

Disaster Management Plan for Odisha
(Agriculture Sector)

Agriculture Department
Government of Odisha

Chapter 1

Profile of the Department

The Department of Agriculture has the mandate to plan, develop, utilize and manage State's resources efficiently and effectively for fostering a developing/ developed environment for the farm and the farm entrepreneur with the objective of enhance farm income and ensure food security to all. To achieve this objective, the Department formulates Agriculture Policies & Plans and undertakes implementation, monitoring of agricultural projects through the different directorates and its ancillary organisations.

The Department is headed by the Principal Secretary. The functions of the Department are carried out through following organizations /wings, public sector undertakings.

- Directorate of Agriculture and Food Production
- Directorate of Horticulture
- Directorate of Soil Conservation
- Odisha State Seeds Corporation (OSSC),
- Odisha State Seeds and Organic Produces Certification Agency (OSSOPCA)
- Agriculture Promotion and Investment Corporation Ltd. (APICOL)
- Odisha Agro Industries Corporation (OAIC),
- Odisha State Cashew Development Corporation Ltd.(OSCDC Ltd.) and
- Institute on Management of Agricultural Extension (IMAGE)

ORGANISATIONAL SET UP

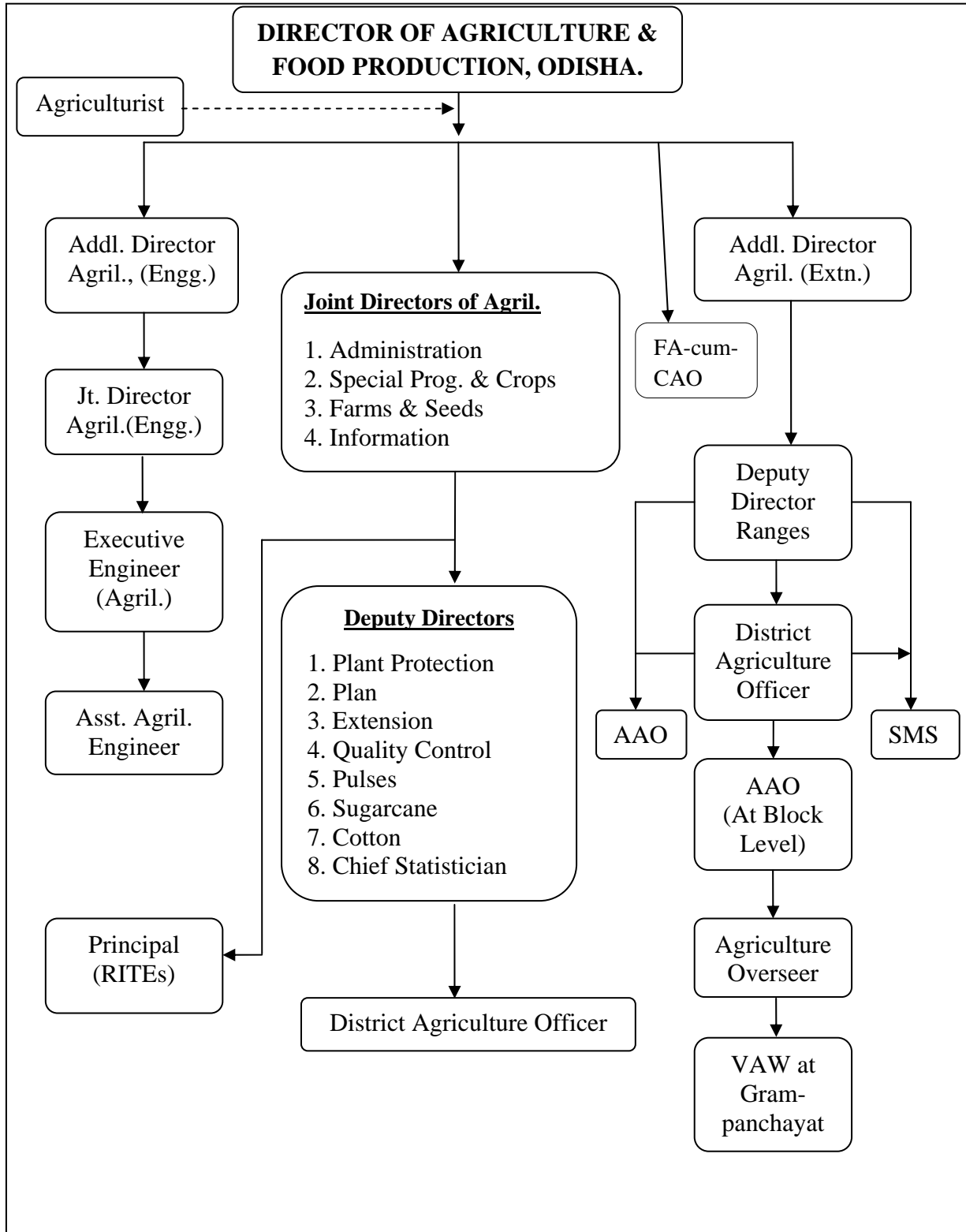
Directorate of Agriculture

The directorate is headed by Director of Agriculture and Food production of Odisha with headquarters at Bhubaneswar. Every district is headed by a Deputy Director of Agriculture with supporting agriculture extension functionaries.

