

**Disaster Management Plan for Manipur**  
**Department of Horticulture and Soil Conservation**  
**Government of Manipur**

**PROFILE OF THE DEPARTMENT**

The Department of Horticulture & Soil Conservation was established during 1978 when the erstwhile Agriculture Department was trifurcated into three entities namely, the Agriculture Department, the Horticulture & Soil Conservation Department and the Command Area Development Authority with the objective of taking up programme implementation for horticulture development and soil & water conservation measures. Over the years, the programmes implemented by Horticulture & Soil Conservation Department slowly gained importance and popularity among the farmers. Alongside, the higher allocations made to Horticulture Sector in the Central Budgets during VIII, IX and X Plan gave a boost to Horticulture programmes in the State, as elsewhere in the Country. The annual Budget allocation made to Horticulture & Soil Conservation Department from the State Plan merely meet the requirements of staff salaries, wages of muster roll labourers and other Office expenses leaving no balance to take up developmental activities

The state has rich resources in terms of land and soil fertility, rain, water, vegetation etc. and the prevalence of suitable Agro-climatic conditions ranging from temperate to tropical and sub-tropical zones provide scope for development of horticulture in the state. Despite these natural advantages, growth of horticulture in the state has remained lackluster till recently due to the wide gap between the technologies generated and their adoption by the farmers in their fields and orchards. Resources constraint for investment in horticultural activities is another major factor for lack of development of horticulture in the state. A planned approach towards horticulture development in the state was undertaken a few years back when a survey was conducted in collaboration with the National Horticulture Board to identify potential areas for horticulture development in the state. The survey report indicates that about 2, 77, 064 ha. constituting 12% of the total geographical area of the state are available for horticulture and allied activities. Out of this potential area, only about 14% has been brought under different horticultural fruits and vegetable crops. However, during the last 2 / 3 years the areas under these crops are being expanded rapidly in all the districts of the state.

**Organizational Structure**

Director is the head of the Department. Director is the head of the Department. At the Headquarter, the Director is assisted by:

- (i) Additional Director    Additional Director Agri (H)
- (ii) Joint Directors        a. Senior Horticulturist

b. Joint Director (SC)

- (iii) Deputy Directors
- a. Deputy Director (HQ)
  - b. Deputy Director (HR)
  - c. (Deputy Director (H)
- (iv) Agriculture Officers
- a. Agriculture Officer (Planning)
  - b. Agriculture Officer (Information)
  - c. Agriculture Officer (Soil Conservation)/ Officer-in-charge, TM.
  - d. Agriculture Officer (Floriculture)

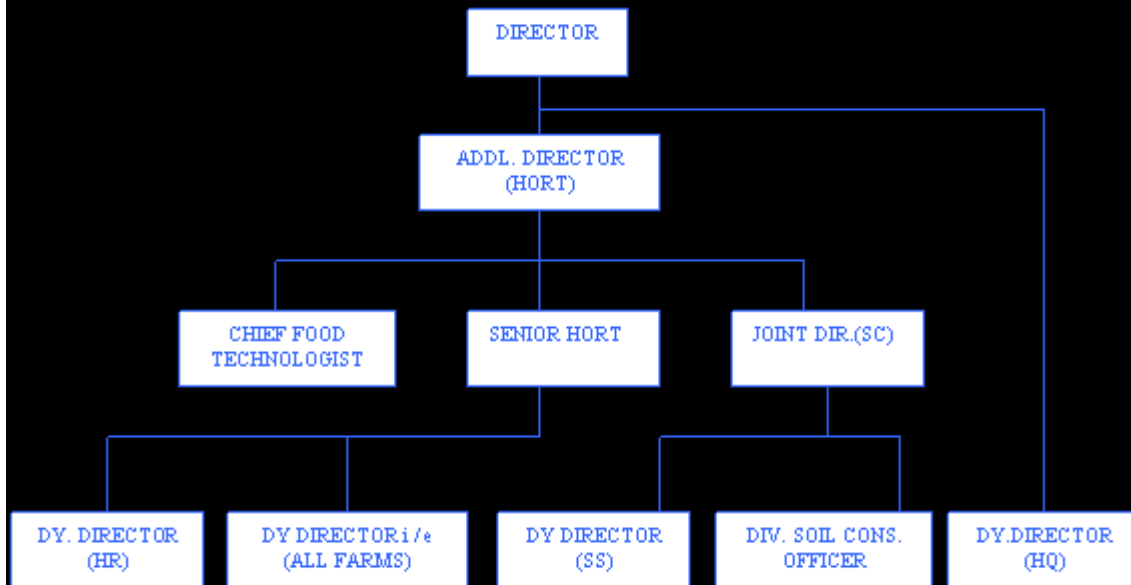
Districts are administered through the District Officer (H&SC) who are the rank of Deputy Directors. They are the head of the districts in respect of Horticulture & Soil Conservation Department. The District Officers at the District HQs are assisted by:

