



सत्यमेव जयते

CONTINGENCY AGRICULTURE PLAN FOR KHARIF 2010

Department of Agriculture & Cooperation
Ministry of Agriculture
Government of India

Krishi Bhawan, New Delhi - 110001

**CONTINGENCY
AGRICULTURE
PLAN
FOR KHARIF 2010**

CONTENTS

Sl. No.	Subject	Page No.
1.	Introduction	1
2.	Date bound contingency crop plan for rainfed areas located in different meteorological sub-divisions	2
3.	Crop-group/crop-wise contingency plan for kharif season	6
4.	Contingency plan relevant to all crops and cropping systems	10
5.	Judicious use of surface and ground water during scanty rainfall/ drought	12
6.	Specific contingent plan for rainfed regions of Rajasthan and Haryana	14
7.	Contingent plan specific to irrigated areas of Punjab, Haryana and western UP	15
8.	A list of drought tolerant and early maturing varieties of different kharif crops	16
	(a) State wise list of pulse crops varieties	
	(b) List of varieties/ hybrids of sunflower and castor released between 2005-2010	
9.	Availability of certified seed of kharif crops during 2010 from public sector seed corporations	23
10.	Contingent plan for livestock during drought	24
	(a) Ensuring availability of quality fodder	
	(b) Extended rainfall vis-à-vis green fodder strategy	
11.	Crop Contingent plan for flood affected districts of Haryana and Punjab	26
12.	A brief crop contingent plan for Rabi 2010-11	27

CONTINGENCY AGRICULTURE PLAN FOR KHARIF 2010

Introduction :

The India Meteorological Department (IMD) has issued the second stage long range forecast for the South West monsoon season rainfall (June – September) over the country as a whole on 25th June, 2010. The IMD has predicted that rainfall for the 2010 South West monsoon is likely to be 102% of Long Period Average (LPA) over North West India, 103% of LPA over North East India, 99% of LPA over Central India and 102% of LPA over South Peninsula; all with a model error of $\pm 8\%$. On an average the country is likely to receive 102% of LPA monsoon season rainfall with a model error of $\pm 4\%$. Rainfall over the country as a whole for the months of July and August is likely to be 98% and 101% of LPA, respectively with a model error of $\pm 9\%$.

Occurrence of normal rain during South West Monsoon season (June – September) is very crucial for agricultural production as nearly 65% of Indian agriculture is rainfed/ rain dependent. The normal prediction of south west monsoon season rainfall by IMD during 2010 is a welcome sign. However, from agricultural production and productivity view point, uniform spatial and temporal distribution of rainfall in all regions of the Country is very crucial and more relevant than average rainfall for the whole country. Even during a normal rainfall year some regions/ districts within the states may get less or scanty rainfall. Timely formulation and implementation of contingent agriculture plan helps to negate/ moderate the ill effects of low/scanty rainfall on production and productivity of crops in such regions/ areas.

The Department of Agriculture & Cooperation (DAC) has prepared a contingent crop plan to suit to different southwest monsoon scenarios in different agro-climatic regions of the country. A copy of this contingent crop plan is being circulated to all the States for initiating timely interventions to deal with sub-due/ scanty monsoon, in case such situation arises, during Kharif, 2010. The states will use this contingent plan as a broad guideline and will implement strategies after incorporating location specific modifications/ adjustments.

The Central Research Institute for Dryland Agriculture (CRIDA/ ICAR), Hyderabad is preparing district wise contingency plans. They will complete the job for about 200 districts by September – October, 2010. The Agriculture Commissioner, DAC is visiting States to review the preparedness of different states for Kharif, 2010 in terms of input availability and crop contingent plans. The exercise has been completed for the states of West Bengal, Bihar, Orissa, Chhatisgarh, Jharkhand, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Madhya Pradesh and Maharashtra by July 13, 2010. All these States

have been advised to prepare district-wise contingent plans in collaboration with SAU's/ ICAR Institutes/ KVK's.

2. Date Bound Crop Contingency Plan for Rainfed Regions

Till 14th July,2010 the monsoon have covered almost the entire country. The spread of monsoon in time and space seems to be quite satisfactory except some regions/ districts in UP, Bihar, Jharkhand, MP and Rajasthan. A crop contingent plan according to probable date of occurrence of monsoon in different agro-eco regions for rainfed areas is presented below. The states may implement this crop contingent plan to coup-up with less/scanty rainfall, in case such situation arises during Kharif season.

SI. No.	IMD/Agro-eco region	Probable date of occurrence of rainfall		
		15-31 July	Crop Plan 1-15 August	16-31 August
1	2	3	4	5
1.	IMSD sub division (IMSD) : Punjab Agro ecoregion (AER): 9.1 Major production systems (MPS) : Maize/ Rice-Wheat Area domain (AD): Submontaneous districts of Punjab, J&K, HP and Western UP	Short duration maize, moong, mash as grain crops. Bajra, guar, sorghum and maize as fodder crops. Vegetable cowpea and clusterbean.	Moong and mash as grain crop. Bajra, guar and maize as fodders. Sunhemp or Sesbania as green Manure, Vegetable type clusterbean and cowpea.	Bajra as fodder crop
2.	IMSD : Plains of western UP; AER :4.1 MPS : Pearl millet/ Rapeseed and Mustard AD : Agra, Mathura, Aligarh, Bulandshahar, Meerut, Etah, Mainpuri and Western part of Muzaffarnagar	Pearlmillet, clusterbean, green gram, short duration pigeonpea, vegetable type cowpea and clusterbean	Transplanted pearl millet, clusterbean, green gram and cowpea. Cowpea and clusterbean (vegetable type)	Clusterbean, cowpea
3.	IMSD : Plains of Western U.P. AER : 4.4 MPS : Fodder sorghum/ pulses AD : Jhansi, Banda, Hamirpur, Lalitpur, Morena, Gwalior	Bajra, guar, cowpea, lablab bean, pigeonpea and black gram as grain crops	Bajra, guar and cowpea as grain and fodder. Pigeonpea and black gram as grain crops	Bajra, guar and cowpea as grain and fodder
4.	IMSD : Haryana, Chandigarh & Delhi AER : 2.3 MPS : Pearl millet – Rapeseed/ Mastard AD : Hissar, Bhiwani, Sirsa, Mahendergarh, Gurgaon & part of Rohtak district	Short duration bajra (HHB- 67), moong, urdbean (T-9), Cowpea (Charodi), guar (HG 365) and also vegetable type clusterbean and guar	Transplanting of HHB-67 variety of bajra as grain crop or direct sowing as fodder crop	Moisture may be conserved for toria sowing during Rabi

