and out-scaling some of the successful models evolved both within and outside the country for increasing our agricultural production.

On the brighter side, new opportunities are unfolding in the form of increased demand for agricultural commodities, both in the domestic and global markets as a result of higher economic growth and rising income levels of the consumers. The growing international demand for rice, wheat and maize besides cotton, soy meal, fish, meat, poultry, etc. also opens up enormous opportunities for export. In addition, the increasing demand for high-value commodities such as fruits, vegetables, milk, meat, flowers, etc. and agri-processed products in the domestic markets point towards potential prosperity that can be brought about in the farm sector. The entry of corporate sector in developing and delivering market-driven technologies, contract farming, processing of agri-products, developing organized retailing and exploring markets for exports are providing a new dimension to Indian agriculture. Some of these encouraging developments are taking place around the value chain from plot to plate. But the moot question still remains as to how to involve the farming community, especially the small and marginal farmers, in capitalizing markets and sharing the benefits resulting from the new opportunities. Failing to address this problem now can lead to the exploitation of the farming community, culminating in distress to small holders. Innovative policies, appropriate institutional arrangements and market driven technologies can, on the contrary, harness the untapped opportunities to accelerate agricultural growth to meet our ever increasing demand for food, feed, fibre, fuel, etc. It is indeed a daunting task for all concerned to up-scale such successful models and reform our agricultural sector to address the challenges and harness all available opportunities.

To attain a sustained growth rate of 8 to 9 % during the current Plan, India must accelerate the pace of farm sector growth from the current growth rate of around 2% to at least 4%. Hence, acceleration of productivity growth rate in agriculture is called for as a matter of priority. It would obviously need a dynamic approach, coupled with a focused strategy, which is well planned, coordinated and monitored. 'Business as usual' attitude will not work. Concerted efforts would, therefore, be required for meeting the targets that are achievable but could not be addressed in the past in a holistic manner. It is this goal for which following strategic actions are called for as a matter of national priority.

1 Strategies for increasing Agriculture Production

Background

1.1 Agriculture production of essential commodities can be increased by adopting a two-pronged strategy to deal with gaps in production and productivity. First, there exist significant yield gaps between genetic potential, attainable/ experimental stations/frontline demonstration yields and actual/average yields at the farmers' fields (vertical gaps). Second, significant yield gaps also exist between different geographically differentiated regions/districts/ states in different crops (horizontal gap). In the major cereal crops, the vertical gaps vary from 32% to 83% i.e. 32% to 59% in wheat, 48% to 76% in rice and 65% to 83% in maize. Majority of these gaps are due to management practices adopted, ranging between 14% to 78% i.e. 14% to 48% in wheat, 30% to 69% in rice and 60% to 77% in maize. These yield gaps have to be bridged. Besides, considerable land, especially in the eastern part of the country, is sown only once, despite a very favourable water regime. These lands can be double or even triple cropped with appropriate investments and concerted efforts.

1.2 As already stated, the gap in potential and real yields (vertical gap) is quite significant (Table 1). For example, in case of wheat, gap in yields (national average) under research conditions (4.20 t/ha), yields demonstrated on farmers' fields (3.32 t/ha) and actual average yields (2.79 t/ha) is 26.5% between research and demonstrated yields and 19% between demonstrated yields and actual yields. Much larger gaps exist in case of Bihar (58%) and Madhya Pradesh. The major yield gaps are due to management practices. Other reasons for this gap need to be ascertained through specific studies and addressed through appropriate interventions.

Table 1 Yield Gap in cereal crops in major states of India

State	Cereal Crops	Simulated Potential yield (t/ha)	Max attainable Experienced yield (t/ha)	Average Yield (t/ha)	Total Yield Gap I (%)	Management Yield Gap II (%)
		A	B	C	[100(A-C)/A]	[100(B-C)/B]
Punjab	Rice	8.8	7.0	4.0	54.5	43.1
	Wheat	6.5	5.2	4.3	33.8	17.3
	Maize	16.6	13.3	3.1	81.3	77
Haryana	Rice	8.7	7.0	2.8	67.8	59.9
	Wheat	5.6	4.5	3.8	32.1	14.2
	Maize	8.0	6.4	2.8	65.0	56.9
UP	Rice	7.2	5.2	3.8	47.2	26.9
	Wheat	5.4	4.6	2.4	55.6	47.4
	Maize	6.3	4.3	1.2	81.0	72.2
Bihar	Rice	8.7	7.0	2.1	75.9	70.5
	Wheat	5.5	4.4	2.3	58.2	47.7
	Maize	10.7	8.6	2.6	75.7	69.6
Tamil Nadu	Rice	8.4	6.7	2.1	75.0	69
	Maize	13.2	10.2	2.3	82.6	77.3

Sources: Rainfall: Indian Meteorological Department (http://www.imd.gov.in/) Actual yields: SDDS-DES, Ministry of Agriculture, Govt. of India and AGRID-NIC, Ministry of communications & IT, Govt. of India; Agarwal et al 2009. Chand et al (2009); Agricultural Statistics-At a Glance (Department of Agriculture and Cooperation) 2009.

1.3 Similarly, there are wide variations in Inter-State/Inter-District productivity (horizontal gap). For instance, the productivity of rice and wheat in Trans-Gangetic region has been more than 3 t/ha and 4 t/ha, respectively, as against 2 to 2.5 t/ha in lower and mid-Gangetic plains (Eastern Uttar Pradesh, Orissa and Bihar). In case of wheat, the Inter-State variation in productivity is more conspicuous- ranging from as low as 1.4 t/ha in Maharashtra to as high as 4.3 t/ha in Punjab. Similarly, in rice, the Inter-State variation ranges from 1.23 t/ha in Bihar to 4.00 t/ha in Punjab. Similarly, Inter-District variations in productivity are also prominent within States. It is imperative to target low productivity States/Districts to bridge yield gaps and enhance productivity to meet future food requirements.

1.4 Wheat is the major rabi crop accounting for nearly 72% of total foodgrain production (during winter) in the country. Although production of wheat has risen to an all time record level of around 81 m t, productivity of wheat seems to be plateauing. There are inter-state variations also. For addressing low wheat productivity and also to arrest plateau of yields, district-wise planning with emphasis on increase in area and productivity in eastern and southern states will be required. Timely sowing of wheat, balanced use of fertilizers as per soil tests with increased use of organic manures, crop residues and bio-fertilizers has to be ensured. Also the use of soil ameliorants like gypsum in soils with high pH, lime in low pH and micronutrients in deficient areas will have to be ensured. Water management in

wheat is required to ensure irrigation at grain filling stage to avoid the terminal heat stress. In this regard, underground pipeline system (UGPL) in Haryana is a success. This system improves water use efficiency as well as yield by 5%. Also, micro irrigation systems need to be promoted in a big way. Promotion of zero till multi-crop planters, straw management systems (turbo seeders, straw spreader attachment for combine reaper binder etc), raised bed planter, diesel pump sets, integrated weed management for the control of Phalaris minor using cultural and mechanical measures together with need based use of herbicides, and integrated disease management especially for Karnal bunt, loose smut and both brown and yellow rusts will be required. As a matter of urgency, the States of Punjab and Haryana must phase out old varieties like PBW-343 and PBW-502 which have become susceptible to rust diseases, with resistant varieties like DBW-17, WH-542 and PBW-550 possessing high yield potential.

1.5 Rice is the main food crop of the country. It is grown both in kharif and rabi season. Production of rice during kharif season mainly depends on monsoon rains. Like wheat, there exists a wide variation in Inter-State/Inter-District productivity. To enhance the production and productivity of rice, National Food Security Mission (NFSM) has been operating in selected districts since 2007-08. For increasing productivity, expansion of area under boro (winter) rice by increasing cropping intensity especially in the states of Assam, Bihar, Jharkhand, Orissa, and West Bengal should be the main strategy. Adoption of short duration/location specific varieties/hybrids, supported by improved package of practices, can enhance yields further. Development of minor irrigation in Eastern India by using ground water, amelioration of soil with lime application in acidic soils especially in Assam, Orissa, Bihar and Jharkhand, promotion of hybrid rice (which yields 20% higher than the conventional varieties), adoption of farm mechanization, particularly the rice transplanters and direct seeded rice using multi-crop planters are the main interventions needed urgently.

1.6 As stated above, considerable area in eastern India remains unsown, whereas very high yields through boro rice and winter maize have been achieved. Fortunately, the water regime of the region is very good, which could be exploited. Therefore, an ambitious time bound programme of ground water use through bore-wells, shallow wells and lift irrigation schemes needs to be taken up. For operating these wells, power will be an essential requirement. Fortunately, eastern region has immense potential for power generation. Operating wells through diesel generating sets is also an alternative option. Therefore, support for diesel pump-sets in eastern India should be an important initiative.

1.7 In order to extend green revolution to States of West Bengal, Orissa, Jharkhand, Bihar, Eastern UP and Chhattisgarh, an amount of Rs. 400 crores under the Rashtriya Krishi Vikas Yojana (RKVY) has been allocated. This should kick-start a major programme of harnessing the ground water in eastern states. Assam should also be included in this programme. As electric power is unlikely to be available to the extent required, it is necessary to assist farmers partly in meeting higher cost of diesel pumping sets for lifting water in eastern states. A scheme on the lines of Diesel Subsidy Scheme of Bihar can be thought of by other States too.

1.8 Challenge of raising productivity of crops in Punjab and Haryana, which have largely exploited available water resources, is to sustain and increase their productivity with less water.

This can be achieved by developing varieties requiring less water, adopting agronomic practices to increase water use efficiency like laser levelling, use of sprinkler/ micro irrigation, zero tillage, residue management (surface mulching), raised bed planting etc. and diversifying to crops requiring less water. Additional investments are required to maintain canals and to have research on conjunctive use of brackish water with canal water.

1.9 Rainfed areas need to be developed through integrated water management and in-situ/ ex- situ harvesting of rainwater. At present, hardly 29 % of the total rainwater is utilized. There exists scope for harvesting, storing and recycling of water to improve production. Common guidelines developed for converging the efforts of different schemes and agencies by the recently established National Rainfed Area Authority (NRAA) need to be adopted for ensuring integrated watershed development. Major efforts on bunding of fields, digging farm ponds and contour furrows, using Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) resources and the use of Conservation Agriculture (CA) practices will ensure better rain water harvesting for increased production. A special focus needs to be given on the integrated development of rainfed farming on modern lines with a view to enhance its production, productivity and profitability as discussed in chapter 9.

1.10 Experiences in some states on raising higher crop yields and incomes in rain deficient areas, by adopting water management practices synchronous with adoption of crop choices and farming practices which lead to fullest utilisation of water available for raising crops of higher value, need to be adopted by all those States having large rainfed areas. These water and crop management practices combined with adoption of bio-pesticides, use of bio-fertilisers and less dependence on pesticides and fertilisers, to the extent possible, will help raising both production and productivity significantly.

1.11 Water use efficiency through use of sprinklers and drips under the Micro Irrigation scheme would ensure more crop per drop of water. Multiple use of limited water for multi-enterprise agriculture will provide much needed livelihood security to small farmers. Micro Irrigation Scheme is being revised to provide higher subsidies. Penetration of these micro-irrigation devices is very low in our country. There is need to take up this programme, not only for horticultural crops, but also for field crops (as a national campaign) in all canal command areas.

1.12 Nearly 50 per cent of the farmers in India have landholdings of less than 1 ha. Individual crop/commodity based approach does not provide livelihood security to small and marginal farmers. Therefore, there is a need to develop and upscale integrated farming systems including crops, horticulture, livestock (especially dairying), fisheries, mushroom production, poultry etc. to generate regular income both for on-farm and off-farm employment.

1.13 A sizeable low lying area in Bihar is currently under Tal. These Tals get refilled with water during monsoon because of overflow of Ganga and its tributaries. Water up to 8 ft depth remains trapped for 3-4 months in these Tals. When the water level in the river decreases, the trapped water starts flowing back, but the process of draining out is much slower. Generally, the fields become cultivable only by November-December. Accordingly, there is need to develop strategies for effective use of available water in these areas for culture of makhana and aquaculture

based farming system during kharif; and raising of crops like winter maize, wheat, boro rice and short duration legumes in rabi.

1.14 The intensively irrigated crop production regions, which currently ensure food security of the country, are experiencing resource fatigue and are under increasing environmental stress. Further, faster growth in these regions will require a technological breakthrough for addressing the emerging issues with new technology transfer pathways that reduce dissemination losses while ensuring accelerated adoption of new innovations.

1.15 In several parts of the country (eastern states and states producing below national productivity), the existing technologies have considerable potential to raise yield levels, but ensuring availability of quality inputs in time and revamping extension services need priority attention. Besides, diversification to high value low volume crops must also be promoted to achieve higher income as well as agricultural growth. Over the last three decades, fortunately, India's production growth for rice and wheat has surpassed its population growth. However, the factor productivity is now declining. The enhancement in productivity of rice and wheat in different cropping systems including R-W system needs to be given high priority as both these crops are major food grain crops for our country.

1.16 For increasing production of major food crops & pulses, specific strategies are discussed in Chapter 10.

2 Strategies for increasing Pulses and Oilseed production

2.1 Currently the Pulses and oilseeds present the biggest challenge before us. Domestic production of pulses is short by about 25% and that of oilseeds by 50% keeping in view our consumption demands. These two commodity groups had cost the country over Rs. 30000 crores on imports during 2008-09. Also, the sharp rise in the prices of pulses during 2009-10 led to a major consumer distress. Therefore, we must lay all our emphasis on finding solutions for enhancing production and availability of pulses and oilseeds. This is the only recourse by which prices of these important commodities can be reduced.

2.2 Pulses are the key source of protein for most of our population which is vegetarian. Pulse crops are also important for the sustainability of our cropping systems as they improve soil health. Water and nutrient requirement of pulse crops is also very low. Despite our efforts, national pulses productivity is only 655 kg/ha. Several initiatives have been taken to focus on enhancing domestic production of pulses. Jharkhand and Assam States have been included in the Mission on pulses to realize the potential of area expansion especially in the rice-fallows. All districts of States under pulses promotion have been included under the National Food Security Mission to give more focus to pulses production in the remaining two years of the eleventh five year plan. More components have been added for pulses promotion under NFSM. It has been decided to take up 'Accelerated Pulses Production Programme' in the form of large scale block demonstrations of technology on five major pulse crops - chickpea, arhar, moong, urad and masoor. 1000 units of 1000 hectares each are planned for implementation from the kharif season of 2010. All these initiatives need to be implemented in a mission mode by the States. Under irrigated intensive cereal production systems of the country (Punjab, Haryana, Western UP), the emphasis should be laid on (i) inclusion of short duration summer mungbean varieties under zero tillage and (ii) reintroduction of pulses in sugarcane production systems through intercropping using raised bed planting. In eastern India, the relay cropping of zero till planting of winter legumes (lentil, chickpea etc) should be focussed in 'rice-fallows'. This must become an integral part of the centrally sponsored schemes like NFSM and RKVY.

2.3 Ministry of Agriculture has decided to organize 60,000 pulses and oilseeds villages in the rain-fed areas for integrated water management and dry land crop production. For this, an amount of Rs. 300 crores has been allocated. This amount could be used to supplement the ongoing schemes of NFSM/Integrated Scheme of Oilseeds, Pulses, Oil-palm and Maize (ISOPOM) by taking up watershed plus activities in the form of land development like ridge furrow planting, cross furrows, surface mulching using locally available mulching material. It has been decided in consultation with major oilseeds/pulses producing States that large scale mechanisation will be introduced in 60,000 villages so identified, by developing 6,000 customs hiring centres on a hub and spoke model. These centres will be managed by societies/Self-Help Groups and other agri-business organisations to provide services of tractors, seed drills/planters etc. to farmers for timely farm operations on modest hiring charges to cover operational expenses. These centres should now play "Single Window Service Providers" role for the farmers. The States should ensure proper capacity building of these service providers.

2.4 Genetic breakthrough in pulse crops is required for quantum jump in production. High yielding and disease resistant varieties of pulse crops should be developed in a time bound manner. Dwarf high yielding short duration varieties of arhar are urgently required. Also, available good varieties need to be promoted for large scale adoption through increased availability of their seeds.

2.5 Efforts should be made to bring more area under pulse crops, especially in rice-fallows and through inter-cropping. Suitable crop practices for this purpose need to be developed. Bihar, Jharkhand and Assam have good potential for increasing area of pulse crop in the rice-fallows, as done successfully for black gram in rice-fallows in coastal Andhra Pradesh. Production of Soybean as a food crop should be increased as it is a rich source of protein.