Table 1.1 Staff Strength under Agriculture Extension set up:

Sl. No.	Name of the Post	Sanctioned Strength
1	ADA	2
2	JDA	4
3	DDA	41
4	DAO	100
5	EE (Agril.)	4
6	SMS	264
7	AAE	91
8	AAO	902
9	Agril. Overseer	1568
10	VAW	3218

ORGANIZATION SETUP OF AGRICULTURE DIRECTORATE

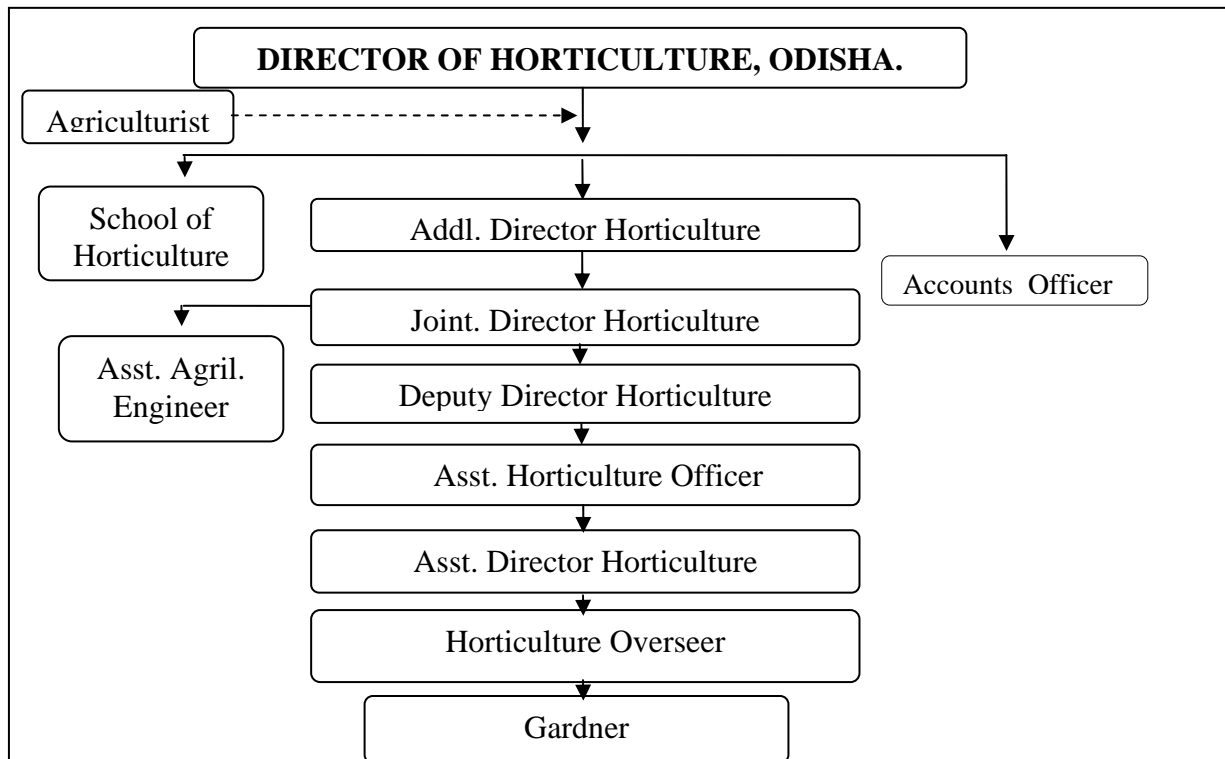


Directorate of Horticulture

Development of Horticultural works was looked by the Directorate of Agriculture and Food production. There by promotion & development of Horticulture crops was taken as second priority, next to rice, pulses etc. After separation of Horticulture Directorate from DA & F.P. vide Agriculture and Cooperation Department resolution no. 27182 AC dt.12th August' 1987, systematic & structured approach for Horticulture development came into being. A designated cadre of extension personnel, though inadequate, was put in place in 1989 which was restructured during 2012.

Table 1.2 Staffing pattern: (as on 01.04.2013):

SN.	Name of the post	Sanctioned strength	In Position	Vacancy
1	Director of Horticulture	1	1	0
2	Addl. Director of Horticulture	1	-	1
3	Joint Director of Horticulture	2	1	1
4	Deputy Director of Horticulture	23	-	23
5	Assistant Director of Horticulture	63	-	63
6	Assistant Horticulture Officer	314	255	59
7	Horticulture Overseer	300	270	30
8	Horticulture Extension worker	794	392	402
9	Gardener	731	394	337
10	Attendant	230	70	160
	Total	2459	1383	1076



Details of infrastructure available with the department

Table 1.3 infrastructure available with Agriculture Directorate

Sl. No.	Particulars of the Infrastructure	Description	Remarks
1	JDA (Information)	1 no	Has a printing press and personnel for media management
2	Deputy Director Offices	31 nos.	
3	District agriculture offices	97 nos.	
4	Executive Engineer's offices	3 nos.	
5	Asst. Agriculture Engineer's Offices	30 nos.	
6	FIAC buildings without godowns	100 nos.	
7	FIAC buildings with godowns	100 nos.	
8	Sadar Godowns at Dist. Level.	40 nos.	
9	Input godowns at each block level	314 nos.	
10	Training Halls	100 nos	
11	AAO Offices	628 nos.	
12	Departmental farms	62 nos	
	i) Godowns	102 nos	
	ii) Seed Processing plants	33 nos	
	iii) Farm equipments.	850 nos.	
	iv) Lift irrigation points.	35 nos.	
	v) Farm Office & staff quarters.		
	vi) Live stock	32 nos.	
	vii) Threshing floor	72 nos.	
	viii) Cultivated land	1492 hect	
	ix) Boundary Wall		
13	Soil, Seed, Fertiliser & pesticide testing laboratories,	26 nos.	Used for soil testing and quality control mechanisms.
14	Bio-control Laboratories/ Field stations.	8 nos.	
15	Regional Institute for Training on Extension, MIWUE & IMAGE	5 nos.	
16	OFMRDC,	1 no.	
17	Plant protection equipments		Available at district and block level
18	Govt. Vehicles		
19	Staff Quarters.		Mostly under RD Deptt.
	Others		

These infrastructure available are prone to flood and cyclone to a lesser extent. However, all the districts have some infrastructure those will be used as launching pads for taking up mitigation measures for resuming agricultural activities.