Sl. No.	IMD/Agro-eco region	Probable date of occurrence of rainfall		
		15-31 July	Crop Plan 1-15 August	16-31 August
1	2	3	4	5
5.	IMSD : Eastern Rajasthan AER : 4.2/2.1 MPS : Maize / Pearl millet AD : Bhilwara, Tonk, Dungarpur, Ajmer, Chittaurgarh, Rajasamand, Jajore, Sikar, Jodhpur, Churu	Sesame (RT-46), green gram (K 851, RM G 62), Sorghum and cowpea as fodder, Snapmelon and mateera as vegetable crops	Sesame (RT-125), green gram (RMG 62), sorghum as fodder crop	Sorghum as fodder, toria (TL 15), taramira (T 27)
6.	IMSD : Jammu and Kashmir AER : 14.2/ 14.3 MPS : Maize AD : Jammu, Punch, Riasi, Muzaffarabad, Udhampur, Kathua	Bajra, cowpea, moong (direct sown), bajra (transplanting)	Bajra + cowpea/ guar (fodder), Jowar + cowpea/ guar (fodder), maize + cowpea/ guar (fodder)	Fodder as shown in 1-15 August and /or field preparation for September sowing of toria, gobhi sarson.
7.	IMSD : Eastern U.P. AER : 9.2 MPS : Rice/ Pearl millet AD : Varanasi, Mirzapur, Jaunpur, Ghazipur, Sitapur, parts of Shahjahanpur, Lucknow, Barabanki, Rai Beraeli, Sultanpur	Short duration upland rice varieties (NDR-97, NDR 118, Barani deep, Cauvery, Akashi, Mutmuri). In light texture soils green gram (T 44, Pant moong 1), black gram (T9, Pant Urd 19, 35, Narendra Urd 1), Pigeonpea (Bahar and Narendra Arhar 1), sesame (T-4, T-12, T-13). Vegetable type cowpea, lablab bean and guar	Hybrid bajra (NHB-3, NHB-4, BJ-104, green gram, black gram, pigeonpea, sesame, niger (GA 10, Ootacamund), short duration upland rice varieties, vegetable type cowpea, guar and lablab bean.	Green gram, bahar variety of pigeonpea. Niger varieties GA 10 and Ootacamund
8.	IMSD : Madhya Maharashtra AER : 6.1 MPS : Rabi sorghum AD : Solapur, Bidar, Osmanabad, Ahmednagar, parts of Satara, Latur and Sangli	Sunflower, pigeonpea, horsegram, setaria, castor, pearl millet Sunflower + Pigeonpea (2:1); Pearl millet + horsegram (2:1); Pigeonpea + Clusterbean (1:2); Castor + Clusterbean (1:2)	Sunflower, Pigeonpea, castor. Sunflower + pigeonpea (2:1)	Sunflower, Pigeonpea, castor. Sunflower + pigeonpea (2:1) Sorghum for fodder
9.	IMSD : Vidarbha AER : 6.3 MPS : Cotton/ sorghum AD : Akola, Warda, parts of Amravati, Yeotmal, Parbhani, Buldana and Khandesh and part of Adilabad of A.P	Pigeonpea, Pearl millet, maize, Sunflower	Pigeonpea, Pearl millet, maize, sunflower, castor	Pigeonpea, castor or reserve the land for rabi safflower

Sl. No.	IMD/Agro-eco region	Probable date of occurrence of rainfall		
		15-31 July	Crop Plan 1-15 August	16-31 August
1	2	3	4	5
10.	IMSD : South interior Karnataka AER : 8.2 MPS : Fingermillet AD : Bangalore, Kolar and Tumkur	Sowing of long duration varieties (Indaf 8, L-5, MR1) or Transplanting of nursery of above varieties Fingermillet + red Gram (8:1) and Fingermillet + field bean, Littlemillet and foxtail, Groundnut, Sunflower hybrids, castor, soybean, chilies	Sowing of medium duration varieties (GPU 28, HR 911, PR 202)or transplanting. Sowing of short duration varieties (GPU 26) as nursery. Sunflower hybrids (KBC 2) and soyabean (KBSH 2). Transplanting of chilies. Maize, sorghum, bajra as fodder crop	Transplanting of short duration varieties (GPU 28, HR 911 and PR 202). Cowpea (KBC1, KBC2, Lolita), H o r s e g r a m (KBH1/ PGG9). Transplanting of Chilies if protective irrigation available. Maize, sorghum, bajra as fodder Crops.
11.	IMSD : Western MP AER : 5.2 MPS : Soybean, Sorghum AD : Indore, Ratlam, Ujjain, Dewas, Dhar, Khandwa, parts of sehere	Short duration Maize, (Navjot, Sathi etc.), Pigeonpea (OCPKL 151, T21, Kh2, ICPL 87, ICPL 88039) in deep soils, Sunflower (Modern, Surya, Manjira and other Hybrids). Sesame (Bhadeli, TKG 22, TKG 37), Cowpea (Pusa Komal, Pusa Baisakhi, Castor (Ganesh and Varuna). Sorghum, sudangrass, maize (African tall) Dinanath grass and bajra as fodder crops.	Sunflower, sesame, cowpea, castor (Varities same as for 15 to 31 July season) Sorghum, Sudangrass, maize (African tall), Dinanath grass and Bajra as fodder.	Safflower (JSF 1, JSF7, JSF 73, Sharda); sunflower (Modern, Surya and Manjira); Sesame (RT 46); Rajgira (CO1, CO2; caster. Maize (African tall) as fodder crop)
12.	IMD : Rayalaseema AER : 3.0 MPS : Groundnut AD : Anantapur, Kurnool, Chittoor districts of A.P.	Groundnut (vemana, TMV 2) + redgram (Palandu)	Groundnut (TMV2, ICGV 91114)	Pearlmillet (ICTP 8203, ICMV 221); Green gram (MGG 295, MGG40, PDM 54); dual purpose sorghum (M 35-1-1, NTJ 1,2,3,4); Horsegram (AK21) Marukulthi and Local)

Sl. No.	IMD/Agro-eco region	Probable date of occurrence of rainfall		
		15-31 July	Crop Plan 1-15 August	16-31 August
1	2	3	4	5
13.	IMSD : Gujarat, Daman, Dadra and Nagar AER : 4.2 MPS : Pearl millet AD : Khera, Gandhinagar, Mehsana, Sabarkanta, parts of Ahmedabad, Panchmahal, Banaskantha and Vadodara Districts.	Clusterbean, castor, fodder sorghum	Thinning of already planted crops. Castor and fodder sorghum	Castor, fodder sorghum, fodder sorghum + cowpeas
14.	IMSD : Saurashtra, Kutch and Diu AER : 2.4 MPS : Pearl millet/ Groundnut AD : Rajkot, Sundergarh, Jamnagar, parts of Junagarh, Bhavnagar and Amreli	Errect groundnut (GG 2, 5,7); Sesame (G1, G2); Hybrid bajra (GHB 235, 316, 558); Green gram (KB51, GM4); blackgram (T9); pigeonpea (ICPL 87, GT 101	Blackgram (T9); Forage maize/ sorghum (GFS 5), castor (Gauch 1); sesame (Purua 1)	Forage maize/ sorghum (Gundri GFS 5), sesame (Purua1)
15.	IMSD : Orissa AER : 18.4 AD : Uplands and medium lands of Balasore, Cuttack, Puri and Ganjam	A. Upland (Rainfed) Blackgram (Setaria/ Pant 30); Greengram (PDM 54/K851); sesame (Uma or local), Early pigeonpea (UPAS 120/ ICPL 87); short duration raddish, okra, cowpea (SEB 1,2) and clusterbean as vegetables	A. Upland (Rainfed) Niger, blackgram, raddish, beans and cowpea as vegetables, early Pigeonpea (ICPL 87/ UPAS 120)	A. Upland (Rainfed) Horsegram, sesame, Niger, Cowpea
		B. Medium land (rainfed shallow submerged low land) Direct line sowing of short duration (about 100 days) rice varieties such as Khandagir, Pathra, Lalitgiri or Udaygiri	B. Medium land (rainfed shallow submerged low land) Direct line sowing of extra early rice varieties such as Heera, Vandana, Kalinga 111, ZHU 11-26, Rudra, Sankar and Jaldi 5	B. Medium land Land preparation For sowing of pre- rabi crops like mustard/ greengram/ early pigeonpea.