2.6 For increasing oilseed production, management practices should be location and variety specific. Informal seed sector must be strengthened to meet the huge demand for quality seed of groundnut and other oilseed crops like sunflower and castor. There is urgent need to improve the seed replacement rate of oilseed crops. Rapeseed-mustard is the premier winter oilseed crop in India. Cyto-plasmic Male Sterility (CPM) based hybrids have now been commercialized and they promise substantial productivity enhancement. Superior sunflower hybrids should be developed and promoted in northern India. In castor, special focus is required for the development of hybrids and varieties resistant to abiotic stresses such as drought and salinity.

2.7 Rice bran is a good source of quality oil but this source has not been fully tapped. From the production of 141 million tonnes of paddy during 2007-08, only 7.00 lakh tonnes of rice bran oil is currently extracted, whereas there is potential to double it to 14 lakh tones. Therefore, steps for tapping remaining 40-50% of bran oil should be taken up by encouraging private sector through proper incentives and policies.

2.8 To make oilseed crops economically viable and competitive, remunerative prices under Minimum Support Price and guaranteed procurement are to be ensured. Immediate steps in this regard must be taken by the Central Government.

2.9 Detailed crop-wise strategies for increasing oilseed production are discussed in Chapter 11.

3 Strengthening Input Delivery Mechanism

3.1 Seeds

3.1.1 National Seed Plan (NSP) had projected a seed requirement of 253.99 lakh quintals for 2009-10, against which production of 280 lakh quintal was achieved. Despite this, more than 70% of seed used by the farmers continues to be farm saved. A rolling seed plan for each 3 year cycle will help in advance planning. States should accord the highest priority to enhance foundation and certified seed production and ensure adequate supply of quality seeds at reasonable price and at the right time to meet the objective of food and nutritional security.

3.1.2 For achieving desirable levels of Seed Replacement Rate (SRR), adequate seed needs to be produced first. Seed production programme should be organised in each State under a comprehensive and integrated State Seed Plan appropriate to region specific requirements. States should ensure production, multiplication and replacement of seed to increase Seed Multiplication Rate and Seed Replacement Rate progressively, particularly in respect of regionally important crops/varieties.

3.1.3 Production of hybrid seed needs to be promoted aggressively to improve crop productivity. In this context, the efforts of Private Sector should also be covered for incentives on par with Public Sector seed production agencies.

3.1.4 Involvement of progressive farmers in quality seed production and dissemination, through appropriate training, is key to future success in achieving higher Seed Replacement Rates. Also, special attention will be required to upgrade the quality of farm saved seeds through governmental interventions, including seed treatment.

3.1.5 The drought of kharif 2009 has re-emphasised the necessity for contingency planning to meet the demand for seeds during natural calamities by banking seed of appropriate varieties/crops. There is a need to develop seed reserves/seed banks of drought resistant and early maturing varieties. Also seed is often required for replacement in flood affected areas. Hence, establishment of Seed Banks will help in re-sowing under conditions of droughts or floods. Accordingly, contingency seed planning for Risk Management is essential.

3.1.6 Re-structuring and revamping the public sector seed producing undertakings is required for product diversification/ upgradation and for improving their governance, core competence and competitiveness. Several of the 15 State Seed Corporations are currently sick. State Seed Corporations should either be reformed/re-organized to make them vibrant organizations or should be closed to allow alternative mechanisms such as Private Seed Sector to play its prominent role. Complacency in seed sector must be avoided at all costs.

3.1.7 State Seed Farms, having substantial capital assets and an important mechanism for efficient multiplication of seeds; require urgent attention as several of them are currently in a state of disuse and neglect. An approach for making optimal use of these farms is to involve progressive farmers to produce certified seeds under contractual arrangements with assured incentives. Also, the concept of "Seed Village Scheme" will help in accelerating the pace of good quality seed production. This approach needs high priority action.

3.1.8 Complementarity of the public sector policy and infrastructure and the private sector dynamism can be maximized through appropriate Public Private Partnerships (PPP). Successful models of PPP could be replicated. Again, long term contracts can be entered between State Seed Corporations and private sector, cooperatives of farmers or SHGs to undertake production and supply of quality seeds.

3.1.9 Seed quality assurance requires considerable investment to have proper infrastructure, equipment and competent human resource. Seed certification agencies have to be adequately equipped and made more efficient, both for certification and quality enforcement. In this context, devolution of current centralized certification system by involving private sector should also be encouraged.

3.1.10 Adequate infrastructure for seed processing must be created by all States at the State Seed Corporations, agriculture universities and private seed agencies. RKVY funds can be availed to provide assistance upto 50% of the cost of seed processing facilities and construction of seed godowns.

3.1.11 India has the potential to become a leading player in seed business sector in the developing world; but its present share in global seed market is less than 2%. Specific interventions through active involvement of National Seed Association of India (NSAI), to boost our seed exports need urgent consideration. For this, enabling environment through single window system will be essential.

3.1.12 The Seed Bill, 2004 is currently awaiting Parliament approval. Before this Bill is enacted, due care should be taken to ensure that farmers' interests are protected and incentives become available, both to farmers and private sector for seed development initiatives, as have been provided in the Protection of Plant Varieties and Farmers' Right Act (PPV&FRA). Farmers' interest should be kept foremost while enacting any new law for seed development.

3.1.13 Seed being the prime catalyst of increased productivity, it is strongly recommended that a National Mission on Seed be launched by the Central Government so as to provide an enabling environment for faster and efficient quality seed production programme at the national level. In this Mission, adequate support for hybrid and quality seed should be ensured for higher Seed Replacement Rate. A strong Public-Private

Partnership through active involvement of farmers, for improved seed systems and seed increase is a need of the time. Subsidy on hybrid/ quality seed production has to be extended to cover the private sector as well. The farmers' participatory role for seed increase will ensure availability of quality seed at a faster pace.

3.2 Nutrients

3.2.1 Average fertilizer consumption per hectare had increased by 46% between 2004-05 to 2008-09, but productivity of food grains grew only by 10% during the same period. This underlines the decline in marginal productivity of soil in relation to application of fertilizers. Moreover, there is greater emphasis on the use of Urea leading to imbalanced fertilisers use. Accordingly, the Central Government has introduced a Nutrient Based Subsidy Policy with effect from 1st April, 2010. Subsidy has also been introduced on micronutrients like Boron and Zinc. Deficiency of Sulphur is quite widespread. Subsidy should also be given on Sulphur to promote its use. Introduction of nutrient based subsidy scheme should incentivise formulation and introduction of new products, including fertilizers fortified with micronutrients and crop and location specific customized fertilizers. Integrated Nutrient Management (INM) has to be encouraged through judicious use of chemical fertilizers, bio-fertilizers and locally available organic manures like farmyard manure, vermi-compost, green manure and crop residues to maintain soil heath and its productivity.

3.2.2 To make farmers aware of the nutrient status of the soils and to encourage them to buy the right kind of nutrients mix, it is necessary to promote soil testing, including testing for secondary and micro-nutrients. For this, country needs adequate infrastructure of soil and nutrient testing laboratories and issuing soil health cards to all farmers. Mobile soil testing vans need to be promoted. All Krishi Vigyan Kendras (KVKs) in each district should also undertake soil testing. Resources under the National Project on Management of Soil Health & Fertility as well as the RKVY administered by the Department of Agriculture & Cooperation (DAC) should be availed of to put in place required infrastructure. A common problem encountered by the States is lack of trained manpower and restrictions on employment of such technical manpower. The services provided by these laboratories are in the nature of public goods. The States may, therefore, consider employing staff from their resources and use DAC scheme funds for the creation of infrastructure.

3.2.3 Fertiliser companies should now produce the right kind of mixtures of nutrients to suit the specific requirements of soils in all agro-climatic zones based on aggregate demand of the type of mix required in specific areas. This is possible if soil health maps are prepared. Soil testing on representative sample basis in all villages should help in the preparation of soil health maps in a time bound manner. States may undertake this on a campaign mode. Indian Council of Agriculture Research (ICAR) and National Bureau of Soil Survey and Land Use Planning (NBSSLUP) should play a key role in this endeavour. Private sector should also be involved. Expenditure on collection of samples and their testing can be met from RKVY and other schemes of DAC. Fertiliser companies should also be associated with such campaigns.

3.2.4 Bio-fertilizers and locally available farmyard manure, vermi-compost, green manure and crop residues are rich sources of nutrients. Their application must be encouraged to maintain soil heath and its productivity. It should be targeted to bring at least 10% area under bio-

fertilizer application. Integrated nutrient management, involving judicious use of chemical fertilizers, bio-fertilizers and organic manure holds good promise for productivity enhancement.

3.2.5 Various studies have brought out that efficiency of chemical fertilizers varies from area to area and crop to crop depending upon several factors. Research efforts to improve uptake efficiency of nitrogenous and phosphatic fertilizers need to be intensified by ICAR and different State Agricultural Universities (SAUs).

3.2.6 In advanced countries, liquid nitrogen is used for increased Nitrogen use efficiency. Currently, India does not produce liquid fertilizers. Also the import of liquid fertilizers is not eligible for subsidies. On the contrary, it is subjected to import duties. Accordingly, imported liquid fertilisers should not only be freed from import duties, but be made eligible for subsidies in line with newly introduced nutrient based subsidy scheme. Efforts should also be made to produce liquid nitrogen in India rather than importing liquid fertilizers. Subsidy should also be provided on liquid nitrogen applicator drills so that nitrogen use efficiency, a national priority, is enhanced.

3.2.7 As lot of nutrients are being lost every year through burning of crop residues especially in rice-wheat systems, a system for carbon credits to farmers should be put in place for recycling of crop residues. Nearly 140 kg Potassium (K_2O) can be harnessed through recycling of crop residues per hectare. Incentives should be given to the farmers for environmental services like carbon sequestration.

3.2.8 Integrated Pest Management (IPM) approach, emphasising use of available pest control methods and techniques such as cultural, mechanical and biological control as well as judicious use of chemical pesticides, has to be popularised. IPM has to be a priority now for the promotion at the National level through establishment of Farmers' Field Schools.

3.2.9 There is a need to strengthen regulatory framework for quality control and management of pesticides. The Pesticides Management Bill, formulated by the Central Government to replace the existing Act, needs to be enacted at the earliest. There is need to create appropriate pesticide/ bio-pesticide quality control set up and to provide deterrent punishment for the sale of spurious pesticides. For this, facilities for testing of pesticides and bio-pesticides should be created using funds available under RKVY and other schemes. Simultaneously, accreditation of existing pesticide laboratories should be ensured to strengthen quality control system of pesticides.

3.3 Water

3.3.1 As a consequence of climate change, water availability for agriculture in future will be a major challenge. World Development Report 2008 emphasized that in order to meet future food demand; water productivity needs to be improved in irrigated as well as rainfed areas. At the technology level, the key principles for improving water productivity are reduction of all outflows (e. g. drainage, seepage and percolation) and increase in the effective use of water. New irrigation technologies like furrow irrigation, mulching, drip and sprinkler irrigation etc. will improve field level water application efficiencies and hence need to be promoted as a national priority.

3.3.2 Efficiency of surface water projects is currently only 35-40%, which can be increased up to 60% by adopting efficient management

practices, proper maintenance and modernization of existing infrastructure, command area development, participatory irrigation management, and efficient irrigation and agricultural practices. Similarly, the efficiency of ground water facilities can be increased from the present level of 65% to around 75%. It is estimated that with 10% increase in water use efficiency, an additional 14 million hectares can be brought under irrigation over and above the existing irrigation capacity. There is an obvious need for lining of canals for preventing seepage of water, which also creates problem of water logging. There is need to devise efficient water distribution systems and on-farm development for better farm water use efficiency. Practice of flood irrigation has to be discouraged at all cost and replaced by better methods of application of water. For this to happen, farmers need to form water users' association for an efficient management of irrigation systems. State Governments need to make investments for this purpose, considering the potential use of water so saved elsewhere.

3.3.3 Command Area Development and adoption of better water management facilities like irrigation and laser land levelling will considerably help in fully utilizing the created potential and also in improving efficiency. Activities such as construction of micro-level structural works, land levelling and shaping, orientation of the farmers towards irrigated agriculture, etc. can be prioritized for achieving optimum utilization of water resources.

3.3.4 In situ water conservation is the best solution for stability and sustainability of agriculture, and improving yields of crops in the rainfed areas. Water conservation and harvesting structures like construction of farm ponds, drainage structures, water carrying pipelines and other micro irrigation works, rejuvenation of old dug wells and use of sprinklers and drips need to be promoted in the rainfed areas. MGNREGS provides large resources for water conservation works including provision of irrigation facility on land owned by households belonging to the Scheduled Castes and Scheduled Tribes, small and marginal farmers, beneficiaries of land reforms, beneficiaries under the Indira Awas Yojana (IAY) and farmers who received waivers/ remission under farm loan waiver scheme. Water conservation and water harvesting works on the principle of 'Khet ka pani khet mein' need to be taken up on a massive scale as a movement in the country.

3.3.5 Availability of fresh water for agriculture is likely to reduce from about 85% currently to about 75 % by 2025. Agriculture will thus depend upon the reuse of sewage and industrial effluent water. There is a strong case, therefore, to develop technologies for effective use of waste water in agriculture. Similarly, about 25% ground water used for irrigation is brackish and/ or saline. Continuous use of such water for irrigation is bound to increase salinity/ sodicity. Major efforts will be required to promote techniques / agronomic practices for conjunctive use of saline water in agriculture. Scientific findings have confirmed safe conjunctive use of saline water up to 10% with that of canal water. Yet this benefit is not harnessed presently.

3.3.6 There is very little consciousness currently about water productivity of crops. Water is one of the most critical inputs today for agriculture crops. Output per unit of water should be a critical criterion to determine appropriateness of adoption of any variety or technology. Varieties need to be evaluated for their water requirement. Farming practices should be compared and evaluated for their water requirement. Government must promote adoption of those varieties and farming

practices where production can be maintained or increased with lesser consumption of water. Competitions should be organised amongst villages with determining criterion being use of less water for same productivity. Government should institute awards for rewarding those farmers who excel in water economy and its efficient use.

3.3.7 Major efforts be made for artificial ground water recharge, using excess surface water during monsoon season, and use of the same during the dry seasons. Example of Gujarat State in this regard needs to be emulated by other States.

3.3.8 Micro irrigation systems (i.e. drip and sprinkler) must be promoted as a matter of priority in both canal command and rainfed areas. It would improve significantly the water use efficiency. Additionally, the input use efficiency of fertilizers and biocides will also be increased. Hence, more incentives in the form of increased subsidy (even up to 90%) for the promotion of micro irrigation programmes become necessary in the national interest. Central Government should, therefore, consider expanding micro-irrigation scheme to cover large area as a matter of national priority. In fact, a comprehensive water development plan is urgently required to harness and make proper use of this precious resource. Provision of sufficient funds for this purpose should be made by the Central Government.

3.4 Credit:

3.4.1 An amount of Rs. 3,75,000 crores is targeted to be disbursed as credit to the farmers in 2010-11. This constitutes nearly 20% increase over credit disbursed in 2009-10. Apart from strengthening rural financial institutions, government has initiated several measures for greater financial inclusion. Major initiatives include promoting micro credit through liberal refinance support from National Bank for Agriculture and Rural Development (NABARD); Kisan Credit Card (KCC) scheme for making credit delivery simple and hassle free, and joint liability groups for extending credit to vulnerable sections of farmers like sharecroppers, oral lessees, etc. Since credit delivery is done at the disaggregated level, States are expected to involve themselves more actively to ensure availability of credit to all the farmers.

3.4.2 Flow of agriculture credit has not been uniform across States. Even within States, there are marked differences between credit flow to developed districts and districts closer to urban centres as compared to under-developed Districts. Institutional development across States is a priority area for equitable flow of credit. Credit should be made available at not more than 4% per annum rate of interest.

3.4.3 State Governments may take appropriate measures for extending fresh credit to all farmers who have benefited under the Agricultural Debt Waiver and Debt Relief Scheme.

3.4.4 State Governments may launch intensive branch/village level campaigns for activating dormant KCCs and provide KCCs to all willing and eligible farmers at the earliest possible in a time bound manner.

3.4.5 State Governments may work in close coordination with the banking system for promotion of more Joint Liability Groups (JLGs) as per NABARD guidelines to ensure that formal credit reaches financially excluded farmers i.e. small and marginal farmers, share croppers, tenant farmers etc. in a time bound manner.

3.4.6 State Governments should regularly monitor the position of credit flow and coverage of farmers within the institutional credit fold and submit monthly progress reports to the Department of Agriculture & Cooperation.

3.4.7 Kisan Credit Card (KCC) has been a great success, but more than 25% farmers are still to have one. The KCCs to all the eligible farmers need to be issued by banks to meet the working capital requirement of the farmers. The long term developmental capital provision is also to be made. A comprehensive list of all farm related activities be prepared by the banks in consultation with NABARD, agricultural experts and administrators. Loan schemes, based on ready-made project reports, for various scales of each of these activities should be launched. Unit cost of these schemes should be revised every year as prices change.