Horticulture

The Directorate has the following institutions for the development of Horticultural sector in the state.

Table 1.4: Infrastructure available with horticulture directorate

Sl. No	Name of the institution	Nos
1	Directorate (State level)	1
2	Dy. Director of Horticulture (District level)	19
3	Assistant Director of Horticulture (District level)	11
4	Assistant Director of Horticulture (Sub Division level)	29
5	Assistant Horticulture Officer (Block)	314
6	Training Institutes	3
7	Farms	85
8	Nurseries	154

The Directorate of Horticulture has 85 departmental farms over an area of 1913.08 ha covering orchard area of 1052.24 ha and 154 transit nurseries engaged for production of quality planting materials and demonstration of technologies. The farms and nurseries have the following mother plants.

Table 1.5 Details of Plantations available with Horticulture Directorate

Crop	No. of mother plants	Crop	No. of mother plants
Mango	90253	K.Lime	2252
Litchi	4260	Cashew	8509
Guava	12347	Arecanut	13048
Sapota	1992	Ber	168
Orange	1870	Jack fruit	60
Bael	629	Others	2794
Coconut	13929	Total	152111

The farms also have infrastructures such as fencing, office, godown, working shed, water source, electricity connectivity, tractor and farm implements.

Chapter 2

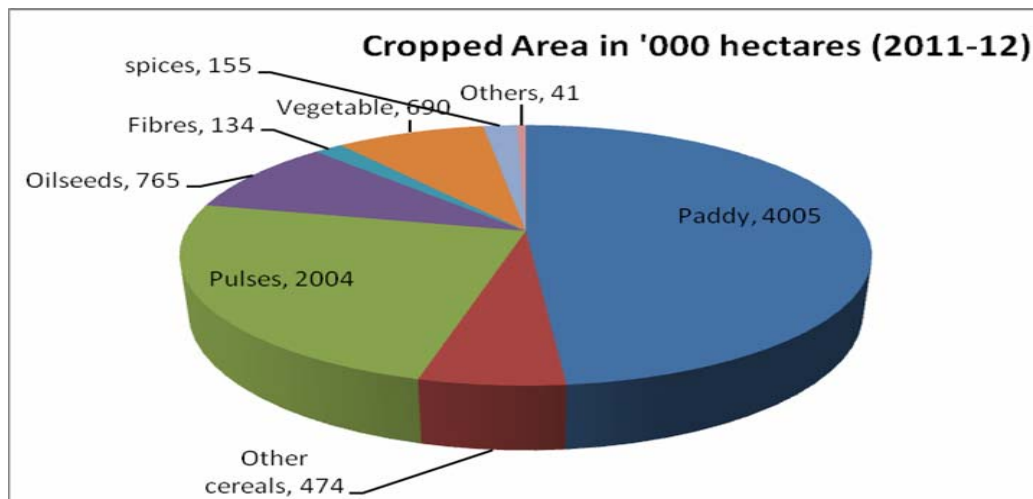
A profile of agriculture in the state and its vulnerability to Natural Distasters

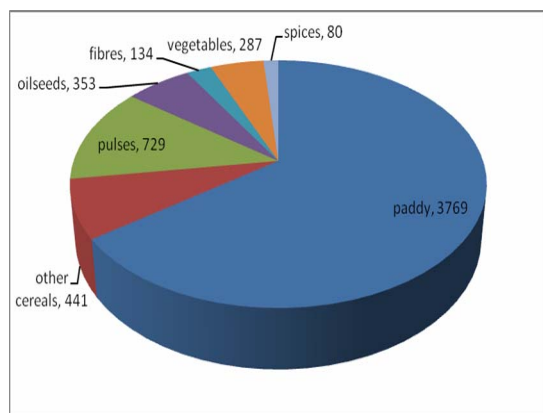
Agriculture in Odisha is the mainstay of majority of the populace and thus, holds the key to socio-economic development of the State. The State has cultivated area of 61.80 lakh hectares out of which 29.14 lakh hectares is high land, 17.55 lakh hectares medium land and 15.11 lakh hectares low land. The State is broadly divided in to 4 Physiographic zones those are further subdivided into 10 agro-climatic zones. Further, about 4 lakh hectares is exposed to saline inundation, 3.54 lakh hectares to flooding and 0.75 lakh hectares to water-logging, particularly in the deltaic areas. With more than 2/3rd of crops grown rainfed, a good harvest is much dependent on a favourable monsoon.

States climate is tropical, characterised by high temperature, high humidity, medium to high rainfall and short and mild winters. The normal rainfall of the State is 1451.2 mm. The actual rainfall received, vary from district to district. About 84% of rainfall is received during the period from June to September. 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 kharif rice, the major crop of the State. Similarly, in drought years, there is considerable loss in production of pulses and oilseeds both during kharif and rabi. These, stand as stumbling blocks in the way of enhancing crop production and productivity.