3. Crop-Group and Crop-wise Contingency Plan for Kharif Season

A. Rice

a. Rainfed

- ❖ *In traditionally* rice growing rain-fed areas where rains are likely to come late and where a normal transplanted rice crop is ruled out, short duration upland rice varieties or those rice varieties that are suitable for direct seeding either in dry or wet condition and subsequent flooding are recommended by direct seeding. In certain areas, delayed transplanting can be done with older nurseries if these varieties are suitable. Suitable rice varieties for different situations are listed in section 8.

b. Irrigated

- ❖ Irrigation at 1 to 4 days after disappearance of ponded water in case of rice produces almost similar yields as are obtained with continuous submergence. This practice economizes more than 30% of irrigation water without lowering the rice yields. Farmers may be advised to strictly follow this irrigation schedule for already transplanted rice crop.
- ❖ Last irrigation to paddy can be terminated 14-17 days before harvest. This saves about 16 cm of irrigation water without any yield reduction. The farmers need to be apprized about this practice well in advance as the short duration early maturing paddy varieties are likely to mature by mid September. The irrigation to such varieties may be withheld beyond August 31 and the same water can be effectively used for main season planted varieties.
- ❖ In case rains are delayed beyond July 31, 2010, maize, green gram and black gram crops should be preferred.
- ❖ Certain varieties of maize and pulses can be grown upto August 15, 2010.
- ❖ Under delayed monsoon arrival situation rice nurseries are over matured. While transplanting such nurseries 1/3rd upper portion can be cut/ removed before planting.

B. Pulses

- ❖ In the event of late monsoon arrival the pulse crops which can be planted preferably up to 15th August or till 1st week of September are: Blackgram, Greengram, Pigeonpea and Mothbean
- ❖ In case of greengram and blackgram all varieties recommended for *kharif* season may be grown up to first week of September. Sowing after first week of September may be done only for the purpose of fodder.
- ❖ Only specific varieties of pigeonpea may be grown up to first week of September which are recommended for pre-*rabi* planting. These varieties are Bahar, Pusa 9 and *rabi* Arhar 20(5) for the States of Bihar, W. Bengal, Orissa, Andhra Pradesh, Maharashtra and Gujarat.
- ❖ Summer moong (SML-668) in Punjab and Haryana may be ready for harvest by end June. The crop if matured should be harvested/ thrashed on priority.

- ❖ Crops like mothbean can be grown for grain as well as fodder till the second week of August in the states of Rajasthan and Gujarat.
- ❖ Most of the pulses crops are sensitive to water logging. In case, heavy rains occur over a short period, excess water should be drained immediately.
- ❖ As far as possible Kharif pulses should be cultivated following Ridge-Trench system.

C. Oilseeds

- ❖ In case of oilseed crops, sesame can be planted up to third week of August whereas niger can be sown upto September. Since the per hectare requirement of seed in case of sesame is very low, all out efforts must be made to cover more area under sesame to utilize the land in the event of failure of other *kharif* crops like maize, pearl millet and other minor millets.
- ❖ Similarly, castor can be grown successfully up to first week of September in areas which are suitable for castor cultivation.
- ❖ The other two important oilseed crops like soybean and groundnut are likely to suffer heavily in case rains are delayed beyond end July. However, groundnut can be planted up to September in a few southern states. Therefore, efforts should be made to cover more area under groundnut in the States of Andhra Pradesh, Tamil Nadu and Karnataka.
- ❖ Since the monsoon rains during 2010 are likely to be continued till September, there seems good possibility of coverage for toria/ mustard in the States of Rajasthan, Punjab, Haryana, Madhya Pradesh, Uttar Pradesh, Bihar and W. Bengal. Therefore greater emphasis is to be given to cover more area under Toria/ mustard crop in case of extended rainfall scenario. Seed of all recommended varieties of toria needs to be assured to take full advantage of extended monsoon phase.

D. Sugarcane

The following contingency plan for the benefit of the cane growers to protect the crop from complete failure in case of scanty rains/ drought is suggested.

a. Soil Moisture Conservation

- ❖ In case drought like situation arises the dried lower leaves of the standing cane crop may be stripped and used as mulch in the inter-row spaces of the crop. This will conserve available soil moisture by controlling weeds and cutting down surface evaporation.
- ❖ The intercultural operations may be undertaken to create dust mulch to break soil capillaries for checking surface moisture loss.

b. Efficient Irrigation Management

- ❖ Extensive (light life saving) irrigation over larger cane area rather than intensive (heavy) irrigation in limited area may be practiced.
- ❖ To adopt to alternate furrow irrigation to effect water economy.

- ❖ Under limited water availability conditions, irrigations should be scheduled to cover the drought susceptible varieties and ratoon stands in the first instance. The irrigation may be phytophased to avoid soil moisture stress at consecutive critical stages of crop growth.
- ❖ Sprinkler irrigation system may be operated during period of less evaporative demand to maintain optimum soil moisture regime.

E. Cotton

- ❖ In the event of shortfall in the availability of canal water, it is suggested that the farmers may adopt alternate furrow irrigation which will economize water requirement by nearly 50%.
- ❖ Use of micro-irrigation system such as drip and sprinkler may be advocated wherever feasible and in the event of limited water availability.
- ❖ Central zone is mainly rainfed. In this zone, cotton is grown mainly as rainfed crop and is subjected to the vagaries of monsoon. The following moisture conservation measures are suggested for effective utilization of the available water in the soil as well as the likely precipitation in the remaining part of the season.
- ❖ Development of ridge and furrow across the slope for effective conservation of soil moisture as well as rainwater.
- ❖ Use of organic mulches such as subabul lopping, straw etc to conserve the soil moisture.
- ❖ Repeated interculture operation to keep the field weedfree.
- ❖ Wherever water resources are available such as lakes, ponds, wells etc. protective irrigations can be provided to the crop.
- ❖ Micro-irrigation system as suggested above may also be adopted wherever possible for improving the water use efficiency and to cover more area.
- ❖ Nutrient input management through foliar applications is suggested.

In those areas of central zone where sowing has not been undertaken so far, short duration varieties recommended for respective states by State Variety Release Committee/Central Variety Release Committee may be planted latest by July 31, 2010. Beyond end July, alternative crops such as castor and pigeonpea may be cultivated looking to the local conditions.

The contingency measures suggested for central zone are also applicable for the rainfed areas of south zone especially Andhra Pradesh and Karnataka

- ❖ In the central zone, varieties of *arboretum* which have higher degree of tolerance to drought conditions such as Maljari (for Madhya Pradesh), AKH 4, AKA 8401, Eknath, Sweta, AKA 5, Turab, Y1 (for Maharashtra) and varieties of *herbaceum* (for Gujarat) may be cultivated.
- ❖ Early maturing varieties of *G. hirsutum* such as PKV 081, Rajat, Anjali, LRA 5166 etc. may also be planted where sowing has been delayed because of late arrival of monsoon.

F. Pearl millet

- ❖ Planting of pearl millet hybrids is not advisable. Even early maturing hybrids like HHB 67 should not be planted beyond end July.
- ❖ Wherever crop has been planted and suffering for moisture stress, the plant population may be reduced and shallow interculture (dust mulching) may be practiced.
- ❖ The pearl millet may be grown mixed with pulses up to 1st week of August as fodder crop, which may give at least fodder to some extent.

G. Sorghum

In case there is delay in monsoon by 2-3 weeks, short duration cultivars such as CSH 6 and CSH 14 can be preferred. In case of staggered planting where some farmers have already sown and others did not, increase seed rate to an extent of 1.5 times of the recommended rate and application of 20 kg of carbofuran or phorate (3g) granules in the seed rows before sowing are recommended to safeguard against the anticipated shoot-fly attack. Other shoot-fly control measures (spraying of endosulphan 2 ml/litre of water after sowing) can also be followed if soil application is not adopted.