3.4.8 Availability of credit to farmers is an important factor for future agricultural growth. Hence, easy availability of credit to farmers should be ensured. This would facilitate timely acquisition of inputs by the farmers. At the same time, the credit flow should be equitable across the States, especially to small and marginal farmers. Considering the poor progress of Debt Swap Scheme and with the objective of protecting farmers from the clutches of moneylenders, there is a need to further liberalize the ambit and scope of the scheme so as to make it more acceptable to the stakeholders. Facility of micro-financing to the farmers both for agricultural operations and for consumption and other social needs should also be extended. The interest rate for non-agricultural needs of the farmers should not be more than 7% per annum.

3.4.9 Eligibility conditions/criteria for providing agricultural loans to small and marginal farmers should be further simplified/liberalized and the repayment schedule for such farmers need to be made more favourable in view of their poor repayment capacity.

3.4.10 Haryana has amended law to provide for recovery of the cooperative loans, taken against the mortgage of agricultural land for agriculture and agricultural purposes, by leasing out of the mortgaged land in place of selling, in case of three consecutive defaults by the agriculturalist with mutual consent of the cooperative Society and the agriculturist. The law further provides that Society may make an application to the Sale Officer for the sale of the mortgaged land for recovery of the outstanding amount if the recovery cannot be effected even by leasing out the mortgaged land. Haryana model can be considered by other States.

3.5 Farm Mechanization:

3.5.1 Farm mechanisation is not only necessary for increasing productivity, but has become essential in view of emerging labour shortage on account of expansion of employment programmes and migration of labour to urban areas. Farm mechanization saves energy and labour, cuts down crop production costs, facilitates timeliness in planting, reduces post-harvest losses and boosts crop output and farm incomes. Empirical studies confirm that there is a strong correlation between farm mechanization and agricultural productivity. States where availability of farm power is more generally have higher productivity as compared to others.

3.5.2 The increasing threat to natural resources, notably land and water, has further necessitated switching over to machine assisted resource-conservation techniques such as zero-tillage, raised-bed planting, precision farming, drip or sprinkler irrigation etc. Farm mechanization becomes more imperative when crop sowing

schedules have to be readjusted on account of erratic weather. The climate change driven early onset of summers in the northern states has resulted in wheat yield dropping by 1.5 quintal per hectare with every one week's delay in planting after mid-November. This loss can be averted by sowing wheat early, which is possible only if the previous paddy crop is harvested mechanically and wheat is planted under zero-tillage using zero till planter that do not require ploughing of the land. Greater degree of farm mechanization would also address the issue of scarcity of farm labour during peak requirement at the time of sowing and harvesting. The introduction of new multi-crop planters that can seed directly in combine harvested fields having residues (turbo seeders) helps not only in saving time, fuel and energy but also in improving soil health and protects environment by eliminating residue burning. The surface residue mulching also helps in regulating soil and canopy temperatures.

3.5.3 We need to encourage establishment of agri-business centres by Self Help Groups (SHGs) of farmers, user groups, agri-entrepreneurs, and cooperative societies to purchase, maintain and provide farm machinery to farmers under custom hiring arrangements. As stated earlier, it has been decided that the funds earmarked for improving productivity in 60,000 oilseeds and pulses villages be used to establish custom hiring centres for farm equipments in 6,000 villages, with the objective to service 60,000 villages/ hamlets on hub and spoke basis. This will benefit small and marginal farmers by employing tillage and sowing equipment, micro irrigation systems and plant protection equipment. RKVY funds can also be used for taking up such projects in different States.

3.5.4 Farm Mechanization sector needs considerable support from Government through easy availability of technology and finance. The State Agricultural Universities (SAUs), Krishi Vigyan Kendras (KVKs), Agri-clinics & Agribusiness Centres etc. are to be strengthened so that both demand and supply issues are handled suitably. Local machinery manufacturers, meeting location specific needs, should be promoted by the States. The subsidy on those machineries that is not good for soil health should be stopped and diverted to more useful alternatives.

3.5.5 All types of tools, implements, machinery and equipment should be allowed to be freely imported without any import duty. It will go a long way in improving the efficiency of farm operations and reduce drudgery in farm operations, especially of women. It will also force the indigenous manufacturers to improve and also improvise their products and be competitive and energy efficient.

3.5.6 As a matter of priority, a Technology Mission on Farm Mechanization should be started to ensure resilience in agriculture through precision farming and also to reduce dependence on labour. It would especially reduce drudgery of women in agriculture, facilitate timely farm operations, save energy and labour, improve input use efficiency, increase crop productivity and above all, reduce cost of cultivation.

3.6 Energy:

3.6.1 The requirement of energy for agriculture is rapidly increasing on account of farmers switching over to increased use of energy operated implements and for energisation of wells for irrigation. Energy demand is expected to rise at a much faster pace in eastern India where considerable area currently remains fallow in rabi and is expected to be brought under cultivation. The availability, efficiency and reach of electric

power need to be increased substantially. States may consider taking up segregation of feeders for dedicated availability of power to agriculture sector, efficiency improvement of existing pump-sets and making power available in un-served areas especially in eastern India.

3.6.2 Much needed emphasis to solar, biomass and wind power in agriculture is required. Accordingly, both research and promotional programme for higher use of solar energy especially in post harvest management be given needed emphasis. It will be highly desirable to initiate a national programme on harnessing bio-energy in agriculture.

3.6.3 Free or highly subsidized fixed tariffs result in inefficient use of power which leads to indiscriminate use of scarce water resources with serious implications for future availability of water and sustainability of agricultural operations. Both Central and State Governments should ensure assured power supply which is more important than supply of subsidized power. Power tariff should also be rationalized.

4 Gearing up Extension System

4.1 Transfer of knowledge to the end user is the most critical gap in the present context. Hence, vibrant extension machinery is urgently needed. Revised Scheme of Extension Reforms has been approved recently (March 2010) by the Central Government. States are expected to revamp quickly their extension mechanism and provide requisite training and extension support to the farmers.

4.2 States are requested to give wide publicity to Kisan Call Centres (a permissible activity under ATMA cafeteria) and also to frequently update web-based Kisan Knowledge Management System. This Kisan Knowledge Management System is being modified to involve State Agriculture Departments in a big way across all tiers of hierarchy from Block to State level, while drawing technical inputs from Krishi Vigyan Kendras and State Agricultural Universities. There should be a close integration between KVKs and Central/State extension agencies, and ATMA model be revisited and further strengthened.

4.3 A time bound programme to fill up existing vacancies in all KVKs and Extension Directorates is called for so that the outreach programmes are implemented to the satisfaction of farmers. Stability of tenure to the incumbents at various levels of agriculture administrative hierarchy will go a long way in improving accountability in the system.

4.4 Various States have tried different innovative extension approaches. Andhra Pradesh and Bihar have evolved a system of providing extension services through women SHGs using farmers who have demonstrated abilities/ knowledge to provide advisory services to farmers. Karnataka has created extension systems at the sub-block level in the form of farmers' organisations. Gujarat provides extension services through Farmers' Fairs before each season. There are other innovative practices in other parts of the country which need to be studied and successful models to be replicated.

4.5 Creation of Technology Agents through vocational training at State Agricultural Universities and establishment of Agri-Clinics will help in proper technology verification and transfer without dissemination losses. This kind of approach will help in providing specialized services to farmers on custom hire basis.

5 Marketing and Credit Reforms

5.1 It is surprising but true that farmers have hardly any choice in marketing their produce. Unlike other producers, farmers have to bring their produce to regulated agriculture mandis, which effectively means going to mandis near their farms/ villages. These regulated mandis virtually act as monopoly institutions for sale of farm produce. In the absence of credit and storage facilities, farmers are forced to go for distress sale of their produce. Thus, a suitable change in this system is required.

5.2 On account of the system of regulated mandis being in the hands of Government, private investment is not forthcoming for handling, storing, and transporting crops. In order to give choices to farmers and for developing more efficient supply chain, it is necessary to bring in private sector investments for developing marketing infrastructure including better handling of agriculture produce.

5.3 Ministry of Agriculture had circulated a Model Agricultural Marketing Law in 2003 for adoption by the States. The Model Act provides for alternative marketing channels to the farmers. Major features of the model Agricultural Produce Marketing Committee (APMC) Act is the establishment of private markets and farmers-consumer markets, facilitating contract farming and direct marketing, single point levy of market fees/cess, setting up special commodity markets, promotion of standardization and grading and promotion of e-trading. States need to adopt these reforms, operationalise them and in fact go beyond the measures proposed in the Model Law to provide a free and competitive market to farmers.

5.4 A Committee of State Ministers for Agri-Marketing has been constituted to promote market reforms and to recommend development of barrier free National Market. Uttar Pradesh, Uttarakhand, J&K, West Bengal, Meghalaya, Mizoram and Puducherry are still to amend their State APMC Act as per Model Act 2003. States of Punjab and Haryana, UT of Chandigarh and NCT of Delhi have done only partial amendments to their APMC Acts as per Model Act. Maharashtra, Andhra Pradesh, Rajasthan, Tamil Nadu, Orissa, Himachal Pradesh, and Karnataka have framed APMC Rules as per model APMC Rules 2007. Others are still to notify their Rules, which must be expedited.

5.5 System of spot electronic markets is one of the biggest institutional reforms which are

necessary to be carried out in agriculture marketing system. This system, when institutionalised, will facilitate development of national price and trading monitoring and information system. This reform should be pushed by the states very aggressively.

5.6 Automation of operations in agriculture markets is essential in view of the fact that agriculture commodities are bulk commodities, requiring primary processing for processing and grading and need to be handled efficiently for movement, storage and transport. It is therefore, necessary that a system of automated mandis be institutionalised in the country, connected with major consumption markets and also with ports in case of exportable commodities. This is best done by inviting massive investments in marketing infrastructure from private companies. Concessions have been offered for import of modern bulk handling machinery on project basis for encouraging private companies to enter this business. States need to consider modernising their marketing infrastructure.

5.7 In order to promote marketing of perishable fruits and vegetables, a reform linked scheme for providing assistance for setting up state of the art modern Terminal Market Complex (TMC) by Private Entrepreneurs (P.E.) in hub and spoke format has been provided under the National Horticulture Mission. The market will have all required infrastructure facilities such as storage, cold storage, electronic auction etc. The floor subsidy is 25% of project cost with a ceiling on subsidy of 40% up to Rs 50 crore per TMC. There is a provision of equity participation by producers association in the TMC up to 26%. Bidding for TMC Patna project is completed and the project approved by EC of National Horticulture Mission (NHM). Bidding is also completed for TMC project at Babangaon in Thane District of Maharashtra and Perundurai in Erode District of Tamil Nadu, with proposals for approval of subsidy awaited from both these States.

5.8 In order to provide scientific storage facilities in rural areas, a capital investment back ended subsidy scheme titled Gramin Bhandaran Yojana is under implementation. The main objective of the scheme includes creation of scientific storage capacity with allied facilities in rural areas to meet various requirements of farmers for storing farm produce, agricultural inputs, etc. and prevention of distress sales through the facilities of pledge loans and marketing credit. Under the scheme, subsidy @ 25% (33.33% for NE and Hilly areas) is provided for construction of godowns. This should be increased to at least 40% (50% for North-East and hilly areas). Funds available under the Scheme should be fully utilised to create a network of rural godowns in the country. In addition, storage facilities and other market infrastructure can be created under Rashtriya Krishi Vikas Yojana (RKVY).

5.9 India is the second largest producer of fruits and vegetables in the world. A large proportion of the produce gets wasted due to improper post harvest handling and fragmented cold chain. Action needs to be taken for creation/ up-gradation of 3.38 million tonnes of cold storage capacity during XI Plan, as recommended by the Task Force. Technical standards for cold storages and Controlled Atmosphere (CA) storages have been finalized and notified w.e.f. 1st April 2010 linking assistance under National Horticulture Mission (NHM), Technology Mission for Integrated Development of Horticulture in the North Eastern States (TMNE) and National Horticulture Board (NHB). The cost and subsidy norms for cold chain components such as cold storages have been revised upwards under NHM.

Cold storages have to be upgraded to meet these technical standards. Government has taken a decision to establish a National Centre for Cold Chain Development as an autonomous centre with active participation of industry to promote development of integrated cold chain in the country.

5.10 Market information along with daily weather conditions should be provided to the farmers using modern ICT tools and techniques (SMS, Panchayat e-services, FM radio, AIR, TV etc.) so that farmer can plan to sell their produce at appropriate time in appropriate market.

5.11 Minimum support prices should be effectively ensured and purchase/procurement arrangements must be put in place by all the States in respect of all commodities related to food security.

5.12 The Commission for Agriculture Cost and Prices (CACP) methodology of calculating costs of cultivation must be reviewed in the context of need to provide economic and remunerative prices to the farmers. The Working Group supports the National Commission on Farmers' report suggesting 50% higher price over the actual cost of cultivation or on the lines of Bureau of Industrial Cost and Prices (BICP) formula used for estimating industrial costs.

5.13 The market for agricultural produce must be immediately freed of all sorts of restrictions on movement, trading, stocking, finance, exports etc. No monopoly, including that of APMCs or corporate licensees, should be allowed to restrict the market. The concept of farmers' markets, where farmers can freely sell to the consumers directly, must be promoted. The use of Essential Commodities (EC) Act should be made only in times of emergency and it must be decided in consultation with State governments.

6 Addressing land and labour related issues

6.1 Considerable attention has been paid for taking up programmes for raising production and productivity, but several institutional reforms are still to be taken up. Mid Term Review of Eleventh Plan highlights the need for reforming three "I"s: Investments, Incentives and Institutions. Institutional issues of land and labour need to be addressed to ensure sustainable growth of agriculture sector.

6.2 Agriculture lands of absentee landowners generally remain underutilized. These landowners do not find land prices attractive enough for selling, whereas small farmers genuinely interested in cultivation do not have resources to purchase the land. Such land could be cultivated through lease arrangements, but land owners avoid such leases for fear of losing ownership of the land due to tenancy laws. Leases take place on the basis of oral agreements for short periods, which discourages productive investments on land. This leads to inefficiency in resource-use. Similarly, large number of rural families own very small holdings which are not viable. Liberal land lease laws would permit many such families to lease out their land which would in turn improve the productivity and scale of operations. These innovative arrangements must be put in place soon.

6.3 There is a need to reform land administration. Planning Commission, in the Mid-term Appraisal of the Eleventh Plan, has observed the need to ensure registration of land lease deeds for protecting the interests of retailers/processors and to computerize land records for bringing about greater transparency and reliability.

6.4 Appropriate enabling policy instruments need to be evolved to take into account emerging land markets for promoting investments and achieving higher level of farm productivity. At the same time, the interests of small farmers should be protected and promoted by suitable institutional mechanisms that give them better access to the market.

6.5 Land ceiling laws in India do not permit corporatisation and industrialisation of agriculture. On the contrary, it is necessary to initiate this process. To begin with, agriculture land ceiling for corporates could be fixed at 25 times the ceiling for individual farmers.

6.6 Proper policy should be put in place for land lease and contract farming. The land reforms need to be fast paced in states lagging behind in production and productivity. The land reforms would ensure better utilization of the natural resources and improve the input use efficiency and farm income on long-term basis. Guidelines need to be chalked out for contract farming/leasing, to ensure that the rights of both land owner and tenant are safeguarded. This would ensure higher investment in agriculture.

6.7 Many countries have shopped for land abroad for growing crops to meet consumption demand in their countries. Indian companies can be encouraged to buy lands in countries like Canada, Myanmar, Australia, Argentina and some African countries for producing pulses under long term supply contracts to Indian canalizing agencies. Similarly, such arrangements can be arranged in Association of South East Asian Nations countries for securing oilseeds supply. At the same time, domestic growers be encouraged through proper incentives to produce more oilseeds and pulses. Remunerative prices along with assured procurement would help in motivating our farmers.

6.8 Agriculture in India is highly labour intensive. Therefore, availability of labour is crucial for agricultural production. At peak times, either adequate labour is not available or it is available at a very high wage rate. In general, the labour preference to work outside agriculture is increasing. Lately, the Mahatma Gandhi National Rural Employment Guarantee Scheme has reduced supply of labour for agriculture work. Policy review is needed to ensure that schemes like MGNREGS do not restrict labour availability especially during peak agricultural operations.

6.9 Appropriate farm machinery needs to be developed for taking up traditional labour based work like transplanting, inter cultural operations, planting, harvesting etc.