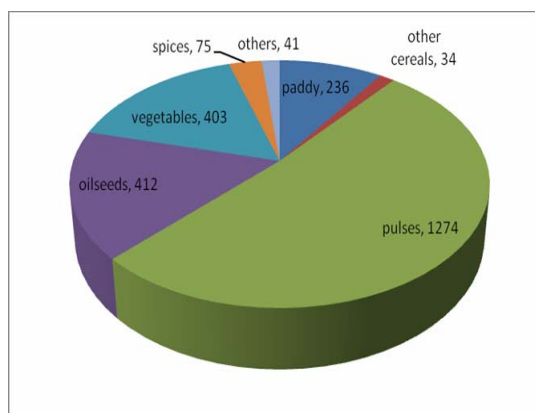
Crop Production

Kharif is the main cropping season and rice is the principal crop being cultivated in around 2/3rd of the cropped area in the season. Cropping during rabi season is mainly confined to irrigated areas and areas with residual moisture. Other important crops grown in the state are pulses (arhar, moong, biri, kulthi), oilseeds (groundnut, sesamum, mustard, niger), fibers (jute, mesta, cotton), sugarcane, vegetables and spices.





Kharif Cropping Season



Rabi Cropping Season

Among the seasons, Rice dominates the cropped area during Kharif and Pulses clearly dominates occupying almost half the cropped area during rabi season. Besides oilseeds, vegetables, fibres, maize and ragi cover a predominant part. Other crops constitute sugarcane, spices and minor millets.

Horticulture sector encompasses a wide range of crops namely fruit crops, vegetables crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices, and plantation crops. New introductions such as mushroom, bamboo, and bee keeping have been accepted for improving the crop productivity, which has further expanded the scope of horticulture. 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 mango, litchi, guava, 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 in '000 ha

Year	Fruits	Vegetables	Floriculture	Spices	Coconut	Cashew	Oil palm
2003-04	227.2	628.6	0.28	170.7	50.438		
2004-05	233.4	629.4	0.31	171.5	50.784		
2005-06	237.5	629.8	0.59	171.8	50.841		
2006-07	255.6	631.62	1.08	174.5	51.035		300
2007-08	265.2	632.0	2.4	175.1	51.598		1300
2008-09	289.6	675.9	3.7	147.3	52.219		2138

Year	Fruits	Vegetables	Floriculture	Spices	Coconut	Cashew	Oil palm
2009-10	302.06	694.18	7.1	147.79	52.493		2138
2010-11	318.7	698.6	7.3	154.4	53.09	148.31	5138
2011-12	326.9	690.07	7.54	154.94	53.94	150.31	9438
2012-13							

Vulnerability of agriculture to natural disasters

Agriculture in the state being predominantly rainfed is most vulnerable to vagaries of monsoon. Out of 52 years only 13 years have been normal years (Table 2.1). This almost puts the state with a 75% probability of being visited by natural calamity of any kind.



Table 2.2: History of natural calamities in the State affecting crop production

Sl. No.	Year	Normal Rainfall mms	Actual rainfall mms	Kharif Rice Production (lakh MT)	Remarks
1.	1961	1502.5	1262.8	36.99	
2.	1962	1502.5	1169.9	36.32	
3.	1963	1502.5	1467.0	42.47	
4.	1964	1502.5	1414.1	43.59	
5.	1965	1502.5	997.1	31.89	Severe drought
6.	1966	1502.5	1134.9	35.37	Drought
7.	1967	1502.5	1326.7	34.43	Cyclone & Flood
8.	1968	1502.5	1296.1	38.48	Cyclone & Flood
9.	1969	1502.5	1802.1	38.39	Flood
10.	1970	1502.5	1660.2	39.13	Flood
11.	1971	1502.5	1791.5	33.76	Flood, Severe Cyclone
12.	1972	1502.5	1177.1	37.35	Drought, flood
13.	1973	1502.5	1360.1	41.91	Flood

Sl. No.	Year	Normal Rainfall mms	Actual rainfall mms	Kharif Rice Production (lakh MT)	Remarks
14.	1974	1502.5	951.2	29.67	Flood, severe drought
15.	1975	1502.5	1325.6	42.74	Flood
16.	1976	1502.5	1012.5	29.58	Severe drought
17.	1977	1502.5	1326.9	40.50	Flood
18.	1978	1502.5	1261.3	41.89	Tornados, hail storm
19.	1979	1502.5	950.7	27.34	Severe drought
20.	1980	1502.5	1321.7	40.31	Flood, drought
21.	1981	1502.5	1187.4	36.63	Flood, drought, Tornado
22.	1982	1502.5	1179.9	27.07	High flood, drought, cyclone
23.	1983	1502.5	1374.1	47.63	
24.	1984	1502.5	1302.8	38.50	Drought
25.	1985	1502.5	1606.8	48.80	Flood
26.	1986	1502.5	1566.1	44.56	
27.	1987	1502.5	1040.8	31.03	Severe drought
28.	1988	1502.5	1270.5	48.96	
29.	1989	1502.5	1283.9	58.40	
30.	1990	1502.5	1865.8	48.42	Flood
31.	1991	1502.5	1465.7	60.30	
32.	1992	1502.5	1344.1	49.76	Flood, drought
33.	1993	1502.5	1421.6	61.02	
34.	1994	1502.5	1700.2	58.31	
35.	1995	1502.5	1588.0	56.48	
36.	1996	1502.5	990.1	38.27	Severe drought
37.	1997	1502.5	1493.0	57.51	
38.	1998	1502.5	1277.5	48.85	Severe drought
39.	1999	1502.5	1435.7	42.75	Severe Cyclone
40.	2000	1502.5	1035.1	41.72	Drought & Flood
41.	2001	1482.2	1616.2	65.71	Flood
42.	2002	1482.2	1007.8	28.26	Severe drought
43.	2003	1482.2	1663.5	61.99	Flood
44.	2004	1482.2	1273.6	58.84	Moisture stress
45.	2005	1451.2	1519.5	62.49	Moisture stress
46.	2006	1451.2	1682.8	61.96	Moisture stress/Flood
47.	2007	1451.2	1591.5	68.26	Flood
48.	2008	1451.2	1523.6	60.92	Flood , Moisture Stress
49.	2009	1451.2	1362.6	62.93	Flood/ Moisture stress/ Pest attack.
50.	2010	1451.2	1293.0	60.51	Drought/ Un-seasonal rain
51.	2011	1451.2	1327.8	51.27	Flood/ Drought
52.	2012	1451.2	1391.3	86.81	Drought in Balasore, Bhadrak, Mayurbhanj & Nuapada districts