H. Small Millets

a) Rayal Seema region of Andhra Pradesh, parts of Karnataka and Maharashtra

Foxtail millet (knagni) is one of the choice crops of these regions in view of its drought tolerance, freedom from major pests and diseases, photo insensitivity and assured modest yield. For fox-tail millet in Andhra Pradesh, Karnataka and Maharashtra, application of 40:30:0 kg NPK/ha as basal dose for achieving quick growth and withstanding drought is recommended.

b) Western Rajasthan

Foxtail millet (knagni) a well known drought hardy crop can give reasonable harvest in areas where annual rainfall is less than 400 mm. Varieties of fox-tail millets, viz. SR 11 (Gauri) and SR 16 (Meera) are suitable for delayed planting and mature in 80 days. SR 16 has stay green character and gives higher fodder yield also. Application of 10-20 kg N/ha as basal dose is beneficial in withstanding drought and giving higher yield.

c) Gujarat

Small millets are not important in the state except in the region of Dangs and adjoining areas. In years of extreme drought and erratic monsoon small millets like kodo, proso and little millet could be ideal crops for contingency planning for producing quickly fodder and grain.

d) Madhya Pradesh and Chattishgarh

Little millet (kutki) is one of the important crops of tribal areas of M.P. and well known for early maturity and resilience. Kodo millet is another crop grown extensively in these states and popular in tribal areas. Kodo millet varieties viz. JK-76 matures in 80-85 days and RBK 155 matures in 90-95 days. Application of 10-20 kg N/ha as basal is beneficial.

I. Vegetables

- ❖ Mulching soil surface with organic material (leaf mould, FYM) and clean cultivation.
- ❖ Growing vegetables such as cluster bean, cowpea, lablab bean which can sustain with less amount of water.
- ❖ Enhancing cucurbitaceous vegetables by raising nursery in polythene bags followed by transplanting in order to save 2-3 irrigations.
- ❖ Sowing/planting cucurbitaceous vegetables adopting hill and channel system to economise water.

Crop and Nutrient Management

In case sugarcane crop experiences drought like situation in particular area it would be advisable to adopt the following management practices to save the crop and revive its further growth.

- ❖ Weed control through herbicides may be taken-up particularly in late planted cane. Where herbicide application is not feasible, the weeds may be cut and used as surface mulch to conserve soil moisture.
- ❖ Earthing-up operation could also be taken in autumn and timely planted crops which have attained reasonable height. The furrows created in this way may be utilized for light irrigations covering more cane area.
- ❖ If drought persists, the sugarcane crop with poor growth failing to form millable canes may be harvested in October to raise ratoon stand from such crop. The harvested material may be used as seed cane for autumn planting and/or feeding to the cattle.
- ❖ The last dose of nitrogen meant for elongation phase, if already not applied, may be top dressed only with light irrigation or after rains.
- ❖ Spray of 2.5% urea with 2.5% KCl or MOP may be useful in areas where some soil moisture is available. This will impart drought tolerance to plants.

Plan for autumn planting of sugarcane crop (2010-2011)

- ❖ The area meant for autumn sugarcane planting should be kept free of weeds and conserve soil moisture to start early planting.
- ❖ Autumn sugarcane may be intercropped with short duration high value mid season income generating crops like *toria*, mustard, peas, spices etc. This will also encourage farmers to go for planting more acreage under autumn sugarcane giving higher cane yield and sugar recovery.
- ❖ Winter initiated ratoon of early sugarcane varieties may be intercropped with high density early bulking forage crops like *senji* to protect the stubble sprouts from cold injury, enhance soil fertility and provide forage to animals.

4. Contingency Plan Relevant to All Crops and Cropping Systems

A. Special package of practices

- (i) Making fields free of weeds for full utilization of water and nutrients by the crops

- (ii) Reduction of plant density: In case of mid season drought the crops should be suitably thinned out. In case drought occurs at very early stage, it is always better to resow with subsequent rain rather than allowing sub-optimal poor plant stand to persist.
- (iii) For drought conditions anticipating prolonged dry spell breaks the practices of inter-row cropping helps in risk distribution. This can be achieved by including a companion crop like green gram, black gram, cowpea than the main crops like sorghum, pearl millet, maize.
- (iv) The recommended dose of nitrogen application should be reduced by 40% under unirrigated conditions and should always be applied at sowing/planting. On the arrival of rains N fertilizer can be top dressed.
- (v) Full recommended dose of P and K should be placed as basal dose. These nutrients help increasing tolerance to moisture stress.
- (vi) Resorting to maximum possible use of organic bulky manures. These organic materials help conserving moisture in the soil.
- (vii) Recommended plant protection measures to be adopted for all the *kharif* crops as per package of practices of respective states.
- (viii) Seed of sorghum, pigeonpea, mung bean, urd bean, cow pea, groundnut, sunflower and castor must be treated with Thiram or Captan @ 2-2.5 g/kg seed before sowing.

B. Soil and water management practices

- (i) Seed beds to be kept ready so as to facilitate sowing immediately with the onset of rains. Fields should be properly leveled for uniform water distribution within the sub-plot.
- (ii) Broad bed and furrow, ridge and furrow, compartmental bunding and contour trench land configuration may be adopted in shallow alfisols as moisture conservation practices.
- (iii) Furrow sowing of *kharif* crops at closure plant to plant distance with wider inter row spacing.
- (iv) Wherever economically viable, mulching should be practiced in between crop rows using locally available mulching material.
- (v) Wherever possible run-off may be harvested to make provision for protective irrigation at later stage/crop ripening.
- (vi) Major emphasis on in-situ rain water conservation, harvesting excess run-off for re-use and groundwater recharge.

C. Some other useful irrigation water saving practices

- ❖ Reduction of conveyance losses while irrigating the light textured soils. A simple and cheap technique is to spread a polythene sheet in the field channel before irrigating the field and then roll it back for irrigating the other field.
- ❖ Wherever possible the crops should be sown on ridged plots and irrigating every alternate furrow on rotation. This helps in saving of irrigation water and better growth and productivity of crops when planted on ridges/beds.

- ❖ Ensuring best use of rainwater. In case a rainfall of about 3-5 cm occurs near to irrigation date, the irrigation may be avoided.
- ❖ Lighter irrigation may be applied during initial growth stages when root growth is limited.
- ❖ Poor rainfall means lesser recharge to the groundwater. Since groundwater is the most dependable source of irrigation, its indiscriminate exploitation must be avoided. In hard rock areas, for improving well yields, long and continuous pumping should be substituted by intermitant pumpage.

5. Judicious use of Surface and Ground Water During Scanty Rainfall/ Drought

Rainwater is the main source of surface and groundwater recharge. In case of deficient and scanty monsoon rainfall recharging of groundwater may not take place. Water management issues related to deficient rainfall and need attention include (a) less exploitation of groundwater for irrigation, (b) increased concentration of salts in the soil profile and groundwater, (c) increased concentration of specific ions like fluorides and nitrates in water and (d) non-availability/ less availability of drinking water for animals in natural storage structures such as ponds, lakes etc. Immediate steps needed to make efficient use of available surface and groundwater in such areas are :

- a) Resorting to drip and sprinkler irrigation practices wherever possible particularly for commercial crops including fruit orchards and widely spaced vegetables. For row crops alternate rows may be irrigated. Raised bed planters save 35 to 50% irrigation water and enable raised bed farming which particularly suits to vegetable cultivation besides cereals, pulses and oilseeds.
- b) Studies on groundwater resources indicate that 25 to 84% of the poor quality water are also being used for cropping in several states of the country such as AP, Gujarat, Haryana, Karnataka, MP, Rajasthan and UP. Based upon climate, soil, water and crop factors, the Central Soil Salinity Research Institute, Karnal has standardized water quality guidelines which must be kept in mind while irrigating the crops using poor quality groundwater in drought prone areas. In a normal rainfall year salinity developed in soil due to poor quality irrigation water gets leached or washed. However, this does not happen in a below normal rainfall year and one has to deal with relatively higher salinity levels. Some specific strategies for efficient use of poor quality water during deficient rain year are :
 - i) Mixed and/ or alternate use of limited good quality and underground poor quality waters for irrigation.
 - ii) Cultivation of salt tolerant varieties like CSR-10, CSR-13, CSR-27, CSR-30 and CSR-36 of rice; KRL 1-4, KRL-19 of wheat; CS-52, CS-54 and CS-56 of mustard; CSG-8962 of gram.
 - iii) Farmers having residual sodium carbonate (RSC) water for irrigation should be encouraged to use this water judiciously by applying gypsum as soil amendment. In order to facilitate quick utilization, it is recommended that gypsum should be kept in baskets (made from bamboo/mulberry sticks) and covered with jute sack and placed under the source of irrigation so that neutralized water is used for irrigation.