7 Sustainable Agricultural Growth

7.1 As per the recent estimates, nearly 120 million hectare area is degraded/wasteland. Reclamation of wastelands by treating saline, alkaline and acidic soil has tremendous potential for increasing area under cultivation. ICAR institutes/SAUs have developed sustainable and eco-friendly technologies to reclaim wastelands for growing crops and trees. States may, therefore, take up initiatives to reclaim wastelands during the next 5-10 years as a matter of priority. Subsidy should be given on use of gypsum for alkaline soils and lime in acidic soils (especially in eastern India) for land reclamation and to increase agriculture production.

7.2 Nearly 90 million hectare area in the country is subject to water erosion. Along with water, fertile productive soil is also carried away and gets deposited in reservoirs downstream resulting in reduction in water storage capacity. Considerable sums of money are used every year for desilting of such reservoirs. Soil and water erosion is extremely serious in the foothills of Himalayas covering the States of West Bengal, Bihar, U.P., Haryana, Punjab, Himachal Pradesh and Jammu & Kashmir. There is need to formulate appropriate policies and programmes to bring all foothill areas under perennial cover of horticulture, forestry and perennial grasses. The establishment of such tree based agro-horticulture and silvi-pastural systems in foothill areas will provide much needed soil and water conservation options and help in-situ groundwater recharge.

7.3 A National Mission for Sustainable Agriculture (NMSA), as part of the National Action Plan on Climate Change, is on the anvil to address issues regarding impact of climate change on the agriculture sector. ICAR/SAUs are focusing attention on research and development to adapt to climate change, with specific reference to the erratic behaviour of the monsoons, temperature & weather patterns observed in recent years.

7.4 Despite efforts to reduce variability in agriculture production, there would always be some contingent events, sometimes at very grave scales, which need to be dealt with promptly. It is, therefore, necessary to create a contingency fund to meet expenditure on handling such adverse events. It will be advisable to have a Fund for Unforeseeable Events to be administered by a governing body under Agriculture Ministry.

7.5 Rice crop residues and standing wheat stubbles burning is common in Punjab, Haryana and Western U.P. Recycling of these residues using new multi-crop planters (Turbo seeders), which can seed in combine harvested fields, will not only reduce the environmental pollution, but also reduce the green house gas (GHG) emission. Additionally, these residues, if properly baled, and fortified, can meet much needed requirement of dry fodder for our livestock during the drought period. Low water requiring trees, shrubs and bushes having food and forage value provide much needed alternate livelihood security during drought. Khejri, a tree of genus Prosopis, natural to Rajasthan, provides livelihood security to both human beings and animals during severe droughts. These trees continue to grow green leaves during drought. There are number of other species like edible cactus (Opuntia ficus Indica) which serve as alternate food and fodder source during low rainfall years/situations. Such perennial trees, shrubs and bushes need to be promoted in all drought prone areas as a strategy for drought proofing.

7.6 Due to fewer possibilities of horizontal (total cropped area) expansion, the vertical expansion needs to be promoted through crop intensification and diversification with the introduction of pulses and oilseeds. Additionally, the conservation precision agriculture technologies need to be delivered on large scale for conserving natural resources, adapting to changing climatic scenarios, reducing land degradation, improving soil health, in-situ water conservation and improving water use efficiency. The promotion of farming systems approach will further improve the income of resource poor farmers.

8 Other General Matters

8.1. Government of India has taken up Rashtriya Krishi Vikas Yojana (RKVY) as a major vehicle for channelizing support to States in agriculture and allied sector. Assistance under RKVY is sizeable and assistance under other Centrally Sponsored Schemes (CSSs) is also likely to move towards being subsumed in RKVY. In this context, and also to focus States' attention on estimating their total requirement, it will be advisable if the States can draw up a programme of investment for the 12th plan period and then assess their total investment requirement. This exercise can be done as part of revamped State Agriculture Plan under RKVY. The Centre and the States can then work out how much of such investments can be funded by GOI under RKVY.

8.2. Ministry of Agriculture has rationalised plethora of centrally sponsored schemes in the sector by first undertaking a major consolidation exercise in the form of Macro- Management of Agriculture Scheme. There are still quite a few CSSs left in the agriculture, and more so in the animal husbandry sector. It is recommended that a further consolidation exercise should be taken up by the Planning Commission to convert existing CSSs into a few focussed schemes.

8.3. National Food Security Mission (NFSM) on Wheat has been started in selected districts of the wheat producing States by Ministry of Agriculture to increase production of wheat by 8 million tonnes by the end of 11th Plan. Only those districts having wheat productivity lower than the State average have been included in the NFSM-Wheat whereas non-NFSM districts also have the potential for increasing the wheat production. From the Twelfth Plan, it will be advisable to concentrate on all the districts of wheat producing States to tap the optimum potential of these areas. Crops such as maize and coarse cereals (sorghum and bajra) should immediately be included in NFSM. This has to be given high priority and major emphasis should be laid on covering more area under hybrids of these crops.

8.4. Technology development and dissemination is the key to ensure that newer and better varieties or package of practices are available to the farmers to achieve higher productivity levels. Mainstreaming and strengthening the extension/crop advisory services and putting input delivery mechanism with knowledge sharing to farmers through public-private partnerships is the key to improve

productivity at farm level. Additionally capacity building using modern ICT tools and an improved interface of farmers-researchers-extension-policy makers is vital to harness better outputs. In this context, building a cadre of Technology Agents and establishment of Agri-Clinics will go a long way in proper and efficient technology transfer to end users. For this, an aggressive vocational training programme at national level, involving SAUs should be taken up.

8.5. There is need to reform the process for collection of agriculture related statistics to correctly reflect the crop area, crop health and crop production. Apart from better coordination between Agriculture and Revenue Departments, it is necessary to use scientific inputs, particularly remote sensing techniques/data for better assessment of crop area, crop health and crop production. There is need to develop a system of recording crop data for horticultural crops as well. Entire statistical system needs to be revamped to cover all crops, to increase accuracy of data collection by conducting crop cutting at panchayat level, increasing sample size to make it more robust, and by ensuring timeliness for estimation at sowing stage, development stage and harvesting stage, and enhancing dependability in terms of accuracy and elimination of higher or lower bias.

8.6. Besides revamping statistical systems for collecting crop data, it is essential to collect data relating to weather parameters and monitor the same for taking corrective action. Tamil Nadu has created infrastructure for collecting weather related data at block level. Karnataka is developing a more ambitious system of collecting seven weather parameters at sub-block level. A national system of collecting and monitoring identified weather parameters should be developed and put in place using RKVY and other funds. The robust data will help in accurate weather forecasting by developing accurate early warning systems for farmers and policy makers.

8.7 The improvement of all our native breeds of cattle, buffalo, sheep, goat, horses, camel and poultry birds need to be emphasized by assigning specific responsibility and targets to all the State Agriculture Universities, ICAR institutes and State Departments of Animal Husbandry. Private sector too should be involved and encouraged to undertake breeding as a business proposition. Financial resources for this purpose need to be provided both by the Union and State governments. For a sustained growth of the rural economy, the development of live stock sector is equally important. In order to give focused attention to the animal husbandry sector, the States may consider setting up of separate Universities of Veterinary and Animal Sciences. Also, the Union Government should set up a "Livestock Mission" on the lines similar to "National Horticulture Mission".

8.8 In most dry and rainfed regions of India, farmers have retained the traditional practices of dry land farming. The mixed cropping is practised in the semi-arid areas of Southern India particularly in Karnataka and Andhra Pradesh. It is a shrewd combination of different crops and a diversity of varieties to ensure food security through the complementarity of crops in terms of nutrient availability, water holding capacity, and sustainability of small farming systems. The finger millet (ragi), groundnut, sorghum, pigeon pea are the crops which are often a part of various crop combinations. In the Deccan Plateau, these crops serve to meet the family consumption and they ensure a fairly balanced diet, the millets being used as a staple, and the pulses providing much needed protein. Ragi is a very hardy crop as well as a grain of great nutritive value and produces good quality

fodder for cattle. There is need for special attention to technological interventions for the scientific cultivation of these crops and also for other high value crops like sunflower, oil palm, coconut and banana in Southern India. Hence, much needed policy support for the cultivation of these crops will have direct impact on food and nutritional security in the southern region.

8.9. Use of plastic materials in agriculture (plasticulture) is a recent development in the field of agriculture, which has been acknowledged world over for enhancing agricultural production as well as quality of produce. To be competitive at marketplace, vegetables and high value crop growers are striving for quality produce, superior yields, and extended production cycles through plasticulture. It is a management tool that enables producers to realize greater returns and often used by peri-urban farmers. Besides, dairying, sericulture, aquaculture, bee keeping, mushroom cultivation, floriculture etc. can help maximize the income of farmers. The use of plastic as mulch and for soil solarisation has also helped in increased production and efficient water use. Hence, efforts to promote use of plastics in agricultural operations should be encouraged henceforth and the required subsidy provisions be put in place.

8.10. Minimum Support Price (MSP) for pulses and oilseeds and vegetables, especially Potato, Onion and Garlic, should also be fixed by GOI. Current policy on MSP de-promotes the pulses, oilseeds and other vegetables. The MSP on pulses, oilseeds and major vegetables will encourage crop intensification and also ensure nutritional security. Additionally, it will be profitable in monetary terms also as the imports of pulses and oilseeds will be reduced. Also procurement policy be extended to all those crops which are covered under MSP by the Government. The CACP methodology of calculating cost of cultivation is highly flawed and unscientific. It needs to be revisited to make it more realistic either on the lines of BICP formula used for estimating industrial costs or preferably the MSP should be at least 50% higher than the cost of cultivation as suggested by Farmers' Commission headed by Dr. M.S. Swaminathan.

8.11. Various schemes/programmes on agriculture development are being run by different Departments and Ministries at the Centre and in the States. There is need to have convergence in their implementation. For this, a coordination mechanism for Ministries of Agriculture, Rural Development, Food and Public Distribution, Irrigation, Fertilisers and Power etc. in the Central/State Government is urgently needed. Also a Scientific Advisory Council on Agriculture under the Chairmanship of Prime Minister should be created to give focused attention to development and implementation of programmes of agriculture development. Similar mechanism should also be created in each State under the chairmanship of Chief Ministers.

8.12. Also at the State level, various aspects of agriculture development are handled in different departments like Irrigation, Energy, Institutional Finance, Cooperation, Rural Development, Science & Technology etc. There are now separate departments for crops, horticultural crops, agriculture marketing, animal husbandry, fisheries, soil conservation and watershed development. Similar disjointed machinery exists at district level. States may consider bringing all agriculture and allied sector related production programmes under the Agriculture Production Commissioner, for coordinating with other allied departments. Chief Secretaries will have to take increased responsibility and devise effective mechanisms. Collectors have to be entrusted with this responsibility at the district level in order to

facilitate smooth functioning of schemes for efficient delivery of services to the farmers.

8.13 Policy intervention is also needed for the promotion of new/alternative nutrient sources like liquid nitrogen. Emphasis must also be laid on the balanced use of fertilizers with adequate support for micronutrients, especially zinc, iron and boron. For pulses and oilseeds, use of Sulphur should be a high priority. The fertilizer application methods and tools (like granulated urea application in rice, liquid nitrogen drill etc.) also need to be revisited to improve nutrient use efficiency (NUE) and balanced use of fertilizers. The current policies somehow lead to an imbalanced use of fertilizers, which has to be corrected. Subsidy on fertilizers should be provided directly to the farmers instead of producers so as to promote its increased use for higher crop productivity.

8.14. Currently, we are experiencing major problem of protein malnourishment of children below 5 years of age. To address this problem, consumption of soybean, which is a rich source of protein, in various forms should be encouraged, rather than exporting soya meal having around 40% protein. Cultivation of soybean in India is a success story and it is being used extensively in south-east Asia as a major food crop. Its use as soya tofu (paneer), soya milk, curd, ice cream, biscuits and soya flour, if promoted, can address to a great extent protein demand for our predominant vegetarian society. Hence, policy intervention and concerted efforts in this regard would help ensuring nutrition security in India.

8.15 A massive effort for building modern silos to arrest post harvest losses of foodgrains is needed at the national level. Hence, immediate action is warranted to build required infrastructure for storage through both public and private sector interventions as a national priority. Funds under RKVY could also be used for this purpose. There is also an urgent need for a long term policy on buffer stocking of food grains so as to build commensurate storage capacity in different parts of the country.

8.16 To meet emerging challenges, there is need to have a strong R & D system in place. India has built an extensive National Agricultural Research System (NARS), which needs to be revamped and revitalized. For this, our current investment must be doubled to remain globally competitive.

8.17 A comprehensive policy for insurance coverage of all important food crops and live stock needs to be put in place on priority and the same should be implemented for which additional funding support should be provided by the Centre. National crop insurance scheme should be made farmer friendly and village should be made as a unit instead of the Block. Weather based crop insurance scheme should be made affordable for the farmers. Insurance must also be extended to dairy animals as a matter of priority.

8.18 The norms of Calamity Relief Fund (CRF) should be revised and the compensation for the loss of crops due to natural calamities like flood/drought/frost should be enhanced to at least Rs.25,000 per hectare. The States should also be allowed to use at least 10% of the funds under CRF for prevention of flood and drought in advance to minimize the impact of such natural calamities.

Conclusions

Considerable scope exists for increasing agricultural production in India. We can certainly meet our food demand and increase the availability of foodgrains, pulses, oilseeds vegetables, fruits, milk, etc. substantially by appropriate research,

extension and policy interventions. What is needed is harnessing available options and resources through proper institutional mechanisms, out-scaling of innovations, convergence of programmes and effective monitoring systems at all levels. Much is possible to achieve through policy interventions suggested in this report. Let us, therefore, move forward in a Mission Mode approach to implement various recommendations made in this report and review them periodically for desired progress.

The suggested strategy for increased food production, as suggested in the report, will add around 80 to 100 million tonnes of extra food grains in next 5 years. As such, a target of around 300 million tonnes of food grains is achievable by 2015 provided an effective monitoring and implementation programme by all States and the Centre is put in place.

9 Rainfed Farming

9. Status of rainfed area

9.1 About 60% (80 million hectares) of the cultivated area in India is rainfed. Out of the total food production in the country, 44% is from dry land farming which also supports about 40% of the population, mostly belonging to the poorer sections of the society. Approximately 85 to 95% of the coarse cereals, 89% pulses, 80% oil seeds 65% cotton and 45% rice is grown in the rainfed areas besides supporting nearly 60% of the livestock population. Green Revolution almost was confined to the well endowed irrigated areas leaving the rainfed areas neglected. But it can be the arena for the Second Green Revolution if issues of technology, water management, risk and profit sharing, improving productivity and profitability of the farm and non-farm sectors are holistically addressed. It is expected that even when all the water resources have been developed, between 45-50% net cultivated area will continue to be rainfed. Therefore, a business as usual approach would not suffice. A more dynamic and innovative approach is the need of the hour.

9.2 The National Agricultural Research Systems under the pioneering leadership of ICAR have helped in improving the productivity of rainfed crops from about 500 kg in 1960s to the current level of about 1 MT. However, this improvement is considerably low when compared to the progress achieved in the irrigated areas.

9.3 The impact of climate change is likely to further aggravate the problems of rainfed agriculture. The rainfall pattern is likely to undergo changes and in future more skewed distribution is predicted. Increased temperatures are also likely to affect the crop performance particularly during rabi season. Intense rains are also likely to cause more soil erosion and runoff potential of different regions. The major challenge lies in securing the livelihoods of the small and marginal farmers who dominate the rainfed regions in the wake of climate change which can cause more crop failures and loss of investments. In addition to use of location-specific technology for climate proofing rainfed agriculture, suitable policy initiatives in terms of insurance, preferential credit, strengthening infrastructure and extension services are also needed.

9.4 Productivity and farm income in the irrigated green revolutionized regions is almost stagnating; factor productivity is declining, cost

of cultivation is going up. There is over-exploitation of ground water resources, greater consumption of energy and overall degradation of the natural resources. Despite this, rainfed agriculture has performed better than the irrigated agriculture especially in the states like Andhra Pradesh, Maharashtra, Gujarat and to some extent in Bihar and Chattisgarh. There is no option but to enhance the productivity and profitability of the rainfed areas.

9.5 A Second Green Revolution, focusing on the rainfed areas is possible only through a technological breakthrough in the use of bio-technology to strengthen conventional breeding methodology by evolving plant varieties resistant to pest and diseases, tolerant to adverse weather conditions, better nutritional value and enhanced durability of product. The State Agricultural Universities (SAUs) and Research Institutes should get a higher budgetary support for R&D in developing new and improved technologies. It is particularly significant to meet the emerging challenges such as impact of climate change on the agriculture sectors. R&D effort should also extend to development of effective post harvest technologies and farm mechanisations. All over the world there is higher mechanization in the rainfed agriculture since cultivation and farming operations have to be completed within a limited period before the loss of soil moisture during the rainy season. It is also true that rainfed farmers are relatively poor and do not have the capacity to invest in expensive machinery for land shaping, cultivation, making beds and furrows, ridge sowing and inter-culturing so important for managing rainwater. Hence less expensive modern farm machinery needs to be developed for doing traditional labour intensive activities like transplanting inter-cultural operations, harvesting of sugarcane etc. Financial support and affordable credit should be provided for promoting custom hiring services by user groups, Self Help Groups (SHGs), private entrepreneurs, etc for this purpose.