(Source: Status of Agriculture in Odisha, Directorate of Agriculture, Odisha)

The Directorate of Horticulture (DoH) 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, drought, cyclone, fire, hail stone, disease, insect & pest, earth quake, tsunami and chemical poisoning 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	Out come
Flood	Flood prone areas	Increased frequency and intensity of rainfall	<ol style="list-style-type: none"> 1. Crop loss especially non perennials like vegetables, betel vine, spices and ornamentals, medicinal and aromatic crops. Fruit crops like banana, papaya and pineapple will damage. 2. Damage of new perennial plantations. 3. Disruption to road transport affecting transport of horticultural produces. 4. Damage to departmental buildings and farms 5. Damage to protected structures.
Drought	Southern and Western Odisha	Less rainfall and water shortage	<ol style="list-style-type: none"> 1. Crop loss (Area) 2. Production loss 3. Higher mortality in new plantations
Cyclone	Coastal Areas	Storm	<ol style="list-style-type: none"> 1. Crop loss both perennials and non perennials. 2. Damage to departmental buildings and farms. 3. Damage to protected structures.
Earth quake	Seismic zones	Waves and shock	<ol style="list-style-type: none"> 1. Damage to departmental buildings and farms 2. Damage to protected structures
Heat wave	Western Odisha	High rise of environment temperature	<ol style="list-style-type: none"> 1. Crop loss due to flower drop 2. Higher mortality in new plantations especially litchi.
Hail storm	Anywhere in the State	Falling of hails	Crop loss of both perennials and non perennials
Fire	Anywhere in the State	Fire caught	1. Perennial orchards during summer
Tsunami	Coastal belt	High tides	<ol style="list-style-type: none"> 1. Crop loss both perennials and non perennials. 2. Damage to departmental buildings and farms. 3. Damage to protected structures.

Nature of hazard	Vulnerable locations	Stimulus	Out come
Disease	Anywhere in the State	Disease out break	Crop loss
Insect, pest	Anywhere in the State	Insect pest out brake	Crop loss
Chemical Poisoning	Industrial areas	Ash pond leakage Industrial waste poisoning	1. Crop loss 2. Soil degradation

Flood: its' causes

Among the natural calamities flood has been the most frequent visitor to the state. In Odisha, the entire coastal line of 482 Km is exposed to frequent flood and water logging in most of the years. Heavy rainfall on the hills of Odisha and Flood waters of Jharkhand and Chattisgarh contribute to flood in coastal lines and deltaic areas of the state. High degree of siltation, soil erosion, breaching of embankments and tidal flow of sea restricting disposal of flood water aggravates flood. The rivers such as Mahanadi, Subarnarekha, Brahmani, Rusikulya, Vansadhara and their tributaries flow carrying the flood water to the sea. 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 and tidal flows also cause flood in coastal areas. Flood remains for about 5-15 days in many parts of coastal belts along with damage of life and properties and also crop fields affecting food security of the victims (*Odisha Review, Mishra et al, 2010*). Thus Government takes up necessary restorative measures and creates an enabling environment for initiating agricultural activities by the farmers.