- iv) The states of Haryana, Punjab, Rajasthan, Madhya Pradesh, Uttar Pradesh and Andhra Pradesh should therefore, need to take special extension programmes and provide gypsum freely/ and or soft loan term basis to promote use of alkali waters.
 - v) In the saline areas, if there is less rainfall and farmers are unable to take Kharif crop, it is proposed that they be advised to give pre-sowing irrigation with saline waters and go in for *toria* cultivation in September.
 - vi) The farmers having saline waters may go for *Isabgol* cultivation as this crop can withstand the saline water irrigation upto EC 8dS/m during the *rabi* season and give profitable yield. *Matricaria* is another medicinal crop which can be cultivated even upto soil pH9.5.
- c) In a sizeable area of Rajasthan, groundwater is also loaded with fluorides and nitrates. Hand pumps have been designed by state agencies for safe use of these waters for drinking. Each pump costs about Rs. 5000-6000. Immediate efforts are required to install these attachments in all drought prone areas having fluoride and nitrate problem in groundwater.

6. Specific Contingent Crop Plan for Rainfed Regions of Rajasthan and Haryana

S.No.	Crops	Varieties	Probable date of occurrence of rainfall			Duration of crop, seed rate etc.
			15-31 July	1-10 August	10-20 August	
1.	Pearl millet + Cowpea (for Fodder) Or Pearl millet + Moth (for Fodder)	Raj. 171, MH 169 + C 152, Charodi-1, B 16, RS 19 Raj. 171, MH 169 + RMO 40, RMO 257 (for fodder)	Yes Yes Yes	Yes Yes Yes	Yes Yes No	85-90 days 65-95 days 10% higher Seed rate 85-90 days 60-75 days, 10% higher seed rate
2.	Moth bean	RMO 40, RMO 257 (for fodder)	Yes	Yes	Moth Bean RMO 40	60-75 days, 10% higher seed rate
3.	Cluster bean	RGC 936, RGC 1002	Yes	Yes	For fodder (RGC 936)	85-90 days, 10% higher seed rate
4.	Cluster bean (Vegetable Type)	Pusa Nav Bahar Pusa Sada Bahar	Yes	Yes	Yes	65-70 days, 10% higher seed rate
5.	Cowpea (Vegetable Type)	Pusa Komal Pusa <i>Do Fasli</i>	Yes	Yes	Yes	65-70 days, 10% higher seed rate

7. Contingent Plan Specific to Irrigated Areas of Punjab, Haryana and Western Uttar Pradesh

Sl. No.	Situation	Option		Rainfall Status			Remarks
		Crop	Variety	Before August 1	August 2-10	August 11-20	
1.	Rice area which could not be transplanted till July 31, 2010	Short duration early maturing rice, Maize	Govinda All Hybrids	Yes Yes	No Yes	No For Fodder	Seed availability to be ensured
2.	In case rain is delayed beyond first week of August nearly 10% of transplanted paddy may wither and may need replacement	Maize Castor Black gram Green gram	All Hybrids Hybrids Mash 338 Moong 613, 668	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes No No No	Seed availability to be ensured. Conserve moisture for early Rabi oilseeds and pulses
3.	In a situation of delayed rains beyond August 20	Maize, Sorghum, Pearl millet may be grown as fodder crops. Dhaincha may be planted as a green manure crop					Dhaincha seed may not be available in sufficient quantity

8. A List of Drought Tolerant and Early Maturing Varieties of Different *Kharif Crops*

Sl. No.	Crop	Suitable varieites
1	2	3
1.	Pearlmillet	For Rajasthan : Pusa 23, RHB 90, Pusa 605, HHB 60, HHB 67, BBH 68, Raj 171, ICMH 356, JBB 2
2.	Sorghum	For Rajasthan : CSH6, CSH 13, CSH 9, CSH 16, CSH 14, SPV 96, CSH 17, CSV 15, CSV 10. For Gujarat : CSH 9, CSH 13, CSH16, CSV 15, CSV 13, GJ 39, GJ37, GSH 1, GH 40, GH 41. For Andhra Pradesh : CSH 16, CSH 9, CSH 13, PSH 1, CSV 13, SPV 462, CSV 15.
3.	Maize	For Rajasthan : Mahikanchan, Prakash, Ganga-11, Shakti, Pusa Hybrid 1, Pusa Hybrid 2. For Gujarat : Guj Makki 1, Guj Makki 2, Prakash, Pusa Hyb 1, Pusa Hyb 2, Gaurav, Shakti. For Andhra Pradesh : Harsha, Deccan 103, Deccan 109, Deccan 107, MMH 133, Prakash, Pro 311, Bio 9681.
4.	Sesamum	For Rajasthan : RT 124 For Gujarat : RT 54, RT 103 For Andhra Pradesh : YLM 11, T 78, Sweta TII
5.	Castor	All available hybrids and varieties For Andhra Pradesh : Jyoti, Deepti, Kranti.
6.	Sunflower	For Rajasthan : PKVSH 27(H), PKVSH 9 For Gujarat : Guj Sunflower, Sungene 85 (H) For Andhra : TNAU-SUP-10
7.	Mothbean	All available improved varieties such as RMO 40, RMO 257
8.	Cowpea	For Rajasthan : V 505, Pusa Komal, Pusa <i>Do Fasli</i> For Gujarat : GC 3, Pusa Komal, Pusa <i>Do Fasli</i>
9.	Green gram	For Rajasthan : ML-267, Pusa 105, RMG 62, MUM 2 For Gujarat : PDM 11, Pusa 105, BM 4, Guj Mung 3 For Rajasthan : WWG 2, Pusa 9072, Madhura 295, IGG 407, IGG 450 For Madhya Pradesh: JM -721 TJM-3
10.	Blackgram	For Rajasthan : T-9, Pant U-19 For Gujarat : T-9, Pant U-19 For Andhra Pradesh : T-9, Pant U-19, LBG -17, LBG-402, LBG-20 For Madhya Pradesh : Barkha (RBU-38), Azad Urd-3
11.	Horsegram	For Rajasthan : AK-21, PHG 9
12.	Foxtail millet	For Rajasthan : Gavari, Meera. For Andhra Pradesh : Prasad, Krishnadevaraya, Narasiharaya, AK-132-1
13.	Fodder Crops Clusterbean	For Rajasthan : DP safed, FS 277, HFG 119, HFG 156, Bundel Guar 1, Bundel Guar 2 For Gujarat : Bundel Guar 1, Bundel Guar 2
14.	Pearl millert	For Rajasthan : Raj Bajra Chari 2, Giant Bajra For Gujarat : Rajko, Raj Bajra Chari 2, Giant Bajra For Andhra Pradesh : Giant Bajra, Raj Bajra chari 2