1. 1 (one) Horti. Development Officer
2. 1 (one) Soil Conservation Officer and
3. 2 (two) Junior Subject Matter Specialist (Pathology and Entomology) in the rank of HDO/SCO

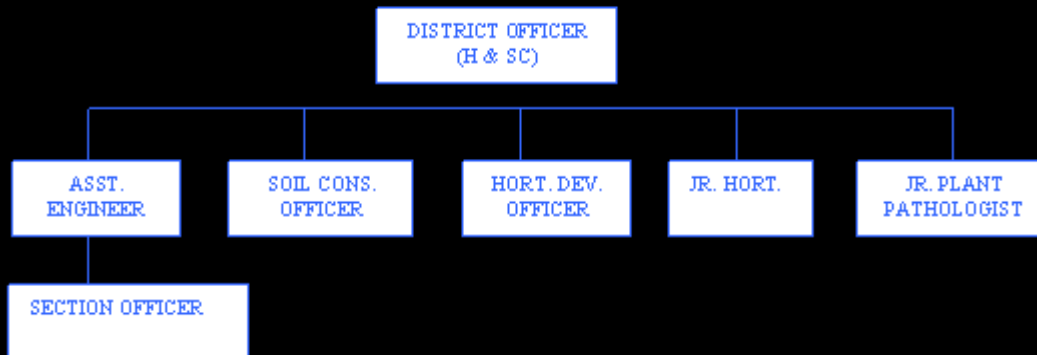
In each Sub -division there are 2 (two) officers. Sub-divisional Officer (Soil Cons.) is the in -charge of all Soil Conservation works of the Sub- division and Sub-divisional Hort. Development Officer is in -charge of Hort. works of the sub-division. Necessary technical and administrative staffs are provided at each level.

Soil Survey and Investigation Cell headed by the Deputy Director (SS) is under direct supervision of Director.

STATE LEVEL



DISTRICT LEVEL



SUB DIVISIONAL LEVEL



## Details of infrastructure available with the department

Table 1.3 Infrastructure available with Horticulture Directorate

Sl.No	Particulars of the Infrastructure	Description	Remarks
1.	Office building	15 nos.	
2.	Training Hall	1	At Khongampat (under MIDH)
3.	Office Vehicles	10 nos.	

## Chapter 2

### A profile of horticulture in the State and its vulnerability to Natural Disasters

The State is endowed with very rich potential for development of different varieties of horticultural crops. To realize this untapped potential, the Government has been giving due importance to the Horticulture Development as a core element, since growth in the sectors is likely to lead to the wide spread economic benefits especially to the rural poor.

Topographically the State is hilly and mountainous with a small central valley of only about 10% of the geographical area. Agro-ecologically the State is situated in the hot and warm humid/ per-humid ago-eco region. The soil of Manipur is strong to moderately acidic. The State receives adequate rainfall with heavy precipitation during July, August. Most of the cultivated area is rain-fed except some irrigated area in central valley. Moreover, above 80% of farmers are small and marginal having low investment capacity. The survey report indicates that the potential area for horticulture crops in the State is about 2,77,064 ha.