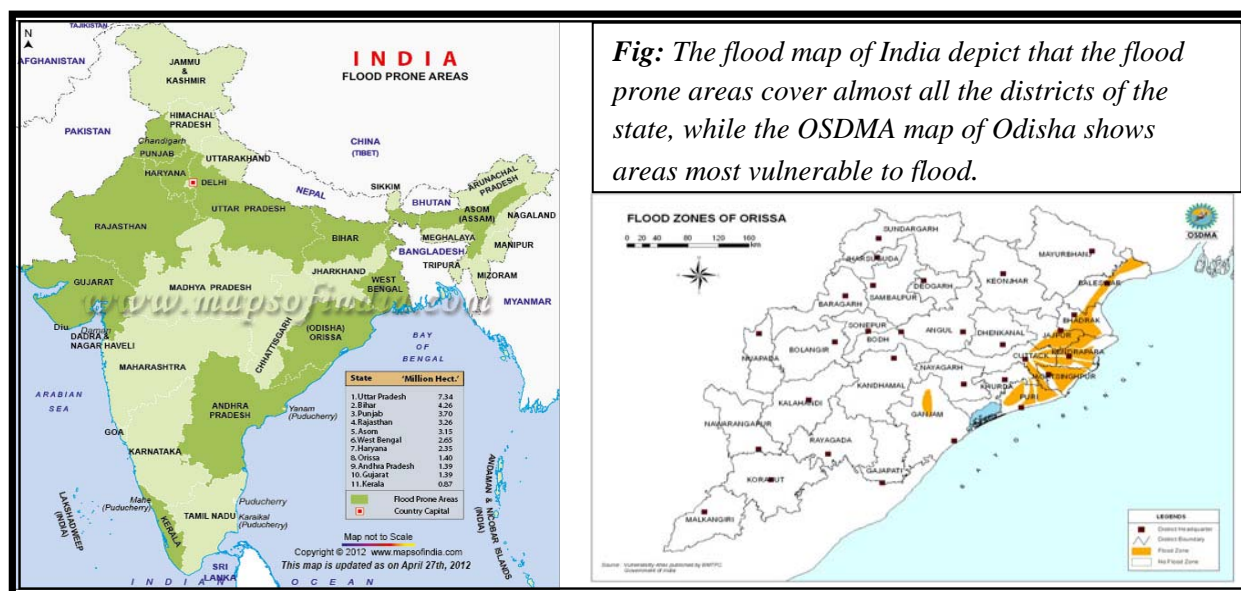


Fig: The flood map of India depict that the flood prone areas cover almost all the districts of the state, while the OSDMA map of Odisha shows areas most vulnerable to flood.

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. Rice resists standing water due to supply of oxygen to root through aerial parts but cannot tolerate submergence for more than 7 days. Deep water paddy can resist flood to the extent of 15 days when at rapid growth stages.

But at early stage of growth, sudden rise of water level, speed and muddiness of water are the factors which makes most of the varieties susceptible to damage under submergence. Since rice is the main crop in rainy season, the extent of damage varies according to days of submergence depending on topography of the land (*Odisha Review, Mishra et al, 2010*). In addition to that crops are also damaged due to sand cast.

Table 2.3 Year-wise statistics of damage to crops in the State from 1953 to 2011

Sl No.	Year	Damage to crops		Sl No.	Year	Damage to crops	
		Area (lakh ha)	Value (in crore ₹)			Area (lakh ha)	Value (in crore ₹)
1	1953			31	1983	0.90	3.26
2	1954			32	1984	4.20	30.45
3	1955	4.10	7.88	33	1985	6.30	60.15
4	1956	0.90	2.15	34	1986	7.90	9.44
5	1957			35	1987		
6	1958	0.20	0.10	36	1988	1.00	2.10
7	1959	2.00	3.24	37	1989	0.09	
8	1960	5.90	20.00	38	1990	4.80	
9	1961	5.10		39	1991	5.40	83.67
10	1962	Neg	0.012	40	1992	0.37	37.10
11	1963	0.90	1.00	41	1993	1.75	
12	1964	1.60	2.02	42	1994	4.65	
13	1965	0.30	Neg	43	1995		
14	1966	0.10	Neg	44	1996	0.20	
15	1967	2.70	8.75	45	1997	4.44	40.23
16	1968	3.70	8.58	46	1998		
17	1969	2.80	11.02	47	1999	1.50	1.48
18	1970	3.20	12.25	48	2000		
19	1971	4.70	19.57	49	2001	9.00	66.74
20	1972	12.00	30.78	50	2002		
21	1973	7.20	37.98	51	2003	8.91	253.83
22	1974	1.20	0.015	52	2004	0.37	7.90
23	1975	4.20	23.21	53	2005	0.94	
24	1976	Neg	0.05	54	2006	2.49	
25	1977	1.90	7.51	55	2007	3.19	
26	1978	3.30	11.17	56	2008	4.38	641.25
27	1979	1.80	0.50	57	2009	0.02	

Sl No.	Year	Damage to crops		Sl No.	Year	Damage to crops	
		Area (lakh ha)	Value (in crore ₹)			Area (lakh ha)	Value (in crore ₹)
28	1980	3.60	40.48	58	2010	0.34	
29	1981	0.40	0.06	59	2011	5.17	
30	1982	12.00	Neg.				
					Average	3.28	31.62
					Maximum	12.00	641.25
					(Year)	(1982)	(2008)

(Source: State wise flood damage statistics, Flood Forecast Monitoring Directorate, Central Water Commission, GoI, 27 Nov'2012)

The flood can be classified as Early Season Flood, Mid-Season Flood and Late-Season Flood depending upon its time of occurrence in June-July, August- September and October-November, respectively.

Early season flood

June is the beginning of planting season in Odisha for all major crops. Before the onset of monsoon, the farmers quickly sow the lowland and some medium land paddy which germinates after onset of Monsoon and grows to a certain height to resist standing water in July and August. After onset of Monsoon, pulses, oilseeds, and upland paddy are sown along with raising nursery for transplanted rice for medium land. Early season flood occurring during June-July causes the following damages –

1. Damage of paddy in nursery, standing crop of vegetables, pulses and oilseeds.
2. Early-transplanted and standing direct sown paddy is affected by flood.

Usually, in the post flood situation there is acute shortage of seed for re-sowing and replanting operation in early season flood. Partially damaged fields often have poor plant population and need to be made up through clonal propagation or gap filling. There are also possibilities of pest (swarming caterpillar) and disease incidence. Shortage of agri-inputs like seeds, fertilisers and pesticide aftermath the flood are likely on account of temporary spurt in demand and need to be looked into.

Mid-Season flood:

When flood comes in the middle of the season during August and September, it is called Mid Season Flood. The extent of loss in most of the times is severe and irreparable as the crops are in active growth stage and the farmers have already spent enough money on management of crops further, the farmers will have to lose the season of cultivation and the land cannot be put to cultivation immediately. The Mid Season Flood puts a lot of organic matter in the field due to decomposition of standing crop at maximum growth stage which increases fertility of the soil.