Sl. No.	Crop	Suitable varieites
1	2	3
15.	Sorghum	For Gujarat : SSG 59-3, MFSH 3, Harasona, Guj Forage Sorghum 1, HC 136, Raj Chari 1, PC 6, PC 9, PC 23. For Andhra Pradesh : PC 6, PC 9, PC 23, HC 136, Raj Chari 1, SSG 59-3, X 998, MFSH 3, Hara sona.
16.	Deenanath grass	For Rajasthan : Bundel Deenanath 1, Bundel Deenanath 2. For Gujarat : Bundel Deenanath 1, Bundel Dennenath 2. For Andhra Pradesh : Bundel Deenanath 1, Bundel Dennenath 2.
17.	Cowpea	For Gujarat : Bundel Lobia 1, : Bundel Lobia 2, EL 4216, UPC 287, UPC 5286, UPC 8705
18.	Napier x Bajra Hybrid	For Gujarat : Co1 For Andhra Pradesh : NB 221, IGFRI 10, CO 1.
19.	Maize	For Rajasthan : African tall For Gujarat : African tall For Andhra Pradesh : African tall
20.	Field bean	For Gujarat : Bundel sem-1, JLP4 For Andhra Pradesh : Bundel sem-1, JLP 4
21.	Guinea grass	For Andhra Pradesh : Macuenni Hamail
22.	Cotton	(i) North Zone (Haryana, Punjab, Rajasthan Western U.P.) (a) Desi varieties : LD 327, LD 491, HD 107, GR 8, Lohit (b) American varieties: Bikaneri Narma, H 777 (ii) Central zone (M.P., Maharashtra, Gujarat) (a) Desi Varieties : Maljari, AKH 4, AKA 8401, Y-1, G.Cot 11, G. Cot 13, G.Cot 17, G.Cot 19. (b) American varieties : Bikaneri Narma, H 777 (iii) South zone (Karnataka, Tamil Nadu, A.P.) (a) Desi Varieties : Raichur 51, DB 3-12, K 10, K 12 (b) American : LRA 5166
23.	Sugarcane	Tropical Zone (A.P., M.S. Karnataka, Tamil Nadu, Kerala, Orissa, M.P., Gujarat) Co 740, Co7219, Co8011, Co 8014, Co 86010, Co 86 032, Co 92002, Co 85019, Co 91010, CoM 88121 (Krina) CoG 93076, 85 R 186 (Harita), CoV 92102, CoA 89085 (85 A 261), CoR 80001, CoC 671. Sub Tropical Zone (Punjab, Haryana, U.P., Bihar) Co 1148, CoS 767, Co 7717, Co 87263, BO 91, BO 128
24.	Rice	Suitable Upland rice varieties Suitable across the states : Tulasi, Vandana, Aditya, Rasi, Jawahar Rice 3-45, Anjali Andhra Pradesh: somasila Chattisgarh: Dateswari Kerala: Harsha Madhya Pradesh: Rasmi Orissa: Lalitagiri, Udayagiri Rajasthan: Vagadhan West Bengal: Kanika, Jamini.

Sl. No.	Crop	Suitable varieites
1	2	3
25.	Millets	<p>(i) Royalseema region of Andhra Pradesh, Parts of Karnataka and Maharashtra Faxtail millet: Prasad (SIA 326): matures in 80-85 days can be planted upto end of August. Krishnaadevaraya and Narasimharaya: produce more stover than prasad. AK 132-1: highly drought tolerant.</p> <p>(ii) Western Rajasthan Foxtail millet: SR 11 (Gavari), SR 16 (Meera)</p> <p>(iii) For M.P. and Chhatisgarh Little millet: JK-8 Matures in 70-75 days. Suitable for contingency planning. Evolved at JNKVV, Jabalpur. Kodo millet: JK-76, RBK-155</p>
26.	Fodder crops	<p>(i) For Western Rajasthan (under late onset of Monsoon) Field bean: Bundel Sem-1 Anjan Grass: Marwar Anjan Yellow Anjan: Marwar Dhaman</p> <p>(ii) For Saurashtra Region of Gujarat (under late onset of Monsoon) Marvel grass: GMG-1 Dharaf grass: GAUD-1</p> <p>(iii) For Punjab & Haryana (under late onset of Monsoon) Sorghum (Single cut), HC-136, HC 171, HC-308, HC-6 Sorghum (Multicut), Punjab Sudex, LX-250. Maize: J-1000 Teosinte: TL-1 Cowpea: CS-88 Guar: HFG-156, Guara-80, Bundel Guar-3 Lablab bean: JLP-4 Guinea grass: PGG-10, PSG-101</p> <p>(iv) For Western Uttar Pradesh (under late onset of Monsoon) Sorghum (Single cut): Pusa chari-6, HC-136, UP chari-1, UP chari-2, Pant chari-3 sorghum (Multicut): <i>Meethi</i> Sudan SSG-59-3, Pusa Chari-23. Cowpea : UPC-287, Bundel Lobia-2. Lablab bean : JLP-4.</p> <p>(v) For Madhya Pradesh & Chattisgarh (under late onset of Monsoon) Sorghum (Single cut): JC-6, HC-171, HC-308 Sorghum (Multicut) JC-69. Cowpea : UPC-287, UPC-5286 Lablab bean: JLP-4.</p>

Short duration rice varieties and hybrids released during last five years included : Virender, CR Dhan 40, Sahyadri 4, Abhishek, Gontra Bidhan, Sushak Samrat, PA 5129, DRBH 2 and GK 500 3

(a) State-wise list of pulse crops varieties is as under :

Mungbean

State	Varieties
Andhra Pradesh	WGG 2, LGG 407, LGG 450, Madhira 295
Assam	Pant Moong 4, Meha
Bihar & Jharkhand	Pant Moong 2, Pant Moong 4, Narendra Moong 1, HUM 1, IPM 02-3
Delhi	MH-02-25, IPM 02-3
Gujarat	Gujarat Moong 4, IPM 02-3, Meha, PKVAKM 4
Haryana	MH 02-15, IPM 02-3, Pusa Vishal
Himachal Pradesh and J&K	Pant Moong 6
Karnataka	HUM 1, China Moong
Madhya Pradesh & Chhattisgarh	BM 4, JM 721, TJM 3, PKVAKM 4, HUM 1
Maharashtra	Phule M 2, TARM 1, HUM 1, PKAKM 4
Orissa	TARM 1, PDM 139, Pusa 9072, OBG -52, LGG 460
Punjab	ML 613, MH 02-15, IPM 02-3, Pusha Vishal, SML 668, Pant Moong-5
Rajasthan	RMG 268, SML 668, Meha, MH -15, IPM 02-3
Uttar Pradesh & Uttaranchal	Narendra Moong 1, Pant Moong 4, Pant Moong 5
Tamil Nadu	COGG 912, CO 5, VBN (Gg) 2, TM 96-2, Pusa 9072, ADT-3, TM 96-2
West Bengal	Pant Moong 4, Pant Moong 5

Urdbean

State	Varieties
Andhra Pradesh	KU 301, Pant U 31, WBG 26, IPU 2-43, TU 94-2, LBG 685, LBG 402, LBG 623, LBG-709
Assam	Pant U 31, IPU 94-1 (Uttara)
Bihar & Jharkhand	IPU 94-1 (Uttara), Birsa Urd 1, Pant U 30, Pant U 31
Gujarat	TPU 4, AKU 4, GU, PU 311
Haryana	Mash 338, Pant U 31, Sekhar
Himachal Pradesh	Pant U 19, UG 218, Pant U 31, NDU 99-2
Karnataka	KU 301, WBG 26, WBU 108, LBG 402, LBG Manikya, 1, Pant U 30, TU 94-2
Madhya Pradesh & Chhattisgarh	TPU 4, Jawahar Urd 2, Jawahar Urd 3, Pant U 30, Azad urd 3
Maharashtra	TPU 4, Pant U 30, TAU 1, TAU 2, Azad Urd 3, AKU15, AKU 4 (Melghat)
Orissa	KU 301, WBG 26, IPU 2-43
Punjab	IPU 94-1, (Uttara), Krishna
Rajasthan	IPU 94-1(Uttara), Krishna, Pant U31, KU 300
Uttar Pradesh & Uttaranchal	IPU 94-1 (Uttara), Narendra Urd 1, Pant U 30, Pant urd 31, KU 92-1
Tamil Nadu	ADT 5, Pant U 30, Vamban-3, Vamban-4, CO6
West Bengal	IPU 94-1 (Uttara), KU 92-1, WBU 109