Horticulture in Manipur is the mainstay of majority of the populace and thus, holds the key to socio-economic development of the State. The State is broadly divided in to 2 Eco Region and 3 Agro Climatic Zones. The average annual rainfall of the State is 1,467.5 millimetres. Even though the quantum of rainfall is quite high, its distribution during the monsoon period is highly uneven and erratic. As a result, flood, drought and cyclone visit regularly with varying intensity. The frequent occurrence of these natural calamities badly affects the production of various horticulture crops of the State. These, stand as stumbling blocks in the way of enhancing crop production and productivity.

### Crop Production

Horticulture sector encompasses a wide range of crops namely fruit crops, vegetable crops, spices, flowers and plantation crops. The agro-climatic diversity in

the state with its high rain fall distributed over a four month monsoon season and a reasonably moderate winter allows for growing a variety of horticultural crops. The agro-climatic conditions are immensely suitable for perennial fruit crops like oranges and limes; annual fruit crops like banana, pineapple and papaya; spices like ginger, turmeric, chilli, a variety of root and tubers and a whole range of vegetables. The low-temperature in hilly areas at higher altitude offer ideal conditions for growing off-season vegetables. Of late floriculture is also showing excellent prospects. The state thus enjoys a natural comparative advantage for horticulture with possibilities for growing a diversified basket of fruits, vegetables, spices, tubers and flowers. Focused attention in the planning process resulted in increase in area and productivity and resultantly, in production of horticulture crops. Due to the effort made for horticulture Development, the concept of hit-tech and commercial horticulture has reached the small and marginal farmers' level. It is a fact that horticulture & plantation sector has provided opportunities of crop diversification, resulting into increased income from the land and also the nutritional security.

Table 2.1. Area of Horticulture Crops

Year	Fruits	Vegetables	Spices	Flower	Plantation
2009-10	44793	19742	12199	-	-
2010-11	45574	20185	12590	-	-
2011-12	49480	20850	13200	-	-
2012-13	51311	21748	13557	-	-
2013-14	54052	24493	14740	-	-
2014-15	55629	27766	15775	810	31

### Vulnerability of horticulture to natural disasters

Horticulture in the state being predominantly rainfed is most vulnerable to vagaries of monsoon. The Department of Horticulture and Soil Conservation has been involved in the plantation of different fruit crops, cultivation of vegetables, spices, root & tuber crops, plantation crops etc. All these activities are partially / fully depend upon the nature like monsoon, temperature, wind etc. Hence, all the natural calamities like flood, cyclone, hail storm, disease, insect & pest, earth quake, affect these activities.

Table 2.3 Hazard wise vulnerability of horticultural crops to various hazards to which the department/state is prone to

Nature of hazard	Vulnerable locations	Stimulus	Outcome
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Flood	Flood prone areas (esp. Valley regions)	Increased frequency and intensity of rainfall	<ol style="list-style-type: none"> <li>1. Crop loss especially non perennials like vegetables, spices and plantation crops. Fruit crops like banana, papaya and pineapple will damage.</li> <li>2. Damage of new perennial plantations.</li> <li>3. Disruption to road transport affecting transport of horticultural produces.</li> <li>4. Damage to departmental buildings and farms.</li> <li>5. Damage to protected structures.</li> </ol>
Drought	Anywhere in the State	Less rainfall and water shortage	<ol style="list-style-type: none"> <li>1. Crop loss (Area)</li> <li>2. Production loss.</li> <li>3. Higher mortality in new plantations.</li> </ol>
Earth quake	Seismic zones	Waves and shock	<ol style="list-style-type: none"> <li>1. Damage to departmental buildings and farms</li> <li>2. Damage to protected structures</li> </ol>
Hail storm	Anywhere in the State	Falling of hail	Crop loss of both perennials and non perennials
Fire	Anywhere in the State (mostly in hill districts)	Forest fire	1. Perennial orchards during summer
Disease	Anywhere in the State	Disease out break	Crop loss
Insect, pest	Anywhere in the State	Insect pest out break	Crop loss

Chemical Poisoning	Industrial areas	Ash, pond leakage Industrial waste poisoning	1. Crop loss 2. Soil degradation
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## Flood