Nature of Damage

1. Incidence of pest and diseases to standing crop that escaped or resisted flood.

2. Damage of upland non paddy crops like vegetables, pulses and oilseeds at fruiting stage.
3. Damage of short duration paddy at maturity stage and medium and late duration paddy at growth stage.

Mid season flood usually affect most of the crops at mid growth stage causing damage in different degree depending upon submergence. Upland paddy which is at maturity stage will be harvested from top due to standing water in field. Important pests like stem borer, gall midge, leaf roller and grasshopper are problematic in rice crop that resist and escape flood damage. Further, diseases like sheath rot, sheath blight, bacterial leaf blight and blast are common diseases found in paddy crops after flood. Appropriate plant protection measures will be taken to save the standing crop. Seed treatment and opening of drainage channel will be taken up for growing paddy crops in flood affected areas successfully. Other crops like vegetables, pulses and oilseeds stand no chance of revival under submergence conditions and need to be re cropped.

Late-season flood

It usually occurs in post Monsoon season in October- November. The flood causes severe damage to medium and long duration paddy at maturity and grain filling stage, respectively. The farmers often have to bear complete loss of money invested on cropping. The winter vegetables and non paddy crops like oilseeds and pulses grown in uplands are also seriously affected at different growth stages.

Nature of damage

1. Lodging and Germination of grains in the field.
2. Incidence of disease and pest in crops that escaped or resisted water logging.
3. High value vegetables are also affected.
4. Grain discolouration and quality deterioration.

Late season flood causes germination of grains in standing crop of paddy. Varieties susceptible to lodging are completely damaged. Sometimes, farmers do not go for harvesting paddy. There is also addition of lot of organic matter due to decomposition of crop residues. Since, the majority of low and medium lands are under paddy cultivation in kharif, farmers bear a great loss in late season flood. Sometimes land preparation for rabi crops is delayed due to high moisture content and none the less provide congenial conditions for harmful soil microbes to grow.

Flood adds a lot of organic matter to field due to decomposition of residues. Further high moisture content in soil helps in taking crops with residual moisture. The yield of crops is better for two to three years in post flood situation. Large scale coverage of crops after flood helps in mitigating loss due to flood. Thus, External interventions are highly essential in production process as flood breaks the backbone of the farmers.

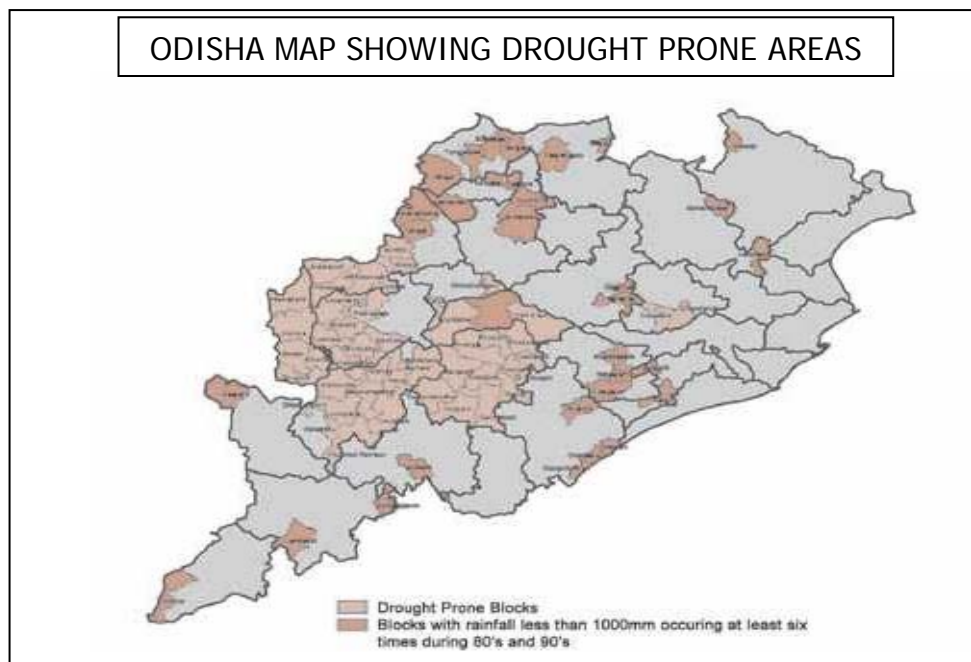
Table 2.3 District wise maximum area affected over last 8 years

Sl. No.	District	Maximum Area affected by flood (in '000 ha) (from 2001-2008)		
		Paddy	Non-Paddy	Total
1	Balasore	71.35 (2007)	6.81 (2007)	78.16
2	Bhadrak	60.62 (2003)	3.13 (2005)	63.75
3	Bolangir	22.68 (2001)	6.39 (2001)	29.07
4	Sonepur	28.53 (2001)	2.52 (2001)	31.05
5	Cuttack	80.59 (2001)	13.87 (2008)	94.46
6	Jagatsingpur	66.23 (2001)	5.30 (2001)	71.53
7	Jajpur	56.18 (2001)	7.44 (2003)	63.62
8	Kendrapara	58.39 (2001)	11.84 (2006)	70.23
9	Dhenkanal	4.69 (2001)	1.85 (2001)	6.54
10	Angul	11.10 (2001)	10.47 (2001)	21.57
11	Ganjam	56.01 (2003)	17.10 (2003)	73.11
12	Gajapati	1.14 (2003)	0.71 (2006)	1.85
13	Kalahandi	67.97 (2001)	15.25 (2001)	83.22
14	Nuapada	15.35 (2001)	0.61 (2008)	15.96
15	Keonjhar	2.09 (2003)	0.98 (2003)	3.07
16	Koraput	7.54 (2001)	7.61 (2001)	15.15
17	Malkangiri	3.85 (2006)	1.53 (2006)	5.38
18	Nawarangpur	1.93 (2006)	1.13 (2006)	3.06
19	Rayagada	2.00 (2006)	2.31 (2006)	4.31
20	Mayurbhanj	9.74 (2007)	2.58 (2007)	12.32
21	Phulbani	0.53 (2006)	0.65 (2001)	1.18
22	Boudh	4.64 (2008)	0.79 (2008)	5.43
23	Puri	87.37 (2001)	3.69 (2006)	91.06
24	Khurda	41.02 (2001)	1.96 (2006)	42.98
25	Nayagarh	9.31 (2001)	3.02 (2001)	12.33
26	Sambalpur	3.19 (2001)	0.58 (2001)	3.77
27	Bargarh	1.31 (2003)	0.86 (2003)	2.17
28	Deogarh	1.92 (2001)	0.76 (2001)	2.68
29	Jharsuguda	7.00 (2001)	1.76 (2001)	8.76
30	Sundargarh	0.80 (2001)	0.39 (2003)	1.19
	Total	785.07	133.89	918.96