Pigeonpea

State	Short duration varieties
Punjab	UPAS 120, Pusa 855, AI 201, AL 15, Pusa 992
Haryana	Manak, UPAS 120, Pusa 855, Pusa 922
Delhi	Pusa 992
Rajasthan	Manak, UPAS 120, Pusa 855
West U.P.	Manak, UPAS 120, Pusa 855
Tamil Nadu	CORG 9701, Co 5, Vambean 3
Madhya Pradesh	ICPL 87, GAUT-001 E, TT 401

(b) List of varieties/ Hybrids of sunflower and Castor released by Central Variety Release Committee during 2005-2010

SUNFLOWER

Sl. No.	Name of the variety/ hybrid/ inbred line		Characteristics/ Traits	States
1.	CO-5	V	Yield (Kg/ha) – 1000-17000 Days of maturity – 85-90 Oil content (%) – 39-42	Tamil Nadu
2.	RSFH-I (Tunga)	H	Yield (Kg/ha) – 1300-1600 Days of maturity – 95-100 Oil content (%) – 40-41	Karnataka
3.	HSFH-848	H	Yield (Kg/ha) – 1200-1500 Days of maturity – 95-100 Oil content (%) – 40-42	Haryana
4.	TAS-82	V	Black seed variety Yield (Kg/ha) – 800-1200 Days of maturity – 90-100 Oil content (%) – 40-42	Maharashtra
5.	LSF-8	V	Tolerant to downy mildew, rust and <i>Alternaria</i> Yield (Kg/ha) – 1300-1400 Days of maturity – 90-95 Oil content (%) – 36-39	Maharashtra
6.	DRSH –I (PCSH-243)	H	Yield (Kg/ha) – 1300-1600 Days of maturity – 95-100 Oil content (%) – 40-42	All India during <i>Rabi-summer</i>
7.	DRSH –I13	V	Yield (Kg/ha) – 1200-1500 Days of maturity – 90-98 Oil content (%) – 36-39	All India
8.	KBSH-53	H	Yield (Kg/ha) – 1700-2700 Days of maturity – 95-100 Oil content (%) – 42-44 Tolerant to powdery mildew	Karnataka
9.	PSH-569		Yield (Kg/ha) – 2000-2200 Days of maturity – 100 Oil content (%) – 40	Punjab

CASTOR

Sl. No.	Name of the variety/ hybrid/ inbred line		Characteristics/ Traits	States
1.	DCH 519	H	Resistant to <i>Fusarium</i> wilt, leaf hoppers Yield (Kg/ha) – 1740-2130 Days of maturity – 105-110 Oil content – 50	Both rainfed and irrigated areas, all over the country
2.	GCH 7	H	Resistant to nemadote-wilt complex Yield (Kg/ha) – 2450 Days of maturity –110-120 Oil content – 49	Irrigated areas of Gujarat
3.	Jwala (48-1)	V	Resistant to wilt, capsule borer and tolerant to Jassid and <i>Botrytis</i> Yield (Kg/ha) – 1100-2000 Oil content (%)– 48	All India
4.	GC-3	V	Yield (Kg/ha) – 2340 Oil content(%) – 49.6 Resistant to wilt, tolerant to <i>Macrophomina</i> root rot	Irrigated areas of Gujarat
5.	YRCH-I	H	Yield (Kg/ha) – 1800 Days of maturity –120 -115 Oil content (%) – 49	Tamil Nadu

V= Variety; H=Hybrid

9. Availability of Certified Seed of *kharif* Crops During 2010 from Public Sector Seed Corporations (quintals)

Crops	Requirement	Availability
Paddy	5353906	5999845
Ragi	27241	30874
Kodo	400	429
Maize	755761	903034
Bajra	254608	295094
Jowar	157105	174420
Total Cereals	6549021	7403696
Urd	133984	188109
Cowpea	21458	21458
Moong	179612	189873
Horse Gram	3728	650
Field Bean	350	350
Moth	15300	5759
Arhar	200677	226985
Rajmash	1102	700
Total Pulses	556211	633883
Castor	43716	64378
Ground Nut	1825967	2006427
Niger	1517	1069
Til	20502	27488
Soybean	2962515	3580675
Sun Flower	45001	52295
Total Oilseeds	4899218	5732332
Cotton	192686	253320
Jute	38392	84775
Total Fiber	231078	338095
Bajra Napier Hybrid	25	25
Guar	76003	84830
Sudan Grass	200	200
Total Fodder	76228	85055
Grand Total	12311756	14193062

10. Contingent Plan for Livestock During Drought

- Livestock suffers even more than human beings during a below normal/ scanty rainfall year. During below normal rainfall year/ drought year there is large scale migration of livestock from states such as Rajasthan to other states in search of fodder. Migration of the animals from Rajasthan to Madhya Pradesh and Uttar Pradesh is an age-old drought escaping strategy. Fodder grasses are also generally transported from Madhya Pradesh Plateau to Maharashtra and Gujarat. The best option is to establish cattle camps in assured irrigation part of the drought prone areas. In case of Rajasthan, these camps should be established along Indira Gandhi Canal where water for drinking and growing fodder is easily available. Facilities like storing densified roughages transported from other parts of the country should also be established adjacent to these camps. In case of severe drought immediate efforts will be needed to grow fodder crops like oats, barley, *Kasni* and *Lucern* etc. during September-October in Indira Gandhi Canal areas.
- Resorting to alternate day watering to camel, sheep and goats. Experimental evidences show that even watering twice a week did not have much adverse effect on body weight of the sheep.
- Avoiding long distance grazing during scanty rainfall/ drought period as tired animals need more and frequent watering and feeding
- Periodic health check-up of all animals in the cattle camps and following of recommended vaccination schedule for all major diseases of the livestock should be taken on priority. Deworming will improve fodder and feed absorption.
- Special care is required for productive, lactating and pregnant animals. These animals must be supplemented with additional concentrates.

(a) Ensuring availability of quality fodder

During sub-optimal monsoon/drought, availability of green fodder and natural grasses is drastically reduced. Even the supply of crop residue, normally used as maintenance ration, is reduced whereas demand is increased due to lesser supply of greens. To mitigate/ moderate the situation and to save the animals, following strategy may be adopted in those areas where there is scarcity of rain or drought like situation.

- (i) Catch fodder crops of maize, *bajra*, cowpea, *bajra* + cowpea, maize + cowpea may be taken-up on availability of light showers even upto August-September.
- (ii) Partially damaged wheat grain may be diverted for feeding to save the

productive animals. However, substandard wheat having very high aflatoxin content should be avoided as the same may result in abortion in pregnant animals.

- (iii) Efforts should be made to increase the production of supplements like UMMB (Urea Molasses Mineral Block) lick, which can be easily transported (as animal chocolate) to be offered to the animals along with crop residues to increase their palatability and digestibility.
- (iv) Possibility of feeding of tree leaves after lopping and grazing of grasses in forest areas may be explored in consultation with Forest Department. Pods of trees like *Prosopis juliflora* can be collected and supplemented as feed source. These pods contain nearly 13% protein and 25-30% sucrose. In Gujarat, these pods are already used upto 30% of the total ration of the animals. Its leaves can also be used as fodder upto 10% of the ration. Similarly, leaves and fruits of other trees such as *Leucaena leucocephala*, *Alanthus excels*, *Prosopis cineraria*, *Salvadora persica*, *Acacia spp*, *Albizia spp*, etc. may be collected to supplement protein content in roughages and moderating fodder scarcity.
- (v) Vegetable/ fruit waste may be collected from *sabzi mandies* and factories processing such foods (like SAFAL). These are generally high moisture feeds. In moist form, these could be distributed to farmers around the factories. After sun-drying these could be transported to deficit areas. The nutritive value of these byproducts is reported quiet high. Apart from providing additional feed resources, such type of recycling also helps in reducing the environmental pollution.
- (vi) Animal camps may be organized along nearby canals like Indira Gandhi *Nahar* of Rajasthan having adequate drinking water. Farmers along the canals may be persuaded to cultivate fodder crops only and may even be compensated suitably.
- (vii) A preliminary estimate indicates that about 20 million tones of rice straw is burnt in Punjab, Haryana and UP alone which creates problem of environmental pollution. This can be properly harvested, bailed, densified and fortified using 4% urea or molasses and transported to areas of fodder scarcity. Standardised machinery for harvesting, bailing, densification and fortification is available in the market. Some budget should be earmarked out of the Calamity Relief Fund or National Calamity Contingency Fund for

implementation of this plan on priority. Perennial grasses like Bhabhar grass (*Eulaiopsis binata*), guinea grass (*Panicum maximum*), napier hybrid, *Dichanthium annulatum*, *Chloris gayana* etc. which grow naturally during rainy season in different parts of the country can also be properly harvested, bailed and fortified for animal feeding either at site or transported to scarcity areas.