Among the natural calamities flood has been the most frequent visitor to the state. The entire valley region is exposed to frequent flood and water logging mostly in monsoon season. Heavy rainfall on the hills of Manipur and Flood waters of valley region affect the cultivated areas of the state. High degree of siltation, soil erosion, breaching of embankments and restricting disposal of flood water aggravates flood. Construction of irrigation and power generation projects on drainage lines of rivers sometimes aggravate flood due to sudden disposal of flood water through the river due to heavy rain fall in catchments. Apart from heavy rainfall, cyclonic wind along with heavy rainfall also cause flood in coastal areas. Flood remains for about 5-10 days in many parts of valley region along with damage of properties and also crop fields affecting food security of the victims. Thus Government takes up necessary restorative measures and creates an enabling environment for initiating agricultural activities by the farmers.

### Crop damage and risk analysis

The flood causes submergence of crop plants restricting respiration and gaseous exchange thereby ceasing all growth processes leading to death and decay. Aerobic crops cannot resist standing water and submergence.

### Nature of Damage

1. Incidence of pest and diseases to standing crop that escaped or resisted flood.
2. Damage of crops like vegetables, pulses and oilseeds at fruiting stage.
3. Oxygen starvation in root crops such as potatoes will lead to cell death in tubers and storage roots.
4. Lack of root function and movement of water and calcium in the plant will lead to calcium related disorders in plants such as blossom end rot in tomatoes, peppers, watermelons, and several other susceptible crops.
5. Leaching and denitrification losses of nitrogen and limited nitrogen uptake in flooded soils will lead to nitrogen deficiencies across most vegetable crops.

## Drought

Drought in India refers to a situation when rainfall is less than or equal to 5 mm for the week. And agricultural drought is a period of four such consecutive

weeks from mid-May to mid-October or 6 such weeks during rest of the year. Almost every alternate year Manipur faces some sort of drought or moisture stress like condition due to uneven and erratic distribution of monsoon rains.

### **Cyclone/ high wind**

Cyclone is not preventable. However, the extent of loss and damage can be minimised through proper planning. Planning for cyclone disaster management can be made in three stages: pre-cyclone, during cyclone, and post-cyclone. Planning at all these stages is important. Since the people in villages are affected persons, their involvement in the management at all three stages is necessary.

Risks involved:

1. The crops are submerged due to heavy downpours associated with a cyclonic weather which is worsened by the impact of high wind.
2. The crops at flowering and fruiting stage are affected to a greater extent due to lodging and shattering of pollens, many a times complete damage of the crop.
3. The supporting infrastructures are likely to suffer severe damage impairing the restorative measures.
4. The disruption of communication, power and transport is likely to delay the restorative efforts and require large funds and co-ordination of all functionaries.

### **Epidemic attack of pest and diseases**

In the present times owing to demand for food, feed and fodder the farmers indulge in and often induced to indulge in intensive agriculture in various combinations. This has led to a situation where there are increased incidences of pest and diseases and often in epidemic form. Conducive crop weather situation created by unsustainable anthropogenic activities coupled with the impact of climate change triggers multiplication of the races of pests and diseases often to epidemic scales requiring more comprehensive plant protection measures to keep things under control. Thus, disease and pest incidence have assumed greater significance in the frame work of disaster management in the modern crop husbandry.

The pest scenario and its incidence in the State vary from crop to crop and season to season because of erratic weather conditions. Conducive crop weather conditions at peak periods of activity coupled with inappropriate plant protection measures often aggravate the pest and disease attack inflicting irreparable damage to crops and their productivity.

Some general strategies adopted for Pest and Disease Control:

1. Surveillance in pest prone areas.
2. Capacity building of field functionaries and farmers on a regular basis.



3. Forecast of possible disease and pest incidence.
4. There is a need to build up season specific pest maps on endemic areas.
5. In case of any pest emergency (attack of major pest) coordinated efforts are put in taking prophylactic / community pest control measures through affected farmers and the functionaries of grass root level under the expert supervision of Specialists/Scientists of CAUs/ ICAR institutes/KVKs etc.