9.6 Management of water, particularly ground water, is key to success in rainfed area cultivation. This is one of the most important investments for realizing sustainable high productivity with minimum risk. Expert advisory services need to be arranged to prevent farmers from entering into risky adventures and over utilization of ground water. Investments should be spared for encouraging most efficient micro irrigation and land uses to cut on the demand of ground water. Regular recharging of ground water to replenish depleted resources is necessary to improve the supply. Drip irrigation and sprinkler irrigation can be very effective in conserving water at the farm level and in raising the productivity per unit of water. Water conservation and water harvesting works need to be taken up at a large scale in these areas. Ground storage by recharging aquifers through check dams and farm ponds should be undertaken on a campaign basis all over the country.

9.7 Better agronomy practices are the key to efficient rainfed area cultivation. Soil health, improvement, judicious and scientific use of nutrients, enhancement of water use efficiency and Seed Replacement Rate (SRR) are basic requirements to increase productivity in this sector.

9.8 A diversified cropping pattern is necessary to cope with risk and uncertainty associated with rainfed farming. Diversification envisages promotion of economically better commodities, crops, improved varieties, high yielding breeds; fast growing tissue cultured planting material, horticulture as well as resource conserving technologies. Productivity of the cold

dryland agriculture of India is several times higher than that of hot dryland agriculture because of cultivation of apples and other temperate fruits, disease-free production of potato, vegetable seeds and proper marketing.

9.9 New approaches to extension services with the aim and integration of research-extension-farmers-market linkages needs to be encouraged. The Extension System needs to be re-engineered with active participation of all stakeholders, namely Government agencies, Corporate Sector, NGOs, Farmer Organizations, Input Dealers and Self Help Groups. In other words, a new concept of Private-Public- People Participation in extension with a strong linkage with the market needs to be evolved.

9.10 Institutionalised and non-institutionalised credit plays a significant role in enhancing productivity of the rainfed agriculture. Because of higher level of risks, the credit policy of the rainfed agriculture has to be devised very specifically. Short term crop loans should be redesigned as medium and long term loans with staggered and recycling of the repayments. Loan for consumption should also be allowed so as to avoid diversion of crop loans for domestic consumption or social functions. Deferment in payment of interest, principal or both under specific adverse conditions should be a part of the credit policy. In order to discourage private loans at exorbitant rates of interest, micro-financing through SHGs especially of women can ensure alternate services and alleviate distress to a significant level.

9.11 Limited public investment portfolio in rainfed farming can be enhanced by harmonizing and harnessing resources of various social and rural development schemes/programmes. Bottom up participatory plans generated at the village, block and district level by qualified and committed professionals, planners and governance will be a very crucial exercise. MGNREGA with its substantial budgetary resource has potential for providing additional hand-holding to the rainfed farming as well. It would be prudent to integrate MGNREGA fully with watershed management programmes. Schemes like MNREGA should not restrict labour availability during agricultural operations. As a result of shortage of farm labour during peak agricultural operations and the high labour cost, farmers with larger land holdings are often reported to be leaving their farms fallow: a situation which is best avoided. It is also a viable option to utilise the MNREGA funds for work programmes in the private lands which at present is confined only to certain categories, like the land of SC/ST, marginal farmers, etc. The MNREGA funds can also be spent on labour engaged by the farmers now excluded, through suitable amendments in the Act to facilitate this. The same analogy, the farmers in the rainfed/dry land area may also be made eligible to get subsidy on farm labour.

9.12 Financial incentives may be given to marginal farmers in the rainfed areas for growing crops for the sake of food security. The difference between the cost of the crop which the farmer is compelled to grow for food security and that which he desires to grow should be compensated instead of giving subsidy on food. Similarly farmers of rainfed areas with the larger land holdings may be incentivised by way of providing 50% of labour charges. In return quantities of pulses, oil seeds and foodgrains equivalent to the value of 50% labour charges may be recovered from such farmers as levy for distribution through the PDS. A suitable scheme may be drawn up for this purpose.

9.13 The National Rainfed Area Authority (NRAA) was set up with the sole purpose of meeting the needs of the Rainfed Areas. A National Mission for Development of Rainfed Agriculture" should be established at the earliest to converge and fill up the identified gaps to achieve sustainable food nutrition and farm income security.

9.14 Recommendations:

9.14.1 To achieve a Second Green Revolution, concerted efforts on a Mission Mode with focus on the pan-Indian nature of the problem of Rainfed Area farming will have to be addressed. To formulate a roadmap for this purpose, the following recommendations may be considered:-

a) To ensure that the entire farm land is put under farming, the farmers of rainfed areas with larger land holdings may be incentivised by way of providing 50% labour charges through MGNAREGA. In return quantities of pulses, oil seeds and food grains equivalent to the value of the 50% labour charges may be recovered from such farmers as levy for distribution through the PDS. A suitable scheme may be drawn up for this purpose.

b) Women farmers play a significant role in rainfed farming especially when there is an out-migration of men to cities. Programmes such as Mahila Kissan Shashaktikaran Pariyojna should be encouraged so that women farmers have access to land, credit, technology and market.

c) Just as Aasha workers under the National Rural Health Mission, it is possible to enrole an army of trained "Kissan Bandhus" attached to the Krishi Vigyan Kendras across the country who could help the farmers through extension activities.

d) A Consortium Approach may also be attempted wherein the Corporate Sector, State Agricultural Universities, State Agriculture Departments, NGOs and Farmers organisations turn into Consortium Partners and work towards production of commodity as well as for improving the resource base through Dryland Horticulture and Soil-water Management.

e) A National Mission for Development of Rainfed Agriculture should be established with defined outcomes and convergence with line Ministries/ Departments and State Governments. It should aim at a holistic development of the rainfed areas, fill the identified gaps and achieve sustainable food nutrition and farm income security in the Rainfed areas.

10 Crop and Region Specific Strategies

FOODGRAINS

Rice

During the last decade, the rice growing regions have witnessed stagnation both in productivity and production. The major thrust has to be on increasing area and productivity in Eastern India, especially Assam, Bihar, Orissa, Jharkhand, West Bengal and Eastern UP to achieve the yield levels that are equivalent to national average.

Constraints:

- Non-adoption of good quality varieties and hybrids
- Inadequate agronomic management
- Poor nitrogen use efficiency
- Incidence of diseases and pests
- Poor dissemination of improved technologies
- Problem of crop residue management

Target:

Additional production of approximately 38.00 million tons (Table 2) of rice can be achieved through adoption of improved varieties and agronomic practices. The national rice productivity is 2.186 tonnes / hectare. It can easily be enhanced to the level of 2.5 tonnes / hectare in Eastern U.P., Orissa, Jharkhand, Assam and Bihar where productivity is below national average. Similarly, the states like Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, West Bengal and Haryana can easily achieve productivity level of around 4.00 tonnes / hectare as achieved in Punjab. Accordingly, 20.94 million tonnes can be added further.

Table 2 Estimated Production of Rice by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (2.186 t/ha)	**Target to achieve 2.5 t/ha**			
U.P.	2.171	0.329	4.29	1.41
Orissa	1.52	0.98	4.45	4.36
Chhattisgarh	1.176	1.324	3.75	4.97
Assam	1.72	0.78	2.32	1.81
Bihar	1.61	0.89	3.57	3.18
Jharkhand	1.947	0.553	1.65	0.91
Eastern U.P.	1.61	0.89	1.42	1.26
Total				**17.90**
States Above National Productivity (2.186 t/ha)	**Target to achieve 4.022 t/ha**			
Punjab	4.022	0	2.61	0.00
Haryana	3.008	1.014	1.08	1.10
A.P.	2.347	1.675	3.98	6.67
T.N.	2.51	1.512	1.79	2.71
WB	2.646	1.376	5.72	7.87
Karnataka	2.434	1.588	1.42	2.25
Kerala	2.514	1.508	0.23	0.35
Total				20.94
Overall Increase				**38.84**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

There are a number of constraints for the rice-wheat cropping system. These can be overcome by the following practices:

- Promotion of "Boro Rice" in the eastern part of India: This is the traditional practice of cultivating rice during post rainy and flood free period with least risks. It requires relatively long duration varieties. Productivity of boro rice is about 2-3 times higher than summer rice but it requires assured irrigation. It can be promoted in States of West Bengal, Assam, Orissa, Eastern UP, Bihar, etc. having sufficient ground water resources. Installation and incentivisation of shallow tube wells or supplemental irrigation from water streams are recommended. However, areas where ground water is showing declining trends as in some blocks/districts of West Bengal, Boro rice cultivation should be discouraged.
- Adoption of hybrid rice cultivation: The area under hybrid rice can be enhanced from current 1.5 m ha to around 5.0 m ha in the next five years to increase the rice

production. At least 30-40% area in eastern region can easily be brought under hybrid rice. Similarly, 10-15% area can be targeted for coverage under hybrids in other rice growing States.

- Use of granulated Urea: Promotion of granulated Urea application would help in enhancing Nitrogen use efficiency. However, there is need to develop efficient applicator.
- Balanced use of fertilizers has to be promoted in all the rice growing states in general and in eastern India in particular.
- Promotion of improved Agronomic Practices like laser land levelling, direct seeded rice, bed planting, SRI, zero tillage, use of quality input, high yielding rice varieties and better crop stand need urgent attention.
- Integrated pest (IPM) and weed management (IWM) practices are to be promoted.
- Seed Replacement Rate (SRR) should be achieved at least to the level of 30-40% for the varieties and up to 100% for hybrids.
- Nursery raising and transplanting dates for paddy should be not before 15th May and 15th June, respectively in Punjab, Haryana and Western U.P.
- Mechanization of rice cultivation is also required in order to promote timely sowing/ planting and ensure reduction of operational cost and drudgery of women. Promotion of mechanical transplanting in rice will reduce cost and labour problem. Implements to be promoted include: paddy transplanter, laser land leveller, zero till multi-crop planters for direct seeding and happy / turbo seeder for residue management.

Researchable issues

- Development of rice hybrids especially for the eastern region
- Development of high yielding and water use efficient rice hybrids/varieties.
- Development of technologies including machines and tools to reduce the cost of cultivation.

Wheat

The current population growth (1.6% per annum) will require additional wheat production, which is a cause of concern for the national food security. The thrust should, therefore, be on increasing productivity in Eastern India which includes Bihar, Orissa, Chhattisgarh, Jharkhand, West Bengal and also in Madhya Pradesh so as to achieve yields equivalent to the national average.

Constraints:

- The productivity in rainfed areas is low, whereas scope exists for improvement. Also, the wheat varieties tolerant to heat, cold, water stress etc. are to be developed.
- Only a selected few varieties are covering major area in irrigated wheat production zones which is of great concern. There is a need to develop varieties which resist terminal heat and also give normal yields in non-terminal heat season.
- Quality seed and inputs are not available in time.
- Factor productivity has gone remarkably down due to deteriorating soil health and less availability of water. There is strong need of site specific nutrient management by promoting soil health cards.

Target:

An additional around 30.00 million tons wheat production (Table 3) can be achieved through better agronomic management. The national wheat productivity is 2.891 t/ha. If 3 t/ha productivity is achieved in West Bengal, Bihar, Jharkhand, Gujarat, Assam, Uttarakhand, H. P., J. & K., Eastern U.P., Maharashtra and M.P. where present productivity is below the national average, it can add around 15.00 m t to wheat production. Similarly, attaining productivity equivalent to Haryana, in the States of Punjab, Western U.P. and Rajasthan, where productivity is above national average, will further add 15.00 m t of wheat production.

Table 3 Estimated Production of Wheat by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (2.891 t/ha)	**Target to achieve 3 t/ha**			
W.B.	2.6	0.400	0.35	0.14
Bihar	2.05	0.950	2.16	2.05
Gujarat	2.4	0.600	1.27	0.76
Maharashtra	1.451	1.549	1.25	1.94
M.P.	1.723	1.277	3.74	4.78
Assam	1.154	1.846	0.06	0.11
Uttarakhand	2.151	0.849	0.4	0.34
Jharkhand	1.5	1.500	0.09	0.14
H.P.	1.653	1.347	0.37	0.50
J&K	1.836	1.164	0.28	0.33
Karnataka	0.903	2.097	0.28	0.59
Eastern U.P	2.05	0.950	2.28	2.17
Total				**13.85**
States Above National Productivity (2.891 t/ha)	**Target to achieve 4.614 t/ha**			
Haryana	4.614	0	2.46	0.00
Punjab	4.45	0.164	3.49	0.57
U.P.	3.002	1.612	6.84	11.03
Rajasthan	3.047	1.567	2.59	4.06
Total				**15.66**
Overall Increase				**29.51**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Emphasis on timely sowing of wheat and adoption of suitable varieties recommended for different agro-climatic conditions. However, wheat sowing should be completed before 15th December and delayed planting be avoided/banned.
- Ensure timely availability of quality inputs.
- Use of resource conservation technologies like use of laser land levelling, Surface seeding, Zero-till-sowing, Furrow Irrigated Raised Bed-planting System (FIRBS), residue management in zero till systems using new planters like Turbo Seeder etc., which have given significant yield increase and reduction in cost of cultivation, need to be popularized.
- Seed Replacement Rate (SRR) of 20% has to be targeted especially in eastern India and around 30-35% in other states.
- The durum wheat cultivation has to be promoted in Madhya Pradesh and Maharashtra.

Researchable Issues:

- Development of terminal heat tolerant wheat varieties.
- Development of low input requiring short duration high yielding varieties.
- Emphasis on hybrid wheat development.

Maize

Among the cereals, maize is a high potential crop. In India, its production has increased from 15.1 m t in 2006-07 to 19.29 m t in 2008-09 mainly with the development and use of a number of single cross hybrids. The productivity level of 2 t/ha has been attained, which amply demonstrates the future potential of maize in India. Moreover, the expansion of area in eastern U.P., Bihar, Jharkhand, West Bengal by almost 1 m ha during last decade is a positive indication as well. Besides the local demand for food and fodder, there is a considerable scope for export as animal feed for pig and poultry production in the South East Asia, as well as China. All N.E. states also have good potential for maize production. Indian scientists have brought about a mini-revolution in maize by developing high yielding single cross hybrids which are not only superior in yield but also rich nutritionally, known as Quality Protein Maize (QPM). Hence, high performance of QPM single cross hybrids warranted maize to be included in the NFSM which currently covers only wheat, rice and pulses.

The thrust on introduction of high yielding single cross maize hybrids is required in Eastern states of India and also in the areas where rice-wheat or rice-rice cropping systems are showing strain.

Constraints:

- Quality seed availability of single cross hybrids is low (around 40%) and hence, there is need for strong public-private partnerships.
- High degree of biotic and abiotic stresses
- Poor farm mechanization in maize production

Target:

Currently, taking the average of last 15 years, maize is having 5.39% growth rate. Maize being a high potential crop can help immensely in meeting out the additional food demand of 6 m t per year. The national productivity of maize is 2.355 t/ha. In states like Rajasthan, U.P., M.P., Gujarat, J&K, Maharashtra, H.P. and Jharkhand where

productivity levels are below national, the productivity level can be enhanced to national average. It will add 3.20 m t to total production. Similarly, if the productivity of Karnataka, Tamil Nadu, Punjab and West Bengal, where it is higher than national level, is enhanced equivalent to the productivity of A.P., then additional production of 2.37 m t can be achieved. In this way, total additional production of 5.57 m t of maize can be achieved (Table 4).

Table 4 Estimated Production of Maize by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (2.355 t/ha)	**Target to achieve 2.355 t/ha**			
Rajasthan	1.86	0.495	1.05	0.52
Bihar	2.274	0.081	0.64	0.05
U.P.(including E.U.P.)	1.443	0.912	0.84	0.77
M.P.	1.288	1.067	0.88	0.94
Gujarat	1.375	0.98	0.42	0.41
J & K	1.569	0.786	0.3	0.24
Maharashtra	2.283	0.072	0.67	0.05
H.P.	2.267	0.088	0.3	0.03
Jharkhand	1.509	0.846	0.24	0.20
Total				**3.20**
States Above National Productivity (2.355 t/ha)	**Target to achieve 4.607 t/ha**			
A.P.	4.607	0	0.79	0.00
Karnataka	2.827	1.78	1.11	1.98
T.N.	4.055	0.552	0.22	0.12
Punjab	3.404	1.203	0.15	0.18
W.B.	3.425	1.182	0.08	0.09
Total				2.37
Overall Increase				**5.57**

Source: Agricultural Statistics at a Glance, 2009, GOI

Action Plan:

- Promotion of cultivation of single cross and Quality Protein Maize (QPM) hybrids for increasing current area under hybrids from existing 40% to 70-80% in the next 4-5 years will double the maize production.
- Public-Private Partnerships should be encouraged for the development of single cross hybrids and also for the development of processing and dissemination of technologies.
- Special thrust to increase the area under winter maize in Eastern UP, Assam, Bihar and Jharkhand.
- Farm mechanization should be promoted. Zero-tillage during winter under rice-maize systems for timeliness in planting and reduced cost of production.
- Since maize has multiple uses like poultry feed, processed food and nutritional animal feed, beside its use for starch, collaboration with industries should be promoted.