(viii) Sugarcane tops and dry sugarcane leaves from sugarcane growing areas may be transported, enriched for crude protein content and fed in scarcity areas. In areas where sugarcane crop may be drying due to moisture stress, whole crop can be harvested and used as fodder.

(b) Extended rainfall vis-a-vis green fodder strategy

- (i) Fodder crops like rapeseed and mustard, Chinese cabbage, *gobhi sarson* and maize may be sown in September for fodder purpose wherever feasible. These crops will be harvested by November to facilitate the sowing of *rabi* cereals.
- (ii) Under irrigated conditions, sowing of *berseem* with Chinese cabbage in last week of September may be taken up for early availability of green fodder. Under less availability of irrigation water *Senji* and *lucern* may be preferred over *berseem* cultivation.
- (iii) Dual purpose crops like barely (variety BH 75) may be sown in October. One cutting may be taken for fodder, 50-60 days after sowing and subsequent one left for grain production.
- (iv) Oats may be grown in October as multicut fodder to ensure availability of green fodder for longer period.
- (v) For quick growth in cereal fodders and higher crude protein contents, application of urea as foliar spray may be taken up.

11. Crop Contingent Plan for Flood Affected Districts of Punjab and Haryana

Heavy rain during the 1st week of July followed by breaches in Ghagar river and Sutlej Yamuna Canal (SYL) resulted in large scale flooding in 5 districts of Haryana viz. Ambala, Kurukshetra, Kaitthal, Fatehbad and Sirsa and 4 districts of Punjab viz. Patiala, Sangrur, Mansa and Ropar Flood water caused extensive damage to the already planted Kharif crops of rice, cotton, maize, moong & fodder crops of jawar, maize and bazra in these districts.

The following contingency plan is suggested to negate/ moderate impact of flood on agriculture in these two States.

- ❖ In case the flood water receded within 2-3 days the transplanted paddy crops will survive and regain regrowth. To push up re-growth and to off set the adverse affect of flood water; the farmers may apply one bag of urea per acre when the water is receded completely. In case some transplanted rice plants are washed away, immediate gap filling can be undertaken.
- ❖ The farmers may not be having rice nurseries at this stage to re-plant rice in the flood affected areas. However, Basmati rice varieties like CSR-30, Pusa 1121 and PB-1 etc. can be planted up to July end. In case nurseries of these varieties are available for transplant that could be preferred option to raise Basmati rice crop. However, in case nurseries are not available, the farmers may go for direct sowing of rice using zero *Till Seed Drill*. Proper Weed Management will be a priority action in direct seeded rice crop. The States may inform the farmers to follow complete package of practices as suggested by the State Agricultural Universities for effective weed management in direct seeded rice.
- ❖ Maize is an excellent substitute for rice in Punjab and Haryana. Several maize varieties including hybrids can be grown up to 1st week of August. The farmers are advised to go for large scale maize cultivation in flood affected districts after receding the flood water.
- ❖ Pulses like moong and urd can also be cultivated up to end of July. The area remained un sown because of late receding of flood water, can be covered by short duration crops like moong, urd and cowpea.
- ❖ Since fodder crops have been damaged by the floods, therefore, there is a strong case to maintain supply of green fodder for animals in the flood affected districts. The farmers may go for cultivation of maize, maize + cowpea, jowar and bajra as fodder crops to supplement the fodder requirements of milch cattle. Most of the fodder crops can be grown upto 15th August.
- ❖ Flood affected areas generally experience out break of human and animal diseases. Special campaigns may be organized for vaccination of animals against out break of major diseases.

12. A Brief Crop Contingent Plan for *Rabi* 2010-11

IMD forecast for South West monsoon indicates extended monsoon scenario and September may be the wettest month. The states may plan from now onwards how

the excess rainwater during the month of September, 2010 can be stored and re-used for early Rabi sowing and for providing life saving irrigation to Rabi crops.

- (i) In case rains are received before September 10, *toria* and *taramira* should be sown immediately as catch crops. Agarni variety of mustard can also be grown during September.
- (ii) In case rains are received by end September, mixed sowing of wheat +gram and barley+gram can be taken up in almost all rainfed regions. Mustard inter-cropped with gram in rows about 3 m apart is another option. Lentil is another pulse crop which can be raised with 2-3 irrigations. Vegetable crops such as peas, broad bean, French bean and spice crop fennel can be raised with availability of one irrigation.
- (iii) In the light of lower availability of surface and ground water for irrigation, the farmers particularly in the Indo-gangetic alluvial plains are advised to resort to zero tillage and strip-till drills wheat cultivation after utilizing the residue moisture available after rice harvest. Zero tilled wheat saves on about 30% water, energy and labour and also gives either equal or enhanced yield compared to conventional tillage. Perfect zero till machines are available in the market. Some budget may be earmarked for supply of such drills on subsidized rate to the farmers. No-till drills and strip-till drills in large numbers should be procured and distributed; and their manufacturing regionalized so that interested farmers or service providers could easily purchase them.
- (iv) Resorting to bed planting furrow irrigated system for wheat cultivation wherever feasible and practical. It saves about 30% irrigation water and increases wheat yield. Planting of cauliflower and tomato on beds to save irrigation water.
- (v) The area left unsown during *kharif* should preferably be sown with *rabi* fodder crops, oilseeds and pulses taking advantage of extended monsoon rainfall during current year.
- (vi) Need based location specific agronomic manipulations such as application of mulch available locally, to conserve moisture, application of P and K as basal dose, reducing N dose and seed rate etc. can be adopted. Special care should be taken for plant protection aspects during drought phase.
- (vii) Resorting to cultivation of less water demanding crops and cropping systems in limited irrigation water supply areas. Such crops and their varieties can

be chosen from the *rabi* contingency plans of respective states. For example, wheat variety WH 157 and WH 283 can be successfully cultivated with limited water in Punjab, Haryana and Madhya Pradesh. Kundan variety of wheat is another such example which has comparatively higher dry matter production efficiency per unit water consumed. Vegetable crops such as garden pea (Arkel, Pragati), winter bean and vegetable mustard are the examples requiring less irrigation water.

(viii) Rotavators are efficient tillage equipment for preparing fine seed bed in 1-2 passes saving time and energy used in seed bed preparation, especially crops that need fine tilth. Since in dry farming time available in seed bed preparation and sowing is limited, large sized tractors with matching implements be used for carrying out different farm operations which should be available through custom service. Seed-cum-fertilizer drills/multi-crop planters should be available for sowing different crops during *rabi*. *Utera* after rice should be replaced by drilled crop using zero-till drill or other seed-cum-fertilizer drills that can work. For timely harvesting and threshing of crops in the fields, vertical conveyor reapers for harvesting and high capacity multi-crop threshers and combines are needed on custom hire. This would help in timely clearing of fields and sowing next crop.