### **Toxicity/ heavy metal contamination**

There are reports of heavy metal contamination in certain river/ lakes/ stream/ water bodies in valley areas due to effluents from urban population which in turn contaminate the irrigational water and the same enter into food chain causing health hazards. As a result, the ever increasing volume of effluents and the wastes from domestic activities pollutes the water and soil resources with toxic substances and heavy metals. The agriculture produces obtained from these areas are contaminated. The contaminated produces fetch lesser market value and can't stand competition in the post WTO regime owing to stringent SPS (Sanitary and Phyto-Sanitary) standards. Further, they threaten our well being by entering into our food chain through the drinking water, plant and animal products we consume or even directly. And these have grave consequences to be unfolded.

### **Capacity of the Department to deal with the Disaster**

#### **Institutional**

Horticulture Directorate through its field functionaries extending upto Field Level Officers led by their respective District Level Officers look into the assessment of crop loss inflicted or likely to be inflicted by any disaster and initiate prevention/ mitigation measures at appropriate time. Pre and post disaster technical support is extended through the field functionaries by indulging in capacity building exercises; trainings on contingent measures, repair and maintenance services of horticulture equipment, awareness campaigns, community pest control, judicious water management etc. Coordinative efforts are put in with allied departments, (Irrigation, Revenue, Cooperation etc.) for assessment of crop damage and taking up preventive and mitigation measures. For example - during droughts or during cropping seasons suitable irrigation scheduling is done through participation of all the stake holders and with due consideration of the water requirement of crops. The functionaries of the directorate facilitate farmers and co-ordinate with financial institutions for wider crop insurance coverage and arrangement of crop loan.

#### **Organisational:**

The organization has its functionaries working at FA/ AO circle cater to the implementation of programmes. They are responsible to give a first-hand report of the disaster impact on its occurrence. They assess the damage and requirement of the farmers for restoration of agricultural activities. Their work is supervised by the

Asst. Agriculture Officer(s) working at the block/ sub divisional level. The District Officers of Horticulture & Soil Conservation at their level monitor the steps taken up by the AO/AAO. The DOs not only monitor and supervise implementation of different programmes at district level but also day to day status of crop weather and the preventive/restorative measures on the event of such Disaster visiting the state. Especially, supply and distribution of the critical inputs; seeds, farm equipment are closely monitored by them.

Organisational communication horizontally/ vertically/ laterally is done so as to build up an action plan with many other organizations to tackle the prevailing situation.

Infrastructural:

1. All the DOs offices have been provided with FAX and e-mail facilities.
2. The supervising officers have been provided mobility for monitoring and supervision of different government sponsored programmes.
3. There are 2 Plant Health Clinics to monitor and manage outbreak of disease and pest.
4. The department has 5 Horticulture farms of which most of the farms are engaged in production of quality planting materials and seeds. The farms also have facilities for tissue culture, input godowns, harvesting yard, seed storage, etc. those may serve as important infrastructure needed for rejuvenating agricultural activities especially aftermath of a disaster.
5. Besides, there are 2 main central institutes viz., Central Agricultural University and ICAR, Imphal Centre apart from 9 KVK Centres which are utilized for capacity building of all stake holders. There are training halls at district and state level across the state, which are used for capacity building of field functionaries and farmers. In addition, awareness drives are taken up from time to time through conducting group meetings and inter personal contacts to effectively overcome the challenges posed by such disasters.
6. Assured irrigation are provided to the selected farmers through Central Sponsored Scheme, PMKSY.
7. Directorate of Horticulture & Soil Conservation provides assistance to the farmers for planting materials, seeds, inputs and other infrastructures through District Officers concerned.

## **Gaps in the existing capacity**

1. The Control Rooms/ Centre for surveillance, monitoring and management need to be set up at different district levels with proper connectivity so that information could flow.
2. There is still a gap in utilizing the full irrigation potential available in the state and if fully utilized could bring even greater areas under assured irrigation.
3. There need to be enactments in place to prevent blocking natural drainages by construction of mega structures, roads etc. which always adds to the damage caused by submergence even under heavy showers.
4. There exists a gap in technology and infrastructure to appropriately deal with the impact disaster, which could be furthered through more of investments under these heads.
5. Mobility support should be enhanced so that the field visits by the functionaries are sufficient to build the capacity of the farmers and take desired restorative measures.
6. Funds need to be provided for organizing capacity building exercises at state, district and sub-divisional levels on disaster management.
7. Calamity resistant storage infrastructure at vulnerable points needs to be in place.
8. Department personnel need to be trained regarding management of disasters.
9. Adequate financial powers need to be vested in the Directorate to manage the crisis.