Researchable Issues:

- Thrust should be given on the development of high yielding single cross and QPM hybrids and their seed production.
- Developing high yielding stress tolerant single cross hybrids.
- Heat tolerant single cross hybrids for spring season.
- Cold / frost tolerant winter maize
- Development of technology for the management of insects, pests and diseases.
- Development of efficient machinery for mechanization.
- Value addition, processing and post harvest technologies.

Pearl Millet

Pearl millet is the most important drought and heat tolerant crop. Among cereal crops, it has the highest water use efficiency under drought stress. This crop has high scope of production in the states like South-West Haryana, Rajasthan and Gujarat, besides a number of states in eastern and southern part of India. More coverage of area under latest hybrids in all the pearl millet growing states should be the thrust.

Constraints:

- Problem of bird damage.
- Inadequate availability of quality seed of hybrids.
- Poor adoption of recommended package of practices.
- Downy mildew disease problem.
- Occurrence of frequent drought in bajra growing region.

Target:

An additional 2.00 m t (Table 5) of pearl millet production can be achieved if the productivity of Rajasthan, Maharashtra, Karnataka, A.P. and J&K. are brought to the level of national average and the productivity of U.P., Gujarat, M.P. and Tamil Nadu is enhanced to the level of Haryana.

Table 5 Estimated Production of Pearl Millet by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (1.011 t/ha)	**Target to achieve 1.011 t/ha**			
Rajasthan	0.828	0.183	5.08	0.93
Maharashtra	0.795	0.216	1.28	0.28
Karnataka	0.702	0.309	0.43	0.13
A.P.	0.983	0.028	0.07	0.00
J & K	0.57	0.441	0.02	0.01
Total				**1.35**
States Above National Productivity (1.011 t/ha)	**Target to achieve 1.769 t/ha**			
Haryana	1.769	0	0.63	0.00
U.P.	1.609	0.16	0.88	0.14
Gujarat	1.298	0.471	0.92	0.43
M.P.	1.373	0.396	0.18	0.07
T.N.	1.435	0.334	0.06	0.02
Total				0.66
Overall increase				**2.01**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Large scale adoption of high yielding early maturing hybrids tolerant to drought.
- Application of appropriate agronomic practices such as optimum seed rate, timely sowing, optimum plant population, IPM, INM, IWM, etc.
- Strategy should be to have 100% seed replacement.
- Strengthening of public-private partnerships for hybrid research and seed production.
- Ensure one supplemental/life/crop saving irrigation.

Researchable Issues:

- Development of downy mildew resistant, drought/heat tolerant, and short duration hybrids.
- Development of hybrids having minimum losses from birds.
- Post harvest processing, value addition and development of quality products

Sorghum

It is a very important dual purpose crop. Both grains and fodder are equally important, though it varies from region to region. In Gujarat, it is

grown in both kharif as well as rabi seasons for dual purpose. In Rajasthan and Haryana, it is extensively grown for green fodder purpose with single-cut and multi-cut forage sorghum varieties. Thrust should be on rabi sorghum with the introduction of improved sorghum hybrids as its demand continues to increase for both food and fodder.

Constraints:

- Inadequate availability of good quality seed of hybrids/varieties.
- The problem of pests and diseases.
- Lower profit and non-competitiveness with cotton, sunflower and pulses.
- Low adoption of improved production technologies.

Target:

The national productivity of sorghum is around 1.00 t/ha. Additional production of around 1.20 m t can be targeted (Table 6) if the states like Maharashtra, Rajasthan, Tamil Nadu, U.P., Orissa and Haryana achieve yield equivalent to the national average and states like Karnataka, M.P., A.P. and Gujarat attain productivity equivalent to A.P. (1.42 t/ha).

Table 6 Estimated Production of Sorghum by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (1.021 t/ha)	**Target to achieve 1.021 t/ha**			
Maharashtra	0.965	0.056	4.16	0.23
Rajasthan	0.631	0.39	0.63	0.25
T.N.	0.875	0.146	0.28	0.04
U.P.	0.817	0.204	0.21	0.04
Orissa	0.624	0.397	0.01	0.00
Haryana	0.453	0.568	0.09	0.06
Total				**0.62**
States Above National Productivity (1.021 t/ha)	**Target to achieve 1.42t/ha**			
A.P.	1.42	0	0.33	0.00
Karnataka	1.136	0.284	1.38	0.39
M.P.	1.117	0.303	0.53	0.16
Gujarat	1.227	0.193	0.13	0.03
Total				0.58
Over all increase				**1.20**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Popularization of best agronomic practices including use of improved varieties/ hybrids.
- Promotion of alternate use of sorghum through better industrialization to produce novel food products, potable alcohol from molded grain, lager beer, high fructose syrup, liquid and powder glucose and sorghum ethanol as bio-fuel.
- Promotion of rabi sorghum with efficient agronomic practices since area under rabi sorghum is almost static.

Researchable Issues:

- Development of high yielding hybrids.
- Development of tall, dual purpose, stay green sorghum through population improvement and recurrent selection best suited for different regions.
- Need to evolve multi-cut sorghum-sudan grass hybrids having lower Hydro Cynic Acid (HCN) content.

Pulses

India is the major producer and consumer of pulses. Unfortunately, productivity is still less than 1.0 t/ha. To meet the minimum requirement of 12 kg per capita of pulses, there is a need to double the production. Thrust is required on the adoption of comprehensive and well planned mission approach to accelerate pulses production with increase in the average productivity of 0.659 t/ha to 1.0 t/ha and increasing area under pulses through inter and intra crop pulse cultivation.

Constraints:

- High yielding varieties resistant to various pests and diseases and also tolerant to abiotic stresses are limited.
- Poor adoption of recommended package of practices, particularly inadequate use of nutrients especially Sulphur and Zinc.
- Poor dissemination of improved technology.
- Non-availability of quality seeds

Target:

An additional production of 4.24 m t (Table 7) of pulses can be achieved if the productivity level of the states like Maharashtra, Orissa, Rajasthan, Karnataka, Chhattisgarh and Tamil Nadu enhanced equivalent to the national average and productivity in the states viz. A.P., U.P., Gujarat, Bihar, Jharkhand, M.P. and West Bengal is enhanced to the level achieved in Haryana.

Table 7 Estimated Production of Pulses by Achieving the Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (0.659t/ha)	**Target to achieve 0.659 t/ha**			
Maharashtra	0.555	0.104	4.06	0.42
Rajasthan	0.467	0.192	3.87	0.74
Karnataka	0.465	0.194	2.38	0.46
Chhattisgarh	0.546	0.113	0.92	0.11
Orissa	0.473	0.186	0.86	0.16
T.N.	0.309	0.35	0.61	0.21
Total				**2.10**
States Above National Productivity (0.659 t/ha)	**Target to achieve 1.032 t/ha**			
Haryana	1.032	0	0.17	0.00
A.P.	0.821	0.211	2.11	0.45
U.P.	0.908	0.124	2.16	0.27
Gujarat	0.757	0.275	0.88	0.24
Bihar	0.804	0.228	0.61	0.14
Jharkhand	0.754	0.278	0.41	0.11
M.P.	0.81	0.222	4.03	0.89
W.B.	0.816	0.216	0.19	0.04
Total				2.14
Overall Increase				**4.24**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Promotion of hybrids particularly of pigeon pea for northern and western regions.
- Promotion of cultivation of improved varieties of Kabuli gram in the north.
- Popularization of improved short duration, disease resistant varieties of various pulses through large scale field demonstrations to overcome existing yield gaps (25-30%).
- Short duration varieties need to be promoted in new areas such as chickpea in south, urd bean in rice-fallows in coastal region of Andhra Pradesh, Orissa and West Bengal, pigeon pea in the north-west (Haryana, Gujarat and Rajasthan), mung bean in north (Western UP, Haryana and Punjab) etc.
- At least 50% area of rice-wheat system to be covered with new short duration disease resistant varieties of mung bean in between (catch crop) the two crops.
- Use of Rhizobium culture and bio-fertilizers to be promoted.

- Use of Sulphur and other micronutrients in deficient regions is to be popularized. The striking 20-30% increase in pulse yield has been obtained with the application of Sulphur and Zinc.
- Promotion of IPM technology.
- One life saving irrigation or supplemental irrigation will enhance production substantially.

Researchable Issues:

- More emphasis is to be given on the development of high yielding varieties/ hybrids in Kabuli gram and Lentil.
- Development of drought and disease resistant varieties (Yellow Vein Mosaic and Pod Borer).
- IPM technology for different crops and regions.

Estimated Additional Foodgrain Production Based On Targeted Productivity:

The States having above national productivity can be brought at par with the states having highest productivity of different crops through better management practices and creation of required infrastructure as their resource endowments are almost similar to the highest productivity states. By achieving the productivity equivalent to national average in states having average productivity below national level and equivalent to the highest productivity in foodgrains in states having productivity above national average, an estimated additional increase in foodgrains of 81.37 m t can be obtained (Table 8).

Table 8 Estimated Additional Foodgrains Production by Achieving Targeted Productivity

Crop	Additional production (m t)			
	National average (t/ha)	Below national average states	Above national average states	Total
Rice	2.186	17.90	20.94	38.84
Wheat	2.891	13.85	15.66	29.51
Maize	2.355	3.20	2.37	5.57
Pearl millet	1.011	1.35	0.66	2.01
Sorghum	1.021	0.62	0.58	1.20
Total cereals		36.92	40.21	77.13
Pulses	0.659	2.10	2.14	4.24
Total food grains		**39.02**	**42.35**	**81.37**

Source: Agricultural Statistics at a Glance 2009.

11 Crops & Region Specific Strategies : Oilseeds

At present, area under oilseeds is 27.46 m ha and the total oilseed production is 29.76 m t which is less than the demand. The average productivity is 1026 kg/ha, while the potential yield is 2000 kg/ha. The potential oilseed crops in India are groundnut, rapeseed and mustard, soybean, castor and sunflower. The thrust has to be given on improvement of productivity levels of potential oilseed crops through technological interventions.

Constraints:

- High yielding varieties tolerant to abiotic and biotic stresses are limited. Varieties resistant to frost in rapeseed and mustard are needed.
- Inadequate availability of quality seed, especially of groundnut.
- Poor know-how regarding application of Sulphur and Zinc.
- Disease and insect pest problems.
- Inadequate availability of suitable machines and tools for pre & post harvest management.

Groundnut

With current area (6 m ha), production target of 10 m t can be achieved with well targeted efforts. Orissa and Bihar offer new area options with higher productivity, which also need to be explored.

Target:

The groundnut production can be enhanced by 1.34 m t (Table 9) if the productivity level of A.P., Karnataka, Maharashtra, M.P., Orissa and U.P., which is below the national level, are brought equivalent to national level and the productivity levels of Gujarat and Rajasthan are increased equal to the productivity of Tamil Nadu.

Table 9 Estimated Production of Groundnut by Achieving Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (1.459 t/ha)	**Target to achieve 1.459 t/ha**			
A.P.	1.451	0.008	1.8	0.02
Karnataka	0.807	0.652	0.91	0.59
Maharashtra	1.168	0.291	0.4	0.12
M.P.	0.94	0.519	0.2	0.10
Orissa	1.219	0.24	0.08	0.02
U.P.	0.568	0.891	0.1	0.09
Total				**0.94**
States Above National Productivity (1.459 t/ha)	**Target to achieve 1.957 t/ha**			
T.N.	1.957	0	0.54	0.00
Gujarat	1.777	0.18	1.86	0.34
Rajasthan	1.728	0.229	0.28	0.06
Total				0.40
Overall Groundnut Production Increase				**1.34**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Use of improved varieties and hybrids (sunflower, castor, rapeseed) with higher rate of seed replacement.
- Use of IPM in states of Andhra Pradesh, Karnataka, Maharashtra and Madhya Pradesh be promoted.
- Promotion and development of weed control technology.
- One supplemental irrigation, wherever possible.
- Sowing of groundnut in permanent raised beds with plastic mulching will make all the difference.
- Use of Sulphur and micro-nutrients be promoted to improve oil quality and quantity.

Researchable Issues:

- Development of varieties and hybrids which can adapt well to changing climatic conditions.
- Development of varieties having high oil content.
- Development of integrated pest and weed management technologies.
- Development of suitable machines and tools for pre & post harvest management.

Rapeseed And Mustard

Expansion of area in eastern States (WB, Assam, Bihar) and north eastern states would help in higher production. Hybrid technology could also be exploited in the northern and western states.

Target:

India has achieved Rapeseed and Mustard productivity of 1.00 t/ha (Table 10). If the productivity of Rajasthan, M.P., W.B., Assam and Bihar are brought equivalent to the national average through agronomic management and in U.P. Haryana and Punjab, which have productivity more than national, if increased equivalent to Gujarat then the additional around 1.00 m t production of rapeseed and mustard can be achieved.

Table 10 Estimated Production of Rapeseed & Mustard by Achieving Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (1.001 t/ha)	**Target to achieve 1.001 t/ha**			
Rajasthan	0.946	0.055	2.5	0.14
M.P.	0.927	0.074	0.58	0.04
W.B.	0.888	0.113	0.41	0.05
Assam	0.523	0.478	0.24	0.11
Bihar	0.947	0.054	0.09	0.01
Total				**0.35**
States Above National Productivity (1.001 t/ha)	**Target to achieved 1.635 t/ha**			
Gujarat	1.635	0	0.34	0.00
U.P.	1.157	0.478	0.86	0.41
Haryana	1.198	0.437	0.5	0.22
Punjab	1.179	0.456	0.03	0.01
Total				**0.64**
Overall Rapeseed & Mustard Prod. Increase				**0.99**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Promotion of only high yielding early varieties/hybrids
- One supportive irrigation, preferably using sprinklers.
- Use of recommended dose of fertilizers specifically Sulphur and Phosphatic.
- IPM approach would make all the difference in Rajasthan, Haryana, Uttar Pradesh, Madhya Pradesh and West Bengal.

Researchable issues:

- Development of high yielding, disease resistant and cold & frost tolerant hybrids/ varieties for different agro-climatic conditions.
- Development and implementation of cost effective technologies e.g. sowing by Ridger Seeder.

Soybean

In the last 50 years, from almost nil acreage, soybean has emerged as the second largest oilseed crop. It is fetching substantial foreign exchange from exports (more than $1.5 billion per annum). Globally, India is fifth largest producer, after USA, Brazil, China and Argentina. As compared to M.P. and Karnataka, yield levels of Soybean are higher in Rajasthan, Maharashtra and A.P. A little push and coordination will help in accelerating soybean production. North-eastern states can also be an important niche for soybean in future but would require advance planning and policy support. Despite area being almost similar to China and Argentina, the productivity is almost half in India (1.2 t/ha).

Target:

The national productivity of soybean is 1.235 t/ ha. The productivity of M.P. and Karnataka is below national average and if it is brought equivalent to national average, and the productivity of Maharashtra and Rajasthan, which is above the national level, if enhanced equal to A.P. then additional 2.50 m t of soybean production can be possible (Table 11).

Table 11 Estimated Production of Soybean by Achieving Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (1.235 t/ha)	**Target to achieve 1.235 t/ha**			
M.P.	1.091	0.144	5.02	0.72
Karnataka	0.858	0.377	0.11	0.04
Total				**0.76**
States Above National Productivity (1.235 t/ha)	**Target to achieve 1.966 t/ha**			
A.P.	1.966	0	0.09	0.00
Maharashtra	1.492	0.474	2.68	1.27
Rajasthan	1.343	0.623	0.8	0.50
Total				1.77
Overall Soybean Production Increase				**2.53**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action plan:

- Popularization of potential varieties with package of practices.
- Public-private-farmer linkage to be strengthened.

Researchable issues:

- Development of high yielding varieties
- Options for the development and adoption of genetically modified soybean can also be explored.
- Integrated Pest Management
- Development and implementation of cost effective technologies.