## Chapter 3

### Prevention, Mitigation and Preparedness Plan

Prevention of natural calamities is almost difficult. Prevention is often long term and would require integrated interventions by the State or National governments. However, some measures are taken up to reduce the impact of different disasters on horticulture crops.

#### Flood

1. Planting flood tolerant varieties and semi aquatic crops in flood prone areas.
2. Raising community nurseries in relatively higher patch of land with protected structures in the flood prone areas.
3. Contour ploughing, contour planting etc. are adopted to promote infiltration and reduce the runoff impact.
4. Construction/ restoration of check dams, embankments, field bonds/ contour bonding before the onset of monsoon.
5. In areas with greater gradient of slope, pucca water/ drainage outlets are constructed to protect the farm land from breaking of bunds followed by soil erosion/ sand cast during heavy downpours.
6. Blocked Drainage channels could be opened up adequately.
7. Catchments could be treated appropriately to reduce run-off and soil erosion.
8. Long and medium term weather forecasts are desirable for reducing the impact.
9. Disaster Warning Systems could also be helpful not only to save the harvestable standing crop but also shift harvested produce to safer places. Further, they could be helpful in moving farm equipments and machinery to safer places in addition to enhance the preparedness to face the calamities.

#### Drought

1. Agronomic packages; Summer ploughing, Conservation tillage, Cropping all the year round, use of organic manures, green manuring, Mixed cropping/ intercropping, Crop substitution, Water harvesting, conservation and management, use of pressurized irrigation systems, sowing short duration and drought tolerant varieties of crops, etc are being followed.

2. Private lift irrigation points are being established through providing assistance in order to bring more and more areas under assured irrigation.
3. Farm ponds and dug wells are also being established to cater to the farm water needs.
4. Pumpsets, pressurized irrigation systems (Sprinklers, Drips, Rain guns etc) are being provided on subsidy to enable farmers for fetching the much required life saving irrigation, especially during times of long dry spells.
5. Canals and their distributaries are being lined and Irrigation channels improved to reduce conveyance losses.
6. Proper irrigation scheduling with appropriate crop planning taking more of low duty crops in the rainfed high lands & drought prone areas.

Capacity building exercises are being organized to create awareness among the farmers and extension functionaries in this regard.

### **Crop pest and diseases**

1. Agronomic packages in line with integrated pest management principles; Summer ploughing, cultivation of tolerant varieties, adoption of appropriate soil, water and fertilizer management techniques, adjustment of sowing time to avoid peak periods of activity, Weed control, proper maintenance of drainage channels etc.
2. Preventive plant protection measures; seed/seedling treatment, monitoring pest/ disease incidence through proper surveillance and keeping them under ETL (Economic Threshold Level).
3. Plant protection in a community approach mode.
4. Strict quarantine: intra and inter regional.
5. Capacity building of functionaries and farmers on plant protection.

## Chapter 4: Response Plan

### Appointment of Nodal Officers

Level	Name of the Nodal officer(s)
State	Deputy Director (H)
District	DO
Block/Sub-divisional	AO of the concerned block

Incident Response Teams (IRT) will be formed and function at different levels which shall be in coordination for implementation of disaster related plans.

### **Role of NGOs and Voluntary Sector and coordination thereof;**

The coordination with NGOs & voluntary sector is generally at the District and block/sub-divisional levels. They have been participating in horticultural development programmes and will be vital links to reach every individual affected farmer. The NGOs and Voluntary Organisations may assist during awareness programme, selection of beneficiaries, and supply of crucial inputs to the bonafied farmers as well as dissemination of technologies.

### **System of assessing the damage from any disaster;**

The damage is assessed (Eye estimate) by physically visiting the cropped area jointly with revenue functionaries and through person to person contacts with farmers by the Field Assistants and Assistant Agriculture Officer under the supervision of District Officer. The value of crop loss is calculated based on the average crop yield of the respective district/ block. The data gets aggregated at district level followed by State level to get the consolidated figures based on acreage of crop damage. However damage to the infrastructures has to be done on assessment of actual loss.