Sunflower

Potential of sunflower has not been fully exploited so far in India. Improved early maturing hybrids of sunflower in northern states such as Haryana, Punjab and Western U.P. can help in accelerating production growth rate of oilseeds. New niche for this promising crop could be Bihar, West Bengal, Assam, Orissa, etc.

Constraints:

- Non-availability of promising hybrids and their quality seed.
- Lack of efficient production technology.
- Bird damage
- Procurement / Marketing

Target:

The national productivity of sunflower is 0.765 t/ha. Karnataka and Maharashtra have substantial area under this crop but their productivity is below national average, which can be brought equivalent to the national level (Table 12). The productivity of A.P., Tamil Nadu, Haryana and Bihar is higher than national average. In these states, enhanced productivity through proper package of practices will enhance its production easily by 0.5 m t.

Table 12: Estimated Production of Sunflower by Achieving Target Productivity

States	Yield (t/ha)	Targeted yield difference (t/ha)	Area covered (m ha)	Estimated additional production (m t)
States Below National Productivity (0.765 t/ha)	**Target to achieve 0.765 t/ha**			
Karnataka	0.571	0.194	1.03	0.20
Maharashtra	0.68	0.085	0.3	0.03
Total				0.23
States Above National Productivity (0.765 t/ha)	**Target to achieve 1.615 t/ha**			
U.P.	1.615	0	0.01	0.00
A.P.	1.026	0.589	0.43	0.25
T.N.	1.59	0.025	0.04	0.00
Haryana	1.583	0.032	0.02	0.00
Bihar	1.335	0.28	0.02	0.01
Total				0.26
Total Sunflower Prod. Increase				0.49

Source: Agricultural Statistics at a Glance, 2009, GOI.

Action Plan:

- Development and supply of hybrids through Public-Private-Partnership.
- Popularization of machines for post-harvest handling.
- Timely supply of seeds and other inputs.

Researchable issues:

- Development of superior hybrids both in yield and oil content.
- Development of high yielding and pest resistant hybrids
- Development of suitable machines and tools for pre and post-harvest management.

Castor

Castor is an important non-edible oilseed and is grown especially in arid and semi arid regions. India is the first country in the world to exploit hybrid vigour on commercial scale in this crop. Castor plays an important role in the agricultural economy by earning substantial foreign exchange through export of castor seed, oilcake and oil. Castor oil is very widely used in cosmetics, paints, synthetic resins & varnishes; in the areas of national security involving engineering plastics, jet engine lubricants; and also in polymers for electronics and telecommunications, pharmaceuticals etc. Because of its unlimited industrial applications, castor oil enjoys tremendous scope and demand world-wide. Thus, this crop can be highly beneficial for the improvement of farmers' economy. Gujarat accounts for 72% of India's castor seed production followed by Andhra Pradesh and Rajasthan. India has substantial area under this crop with about 65% of the share in World production followed by China with 23% and Brazil with only seven per cent.

Constraints:

- Non-availability of short duration and high yielding hybrids for rainfed condition.

Action plan:

- Potential hybrids are to be promoted in castor growing areas.
- The production packages are to be provided to the farmers including use of supplemental irrigation or drip irrigation.
- Promotion of public-private-partnerships.

Researchable issues:

- Development of high yielding hybrids.
- Development of machines and tools suitable for pre and post-harvest handling.

Estimated Additional Oilseeds Production

By achieving the national productivity of different oilseeds in states having productivity less than national average and enhanced equivalent to highest achieved in states having productivity above national average, the estimated additional increase in oilseeds production of around 5.50 m t can be harnessed (Table 13).

Table 13 Estimated Additional Oilseeds Production

Crop	Additional production (m t)			
	National average (t/ha)	Below national average states	Above national average states	Total
Groundnut	1.459	0.94	0.40	1.34
Rapeseed & Mustard	1.001	0.35	0.64	0.99
Soybean	1.235	0.76	1.77	2.53
Sunflower	0.765	0.23	0.26	0.49
Total		**2.28**	**3.07**	**5.35**

Source: Agricultural Statistics at a Glance, 2009, GOI.

Annexure I

F. No. 23011/4/2010-GC&C
Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation

Krishi Bhavan, New Delhi
Dated 17th May, 2010

Subject : Constitution of three Working Groups of Central Ministers and State Chief Ministers regarding prices of essential commodities.

In pursuance to the decisions taken in the first meeting of the Core Group of Central Ministers and State Chief Ministers, held on 8th April, 2010 under the Chairmanship of Hon'ble Prime Minister, following three Working Groups are constituted:-

1. Working Group on Agriculture Production

i. Working Group will comprise

Chief Minister, Haryana — Chair
Chief Minister, Punjab
Chief Minister, West Bengal
Chief Minister, Bihar

ii. ***Terms of reference:*** The Working Group on Agriculture Production will deliberate on and recommend measures for increasing agricultural production and productivity including long term policies for sustained agricultural growth. This working group will also deliberate on availability and management of various issues relating to inputs viz. seeds, fertilizers, water, power, credit, machinery etc. More specifically, Terms of Reference of the Group will include suggestions of strategies/plans of action, inter alia, for

(i) Bridging yield gaps
(ii) Crop specific strategies - special focus on pulses and oilseeds
(iii) Strengthening Input delivery mechanism for seeds, nutrients, water, credit, power
(iv) Gearing up extension administration
(v) Marketing reforms
(vi) Addressing land and labour related issues

iii. The Working Group will be serviced by the Department of Agriculture & Cooperation.

2. Working Group on Consumer Affairs

i. Working Group will comprise

Chief Minister, Gujarat — Chair

Chief Minister, Andhra Pradesh

Chief Minister, Maharashtra

Chief Minister, Tamilnadu

ii. Terms of reference: The Working Group on Consumer Affairs will deliberate on and recommend measures for reducing the gap between farm gate and retail prices and better implementation and amendment(s) to Essential Commodities Act. More specifically, Terms of Reference of the Group will include suggestions of strategies/plan of action, inter alia, for:

(i) Increasing efficiency of distribution channels from farm to consumers

(ii) Reducing intermediation costs and for reducing gap between farm gate and retail prices

(iii) State interventions for retailing essential commodities at reasonable prices

(iv) Enforcement of statutory provisions to improve availability of essential commodities at reasonable prices

iii. The Working Group on Consumer Affairs will be serviced by the Department of Consumer Affairs.

3. Working Group on Food and Public Distribution

i. Working Group will comprise

Deputy Chairman, Planning Commission — Chair

Chief Minister, Chhattisgarh

Chief Minister, Assam

Chairman, Economic Advisory Council to Prime Minister

ii. Terms of reference: The Working Group on Food and Public Distribution will deliberate on and recommend measures for better and effective delivery of essential commodities to the vulnerable sections of society and augmentation of warehouses & storage capacity including cold chain. More specifically, Terms of Reference of the Group will include suggestions of strategies/plans of action, inter alia, for:

(i) Finalizing number of BPL beneficiaries

(ii) Streamlining and strengthening TPDS

(iii) Web enabled computerization of PDS System (including FCI godowns)

(iv) Enhancing storage capacity

iii. The Working Group on Food and Public Distribution will be serviced by the Department of Food and Public Distribution.

4. **All the three Working Groups would present their recommendations to the Core Group in two months.**

5. **The servicing Department will ensure that a copy of the agenda papers, minutes of the meetings, etc. are expeditiously forwarded to the GC&C Division of the Department of Agriculture & Cooperation.**

Secretary (Agriculture & Cooperation)

To,

Shri Pranab Mukherjee, Minister of Finance
Shri Sharad Pawar, Minister of Agriculture and Minister of Consumer Affairs, Food & Public Distribution.
Shri Montek Singh Ahluwalia, Deputy Chairman, Planning Commission.
Shri C. Rangarajan, Chairman, Economic Advisory Council to the Prime Minister.
Chief Minister, Andhra Pradesh
Chief Minister, Assam.
Chief Minister, Bihar.
Chief Minister, Chhattisgarh.
Chief Minister, Gujarat.
Chief Minister, Haryana.
Chief Minister, Maharashtra
Chief Minister, Punjab.
Chief Minister, Tamil Nadu.
Chief Minister, West Bengal.

Copy forwarded for information to :-
Principal Secretary to the Prime Minister.
Cabinet Secretary

Secretary (Agriculture & Cooperation)

Copy forwarded for information to:-
Secretary, Department of Food & Public Distribution
Secretary, Department of Consumer Affairs.

Secretary (Agriculture & Cooperation)

Minutes of the First Meeting of the Working Group on Agriculture Production under the Chairmanship of Shri Bhupinder Singh Hooda, Chief Minister Of Haryana

1. The first meeting of the Working Group on Agriculture Production was held under the chairmanship of Chief Minister, Haryana on 7th June, 2010 at Haryana Niwas, Chandigarh. The list of participants is at Annexure-I.

2. Smt. Urvashi Gulati, Chief Secretary, Haryana extended a warm welcome on behalf of the Government of Haryana to all participants in the first meeting of the Working Group on Agriculture Production and thereafter requested Shri P.K. Basu, Union Secretary (Agriculture & Cooperation) to take up the responsibility of conducting the meeting. Shri P.K. Basu in his opening remarks welcomed the members of the Working Group. He referred to the meeting of the Core Group of Central Ministers and State Chief Ministers regarding prices of essential commodities held under the chairmanship of the Hon'ble Prime Minister on 8th April, 2010 which decided to constitute three Working Groups, including one Working Group on Agriculture Production. He drew attention to the mandate of the Group, which is to deliberate on and recommend measures for increasing agriculture production and productivity, including long term policies required for sustained agriculture growth. The Working Group is also mandated to deliberate on availability and management of various issues relating to inputs. In particular, he drew attention of the members that the Working Group has the following specific Terms of Reference:

   (i) Bridging yield gaps

   (ii) Crop specific strategies - special focus on pulses and oilseeds

   (iii) Strengthening input delivery mechanism for seeds, nutrients, water, credit, power

   (iv) Gearing up extension administration

   (v) Marketing reforms

   (vi) Addressing land and labour related issues

   He then requested Chief Minister, Haryana to guide the discussions to address the terms of reference of the Working Group.

3. Chief Minister, Haryana welcomed Chief Minister, Punjab, Finance Minister, West Bengal, Agriculture Minister, Bihar, Union Agriculture Secretary and all participants to the First Meeting of the Working Group on Agriculture Production. He highlighted the achievements of the farmers of the country in achieving self sufficiency in foodgrains. He stated, however, that there were no grounds for complacency since productivity of foodgrains has stagnated in the current decade in the northern part of the country. There is need for a second green revolution to meet the additional demand of food-grains due to a burgeoning population and a higher standard of living.

In his opinion, this could be achieved through a dynamic approach, a focused strategy and application of new tools of science and technology.

4. Degradation of soil health, fragmentation of land holdings, imbalanced use of fertilizers, inadequate availability of quality seed, poor mechanization, depletion of water resources and poor dissemination of technology were mainly responsible for low productivity in the country. He stated that indebtedness of small and marginal farm families was a matter of concern. Input costs for agriculture are increasing while factor productivity is declining.

5. The Chief Minister, Haryana was of the view that implementing location specific strategies and plans of action for every State within a systematic and time bound framework would be the key to tackle the problems plaguing the agriculture sector. A Road Map would have to be drawn up for the country as a whole to increase agricultural production and productivity.

6. A presentation was then made by Financial Commissioner & Principal Secretary (Agriculture) Shri Roshan Lal regarding the issues relating to improving agriculture production, productivity & growth. A copy of the presentation is placed at Annexure-II.

7. After the presentation, the Chief Minister, *Haryana requested the Chief Minister,* Punjab, the Finance Minister, West Bengal and Agriculture Minister, Bihar to share their views and give their suggestions on the terms of reference.

8. Chief Minister, Punjab gave a brief background of the achievements made by his State in the production of food-grains. He referred to the availability of assured irrigation and new green revolution technology as the main factors for the phenomenal increase in the yield and overall production of foodgrains in Punjab. However, CM, Punjab expressed his deep concern at the decline in canal irrigated area from 16.60 lakh hectare in 1990-91 to 11.04 lakh hectare in 2007-08. He drew attention to the trend of decreasing water table due to over use of ground water which was likely to not only affect the economic security of farmers in Punjab but also food supply to the central pool. He stressed the need for sustainable agricultural growth through conservation of surface and ground water. He urged the Central Government to finance rejuvenation of the canal system & suggested that the popularization of drip irrigation on a large scale was likely to yield dividends.

9. CM, Punjab further stated that farmers respond to the stimulus of assured marketing and prices. He demanded that Government must also ensure procurement of maize. For bridging the yield gap, he talked about the need for development of new technology for the salinity affected areas of Punjab. He also underlined the requirement of strengthening agricultural research to deal with the problem of high temperature stress. He said that unless the income from oilseed and pulses matches that of wheat and rice it would be difficult to popularise the cultivation of these crops. He also mentioned that agricultural inputs should be available within easy reach of farmers and quality must be maintained. Training of farmers in the latest technology was also mentioned along with

establishment of private purchase centres / markets to ensure competitive prices to the farmers. There is urgent need to ensure availability of agricultural equipment to the farmers on custom hiring basis through Agro Service Centres at the level of Primary Agricultural Cooperative Societies.

10. CM, Punjab proposed that calamity relief should cover total loss of the crop which should be equivalent to the average yield of the crop in the State. In areas dependent on tube wells which do not get adequate power supply, farmers have to spend additional money on generators and diesel and should therefore be provided a minimum of Rs.2000 per hectare as assistance. He demanded that the rate of interest of farm credit should not be more than 4% and farmers should be provided with one time capital assistance/grant equivalent to 40% of the investment on equipment, dairy sheds, fish ponds, vegetable net houses, etc. He stressed upon the need to waive loans of all farmers, in full, including loans taken from private agencies.

11. Shri Asim Kumar Dasgupta, Finance and Excise Minister, West Bengal drew attention to the declining rate of growth of agriculture production in the country from 2% in 1997-98 to 1.7% in 2001-02 which was lower than the growth of population, as a result of which per head availability of food-grains declined from 503 gm per day in 1997 to 443 gm per day in 2007. While highlighting the issue of land and labour, he mentioned that West Bengal has accorded special priority to redistributive land reforms i.e. ceiling surplus land has been redistributed in favour of poor farmers and names of share croppers have been registered in the land records. Non land inputs such as irrigation facilities, improved seeds and proper mix of chemical, organic and bio fertilizers are also being provided. He informed that the State Government has introduced a scheme to purchase agricultural land at a price 25% higher than the prevailing market price and distribute the same free of cost to landless agricultural labourers. In view of the fact that productivity was highest in respect of smaller landholdings, he suggested that MGNREGS fund should be allowed to be used to purchase such land.

12. While deliberating on issues related to water, seed, chemical and bio-fertilizers, production and yield, he pointed out that the total net irrigated area in the state as a proportion to total net agricultural area has steadily increased. Use of improved seeds and chemical and bio-fertilizers has also gone up. As a result of these measures, rate of growth of Gross State Domestic Product (GSDP) from agriculture has been estimated to reach 4.3% in the State in 2009-10 which is higher than the rate of growth of GDP from agriculture (- 0.2%) for the country as a whole.

13. He highlighted the need for a targeted course of action regarding production, yield, seeds, water, fertilizers, extension administration and power. The State aims to achieve self sufficiency in food-grain production (176.96 lakh MT) by 2011-12. For a speedy expansion of the area under irrigation, emphasis has to be laid on both minor and major irrigation projects. He stressed the need for creation of rain water harvesting tanks in every field, trench schemes and de-siltation of old reservoirs. The involvement of self-help groups (SHGs) and joint liability groups of farmers in

forming seed villages, bio-villages and soil test laboratories is being facilitated. The State Government will fill existing vacancies of Krishi Projukti Sahayaks within the next two years. While addressing the need for strengthening of extension activities, he suggested that the curriculum offered at agricultural universities should include deployment in the villages to help students gain practical knowledge of the actual requirements of this sector.

14. The Minister suggested that to operationalise irrigation schemes, a time bound programme of energisation of pump sets was essential. Subsidy on power consumption for agriculture should be shared on 50:50 basis between the Centre and State Governments. Expansion of credit in the agriculture sector was vital. To aid financial inclusion, a bank branch or a business correspondent facility should be extended to every village with a population of 2000 and above.

15. Minimum Support Price scheme should not only cover paddy, wheat, pulses, and oilseeds, but should also be extended to cane and vegetables such as potato. Procurement should be arranged at the farm gate by involving cooperatives and SHGs. Contract farming should be permitted through the involvement of SHGs without the farmers giving up their rights on ownership of land.

16. Agriculture Minister, Bihar in her address, stated that there is huge possibility of increase in agriculture productivity in eastern India to usher in a new green revolution in the country. In the last few years, hybrid varieties of paddy and maize have become widely available. However, ICAR and State Agriculture Universities need to advise State Governments regarding the suitability of hybrids developed by the private sector. Subsidy pattern on hybrid varieties also needs to be rationalized. Subsidy on tractors and sprinklers should be enhanced to take into account actual expenditure on buying such machinery. A diesel subsidy scheme to aid irrigation should be implemented as a regular scheme under RKVY. Solar pumps should also be considered eligible for subsidy.

17. It is vitally important to ensure minimum support price to farmers, especially in eastern India. The Food Corporation of India and the Central Warehousing Corporation will need to expand warehousing facilities in this part of the country. The Minister also suggested that the National Horticulture Mission and the National Food Security Mission should be extended to all districts of the state. Differential rates of subsidy for the same components under various schemes leads to duplication and confusion at the field level and this situation should be rectified.

18. She mentioned that RKVY is a State Plan scheme and complete independence should be accorded to States to choose projects. She further stated that Central Government should consider merging of centrally sponsored schemes with a cafeteria approach.

19. She informed that Bihar has prepared a road map for agriculture. She suggested that a road map for agriculture for the country as a whole should also be drawn up with a five year perspective.

20. The Minister highlighted the achievements of the State Seed Corporation of Bihar. She claimed that the State had effectively coped

with drought and floods in 2009. 11 lakh tube wells have been sunk in last four years. She underlined the demand for a new Central Agriculture University in the State.

21. Secretary (A&C) requested Sh. GS Kalkat, Chairman, Farmers' Commission, Punjab and Dr. KS Khokhar, VC, Hisar Agriculture University, Haryana to share their views.

22 Sh. Kalkat stated that the mere availability of improved seeds without the simultaneous availability of support services like fertilizers, irrigation, power and marketing, would not be sufficient to improve agricultural productivity. We have to inquire into reasons for low productivity whether it is due to soil, irrigation, seed, or agronomic practices. He also mentioned that non availability of DAP is the reason for un-balanced use of fertilizer.

23. Dr. Khokhar said that technology alone accounts for nearly 50% of agricultural production and productivity. We suffer from technology fatigue hence investment in research, including biotech research is the need of the hour. In his opinion, rain harvesting and watershed management needs focused attention and investment. Research in hybrid varieties by ICAR, co-ordination between States and Centre for support services in agriculture are other areas requiring focused attention.

24. Government of India had circulated draft recommendations on the terms of reference of the Working Group for consideration of all members. The Governments of Punjab and Haryana had provided their comments on the draft which were incorporated in the material for consideration of the Group. These draft recommendations were circulated in the meeting, a copy of which is at Annexure III. Inputs/ comments of the Governments of West Bengal and Bihar on the draft recommendations were provided in the meeting.

25. Chief Minister, Haryana suggested that Draft Recommendations prepared by the Ministry of Agriculture may be reviewed in the light of discussions in the meeting. He also advised that an advertisement should be issued in the press asking for the comments of various stakeholders on the issues before the Working Group. These comments should also be considered to enrich the report of the Working Group.

26. On the request of Agriculture Minister, Bihar, CM, Haryana announced that the next meeting of the Working Group would be held in Patna.

27. The meeting ended with a vote of thanks to the Chair.

List of Participants

1st Meeting of the Working Group on Agriculture Production held under the Chairmanship of Shri Bhupinder Singh Hooda, Chief Minister, Haryana on 07.06.2010 at Haryana Niwas, Sector-3, Chandigarh

1.	S. Parkash Singh Badal, Hon'ble Chief Minister, Punjab
2.	Shri Asim Kumar Dasgupta, Minister of Finance and Excise, Govt. of West Bengal
3.	Dr. Renu Kumari Kushwaha, Agriculture Minister, Bihar
4.	Shri Paramvir Singh, Agriculture Minister, Haryana
5.	Shri G.S. Kalkat, Chairman, Farmers' Commission, Punjab
6.	Shri Sukhbir Kataria, Minister of State for Agriculture, Haryana
7.	Smt. Urvashi Gulati, Chief Secretary, Haryana
8.	Shri P.K. Basu, IAS, Secretary to Govt. of India, Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi
9.	Shri Ashish Bahuguna, IAS, Additional Secretary to Govt. of India, Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi
10.	Shri Gurbachan Singh, Agriculture Commissioner, Govt. of India, Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi
11.	Shri Chhatar Singh, IAS, PSCM, Haryana
12.	Shri Darbara Singh Guru, IAS, PSCM, Punjab
13.	Shri K. K. Khandelwal, IAS, Addl. PSCM, Haryana
14.	Shri M. S. Chopra. OSD/ CM, Haryana
15.	Shri Shiv Raman Gaur, IAS, Addl. PSCM, Haryana and Director, Information & Public Relations, Haryana
16.	Shri N.S. Kang, IAS, Financial Commissioner, Development, Punjab
17.	Shri Sanjiv Chopra, IAS, Principal Secretary to Govt. of West Bengal, Agriculture Department
18.	Shri S.C. Garg, IAS, Joint Secretary to Govt. of India, Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi
19.	Dr. K. S. Khokhar, Vice Chancellor, CCS HAU, Hisar
20.	Shri Roshan Lal, IAS, Financial Commissioner & Principal Secretary to Govt. Haryana, Agriculture Department

21.	Shri A. K. Yadav, IAS, Director of Agriculture, Haryana
22.	Shri Shailendra Kumar, IAS, Director, National Horticulture Mission, Ministry o Agriculture, Department of Agriculture & Cooperation, New Delhi
23.	Shri B. Rajender, IAS, Director of Agriculture, Bihar
24.	Shri B.S. Sidhu, Director of Agriculture, Punjab
25.	Dr. R. P. Narwal, Director Research, CCS HAU, Hisar
26.	Shri Subir Chaudhary, OSD, RKVY, West Bengal
27.	Shri Harcharan Bains, Advisor/ CM, Punjab
28.	Dr. B. S. Duggal, Addl. Director Agriculture, Haryana
29.	Dr. V. S. Raparia, Addl. Director Agriculture, Haryana
30.	Shri R. S. Rana, Jt. Director Agriculture, Haryana
31.	Shri Anil Rana, Jt. Director Agriculture, Haryana
32.	Shri S.P.S. Chauhan, Jt. Director Agriculture, Haryana
33.	Shri R.S.Solanki, Jt. Director (Stat), Haryana

Annexure III

Minutes of 2nd meeting of the Working Group on Agricultural Production held on 30th August, 2010 at 11.50 AM in Conference Hall, Haryana Niwas, Chandigarh.

1. List of participants is given in the Annexure.

2. The Chairman of the Working Group and Chief Minister, Haryana welcomed the participants and delivered his opening address. CM, Haryana drew attention to the background of the formation of the Working Group, its terms of reference, consultations with States and other stakeholders, and various issues addressed in the draft report circulated to members. He suggested that following additional recommendations may also be included in the final report:-

   a) For sustained growth of the rural economy, the development of live stock is very important. In order to give focused attention to the animal husbandry sector, the States may consider setting up a separate University of Veterinary and Animal Sciences.

   b) The CACP methodology of calculating costs of cultivation is highly flawed and unscientific. It needs to be revisited to make it as realistic as BICP formula for estimating industrial costs or in the alternative, the MSP should be at least 50% higher than the cost of cultivation.

   c) Considering the slow progress of Debt Swap Scheme and with the objective to rescue farmers from the clutches of moneylenders who charge exorbitant rate of interest, there is need to further liberalize the ambit and scope of the scheme.

   A copy of speech of CM, Haryana is annexed.

3. Secretary (A&C) made a presentation on the contents / recommendations of draft report of the Working Group. He stated that action on some of the recommendations has already been initiated by the Government of India.

4. The Chief Minister, Punjab suggested that the following issues should also be included in the draft report:-

   i) Rehabilitation and modernization of canal network

   ii) Establishment of Agro Service Centres for the benefit of small and marginal farmers

   iii) 4% rate of interest on Agricultural credit

   iv) Allowing states to use 10% of the amount available under Calamity Relief Fund for flood protection works

   v) Region-specific allocation of funds under RKVY

5. Copy of the speech of CM, Punjab is annexed. CM, Punjab further suggested that all the four CMs should go to the Prime Minister to present the report of the Group. He also suggested that a summary of main recommendations (2-3 pages) should be prepared for briefing PM about the recommendations of the Working Group.

6. Agriculture Minister of Bihar in her speech stressed on the following points:

   a) Flexibility in the norms of Calamity Relief Fund to allow compensation to farmers forced to keep their land fallow because of natural calamities like drought

   b) Including Diesel subsidy for irrigation as one of the components of RKVY

   c) Making a provision in the MGNREGS to allow agricultural operations so as to address labour shortage problems

   d) Formulating policy at national level to control the neelgai menace

   e) Increasing storage capacity by FCI and CWC in Bihar and NE states

   f) Setting up an international institute on climate change in Pusa in the memory of Dr. Norman Borlaug

   A copy of the speech of Agriculture Minister of Bihar is annexed.

7. Principal Secretary (Agriculture), Government of West Bengal extended an invitation on behalf of CM, West Bengal to host the third meeting of the Working Group in Kolkata. He highlighted following points for consideration of the Working Group:

   i) A separate section may be included in the Report on the subject of natural calamities

   ii) Expand DRI scheme of lending at 4% interest to cover beneficiaries of land reforms and marginal farmers

   iii) Provide a window under RKVY to address natural calamities

   iv) Consider using MGNREGS resources to purchase and distribute land to landless labourers

   v) Assess the additional investment requirements to implement the recommendations of the Working Group

8. The Working Group decided to incorporate the suggestions made in the meeting in the draft report and authorized the Chairman to approve the final report.

9. The Chairman of the Working Group thanked CM, Punjab for his suggestion of calling on the Prime Minister to present the final Report of the Working Group and assured that the report of the Group will soon be finalised by him as authorized by the Group.

10. The meeting ended with a vote of thanks proposed by the Financial Commissioner & Principal Secretary (Agriculture), Government of Haryana.

List of persons who attended the 2nd meeting of the Working Group on Agricultural Production held on 30th August, 2010

1.	Shri Bhupinder Singh Hooda, Chief Minister, Haryana - In the Chair
2.	Shri Prakash Singh Badal, Chief Minister, Punjab
3.	Dr. Renu Kumari Kushwaha, Agriculture Minister, Bihar
4.	Dr. R.S. Paroda, Chairman, Farmers' Commission, Haryana
5.	Shri G.S. Kalkat, Chairman, Farmers' Commission, Punjab
6.	Shri P. K. Basu, Secretary, DAC
7.	Shri Ashish Bahuguna, Additional Secretary, DAC
8.	Dr. Gurbachan Singh, Agriculture Commissioner, DAC
9.	Shri Chhattar Singh, PSCM, Haryana
10.	Shri Darbara Singh Guru, PSCM, Punjab
11.	Shri A.K. Agarwal, Pr. Secretary (Agri), Govt. of West Bengal
12.	Shri N.S. Kang, Financial Commissioner, Govt. of Punjab
13.	Shri S.C. Garg, Joint Secretary, DAC
14.	Shri Roshan Lal, FC and Pr. Secretary (Agrl.), Govt. of Haryana
15.	Dr. K.S. Khokhar, Vice Chancellor, CCS, HAU, Hisar.
16.	Shri K.K. Khandelwal, Additional PSCM, Haryana
17.	Shri A.K. Yadav, Director of Agriculture, Govt. of Haryana
18.	Shri B.S. Sidhu, Director of Agriculture, Govt. of Punjab
19.	Shri Arvinder Singh, Director of Horticulture, Govt. of Bihar
20.	Shri Subir Chaudhary, Consultant, RKVY, Govt. of Bihar
21.	Dr. M. Subbarayan, Deputy Secretary, DAC

Annexure IV

List of News- Papers Where the Notice Inviting Comments from Stakeholders was Published

1.	English- The Times of India and the Hindu in all their editions nationwide & The Tribune, Chandigarh.
2.	Hindi- Dainik Jagran and Nav Bharat Times in all their editions nationwide.
3.	Bengali- Ananda Bazar Patrika, Kolkata.
4.	Gujarati- Divya Bhaskar, Ahmedabad.
5.	Kannada- Prajavani, Bangalore.
6.	Malyalam- Mathrubhumi, Thiruvanathapuram.
7.	Marathi- Loksatta- Mumbai.
8.	Oriya- Dharitree, Bhubaneshwar.
9.	Punjabi- Ajit, Jalandhar.
10.	Tamil- Thanthi, Chennai.
11.	Telugu- Tel. J. D. Patrika Vaartha, Hyderabad.
12.	Urdu- Milap, Delhi.
13.	Assamese- Asomiya Pratidin, Guwahati.

भारत सरकार

कृषि मंत्रालय

कृषि एवं सहकारिता विभाग

कृषि उत्पादन बढ़ाने के बारे में विचार आमंत्रण सूचना

(सं. 23011/8/2010-जीसी एण्ड सी)

भारत सरकार ने दीर्घकालीन कृषि विकास के लिए लम्बी अवधि की नीतियों सहित, कृषि उत्पादन तथा उत्पादकता बढ़ाने के लिए विचार करने तथा उपायों की अनुशंसा करने हेतु कृषि उत्पादन के बारे में मुख्यमंत्रियों के एक वर्किंग ग्रुप का गठन किया है। ग्रुप के विचारार्थ विषयों (टीओआर) में अधोलिखित के लिए अंतर-सम्बंधत: रणनीतियों/कार्य योजनाओं के सुझाव देना भी शामिल है।

(i) फसलों के अंतराल को दूर करना

(ii) फसल विशेष के सम्बंध में रणनीति, दालों तथा तिलहन पर विशेष फोकस सहित

(iii) बीजों, न्यूट्रिएन्ट्स, जल, ऋण, बिजली आदि हेतु इनपुट डिलीवरी मैकेनिज्म को मजबूत करना

(iv) एक्सटेंशन एडमिनिस्ट्रेशन को बढ़ाना

(v) विपणन सुधार

(vi) भूमि तथा श्रम सम्बंधी मुद्दों का समाधान

इस सम्बंध में पृष्ठभूमि नोट्स तथा वर्किंग ग्रुप की पहली बैठक में जिन मुद्दों पर विचार-विमर्श किया गया, उनका विवरण **www.agri-coop.nic.in** पर 08.04.2010 को आयोजित आवश्यक वस्तुओं के मूल्यों के सम्बंध में केन्द्रीय मंत्रियों तथा राज्यों के मुख्यमंत्रियों के कोर ग्रुप पर सेक्शन में देखा जा सकता है।

समस्त पणधारियों-कृषकों, कृषक संघों, चैम्बर्स ऑफ कॉमर्स, उत्पादक संघों, निर्यातक समूहों, उद्यानकृषि उत्पादक संघों आदि को एतद्द्वारा आमंत्रित किया जाता है कि इस सूचना के प्रकाशन की तिथि से 15 दिन के भीतर अपने विचार तथा सुझाव निदेशक (योजना समन्वयन), कृषि एवं सहकारिता विभाग, कृषि मंत्रालय, कमरा नं. 143, कृषि भवन, नई दिल्ली को डाक से अथवा **chhavi.jha@nic.in** पर ई-मेल से प्रेषित करें।

(छवि झा)
निदेशक (योजना समन्वयन)

डीएवीपी 01101/11/0009/1011

10.06.2010

GOVT. OF INDIA
MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTURE AND CO-OPERATION

NOTICE INVITING VIEWS ON RAISING AGRICULTURE PRODUCTION

(NO. 23011/8/2010-GC&C)

Government of India have constituted a Working Group of Chief Ministers on Agriculture Production to deliberate on and recommend measures for increasing agriculture production and productivity, including long-term policies for sustained agriculture growth. Terms of Reference (TOR) of the Group include suggestion of strategies / plans of action, inter alia, for

i) Bridging yield gaps
ii) Crop specific strategies, with special focus on pulses and oilseeds
iii) Strengthening input delivery mechanism for seeds, nutrients, water, credit, power, etc.
iv) Gearing up extension administration
v) Marketing reforms
vi) Addressing land and labour related issues.

Background notes for, & the issues discussed in, the first meeting of the Working Group can be seen at **www.agricoop.nic.in** in the section on Core Group of Central Ministers and State Chief Ministers regarding Prices of Essential Commodities held on 08.04.2010.

All Stakeholders-farmers, farmers' associations, chambers of commerce, producers associations, exporters groups, horticulture growers associations etc. are hereby invited to give their views and suggestions on the above TOR within 15 days from the date of the publication of this notice to Director (Plan Coordination), Department of Agriculture & Co-operation, Ministry of Agriculture, Room No. 143, Krishi Bhawan, New Delhi, by post or through e-mail on **chhavi.jha@nic.in**

(Chhavi Jha)
Director (Plan Coordination)
10.06.2010

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