## **Roles and responsibilities and coordination mechanism for the department;**

The extension machinery is kept vigilant to report any such emergency at once to the respective district and state headquarters. Aftermath a disaster the Directorate closely monitors and supervises supply of critical inputs like seeds, fertilizers, pesticides, Contingent crop management etc.

## **Disaster Specific Response Plan – Response plan for major disasters such as earthquake, flash flood/cloudburst, snow avalanche, landslide etc. in which state level response would be needed;**

High Floods causing submergence for longer duration, Flash Flood/ cloudburst, Cyclone, Severe Drought, Pest and disease epidemic are some disasters that need state intervention. The state is needed to provide adequate input assistance, resume immediate supply of required varieties of crop seeds, fertilisers, organize capacity building/ awareness camps and community/ prophylactic pest control, rescheduling crop loan repayment, provision of soft loans etc.

## **Chapter 5**

### **Relief, Rehabilitation and Reconstruction**

#### **Norms of relief, if applicable**

Input assistance extended as per Central Government & Ex-gratia by State Govt.

#### **Minimum Standards of relief**

The minimum entitlement will be based on assessment value submitted by the District level officers.

#### **Rehabilitation Plan**

- Extending input subsidy,
- Compensation as per government norms.
- Facilitating timely payment of indemnity for Crop loss,
- Contingent supply of seeds/ planting materials, fertilisers, pesticides.
- Reconstruction/ repair/ restoration of departmental buildings, farms, equipment etc.

#### **Financial mechanism**

CRF assistance is provided by the Revenue & DM Deptt. after assessment of damage by the District Administration. Besides, more funds would be necessary for the restoration initiatives. Additional funds are sought to be released to Directorate of Horticulture & Soil Conservation and in turn the Directorate releases fund to district

level officers.

### **Action Plan for Reconstruction – ‘Building back better’**

1. Providing Input assistance towards crop loss sustained on account of natural calamities.
2. Regular Capacity building exercises to combat impact of natural disasters.
3. Prepositioning of critical agri-inputs and maintaining reserve/ buffer stock for meeting any emergency.
4. Drawing up district-wise strategies for meeting such mitigation requirements.
5. Regular Crop weather watch analysis and taking up steps as and when required.
6. Constant extension support throughout the cropping season.
7. Restoration of supporting infrastructure on a priority basis.
8. Facilitating adequate crop insurance coverage.
9. Facilitating soft term loans and revised moratorium periods for repayment.
10. Media Management.

## **Chapter 6**

### **Knowledge Management**

#### **Need of creating network of knowledge institutions;**

There is a urgent need felt for creating such knowledge institutions especially owing to the increased frequency of aberrant weather conditions in the offing due to impacts of climate change. The problems need to be addressed in a very professional manner. The farmers of our state mostly belong to small and marginal category and thus are very vulnerable to impacts of natural disasters. Ours being an agrarian economy the plight of the farmers need to be addressed adequately and appropriately. This necessitates proper documentation and free flow of the entire chain of events before and aftermath of natural disasters.

Department will collaborate with CAU/ ICAR and other Government institutions to organize seminar to share best practices.

#### **Identification of Knowledge institutions and mechanism of knowledge sharing;**

The ICAR/ KVKs can be taken advantage of, on a regional basis for knowledge sharing purpose. Capacity building exercises need to be organized in sufficient numbers on Disaster Management for all the stake holders (govt. functionaries, Farmers, Input dealers, Farmers representatives etc).

Development of web portal for knowledge management will be a priority. Knowledge sharing will be done through electronic media, personal contact and



discussion in seminars/workshops.

### **Documentation of lessons learnt; and**

Such statistics of area affected, extent of damage, input subsidy extended, different measures taken etc. are all recorded for future guidance. Pertinent information will be hoisted in the websites of respective directorates and circulated in the vulnerable areas. However all these along with a critical analysis of the same could help us to locate gaps and be ready appropriately to plan for such eventualities.