From the tables it can be inferred that about 9.19 lakh hectares of cropped area are exposed to damage by flood & submergence, although there have been occasions, when about 12 lakh hectares of crop was affected. However on an average 3.28 lakh hectares of cropped area are affected due to flood. The degree of crop damage greatly varies basing on the duration of submergence and intensity of flood coupled with the time of occurrence and stage of the crop.

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 Odisha faces some sort of drought or moisture stress like condition due to uneven and erratic distribution of monsoon rains. The early season, mid-season and late season droughts affect crop stand and production to different extents basing on their intensity, duration and type and stage of the crop.



(Source: Chapter -, Vulnerability Reduction for Sustainable Development: In the Context of Natural Disasters, Odisha Human Development Report, Page-41)

Table 2.4 Frequency of meteorological drought between 1960-2003 based on departure of actual annual rainfall (Meteorological drought is an indicator of Agricultural drought)

Undivided Districts	Drought Frequency between 1960-2003		Decade-wise drought frequency (Moderate / Severe)			
	MOD	SEVERE	1960-69	1970-79	1980-89	1990-2003
Dhenkanal	9	1	4	2	1	3
Cuttack	9	0	2	3	1	3
Puri	7	1	1	3	2	2
Balasore	11	0	3	3	5	0
Phulbani	14	1	2	6	3	3
Koraput	3	0	1	2	0	0
Kalahandi	4	2	2	1	1	2
Keonjhar	11	0	3	4	0	4
Ganjam	5	0	3	0	1	1
Mayurbhanj	7	0	2	2	1	2
Sambalpur	10	1	3	4	4	3
Sundargarh	18	2	5	4	5	5
Bolangir	16	2	2	6	6	4

Legends: MOD= Moderate drought, SEVERE= Severe drought

(Source: Kar et al., 2004, Agro-climate & Extreme Weather Analysis for Successful Crop Production in Odisha, Bulletin No. 22 WTCER)

Table 2.5 Probability (%) of moderate and severe drought in different undivided districts of Odisha

Undivided Districts	Welbulls method		Log Pearson distribution	
	Mod Drought	Severe Drought	Mod Drought	Severe Drought
Cuttack	22.33	2.23	20.00	1.00
Puri	25.00	5.00	28.00	8.00
Balasore	26.67	2.23	22.00	1.00
Dhenkanal	26.67	4.45	30.00	8.00
Koraput	29.31	2.33	31.00	1.00
Ganjam	20.00	2.23	25.00	1.00
Phulbani	35.56	4.45	40.00	8.00
Sambalpur	33.34	4.45	38.00	7.00
Sundargarh	50.00	9.10	46.00	13.00
Mayurbhanj	20.94	2.33	23.00	1.00
Bolangir	43.20	9.10	40.00	14.00
Kalahandi	28.19	6.72	32.00	9.00
Keonjhar	28.89	4.45	30.00	7.00

(Source: Kar et al., 2004, Agro-climate & Extreme Weather Analysis for Successful Crop Production in Odisha, Bulletin No. 22 WTCER)

Table 2.6 Crop loss during the drought year in Odisha- a case study of 2000 drought

Sl. No.	Type of land	Extent of land affected (in lakh Hect.)	Average yield Per hectare (Quintal)		Total yield of the state		Estimated loss of crop yield (in lakh MT)	Amount of loss in Rupees (Crore)
			Normal year	2000	Normal Year (in lakh MT)	2000 (in lakh MT)		
1	High Land	3.48	15.16	4.72	5.28	1.64	3.64	192.92
2	Middle Type of land	5.16	2.80	10.84	12.28	5.59	6.69	354.57
3	Low Land	2.05	14.78	16.02	5.08	3.28	1.80	95.40
TOTAL		10.69	20.70	9.62 (46.47%)	22.64	10.51 (46.42%)	12.13 (53.58%)	642.89

Source : Revenue Department, Govt. of Odisha

Table 2.7 Extent of crop damage due to drought during 2011

Districts	No of Blocks	PADDY					
		Area affected due to moisture stress (in hectares)					
		0-10%	11-25%	26-50%	51-75%	> 75%	Total
Bhadrak	1	0	0	0	0	3422	3422
Bolangir	14	5400	6720	35462	78162	9680	135424
Subarnapur	4	3530	6946	8475	22537	0	41488
Cuttack	6	2839	3709	1439	601	0	8588
Anugul	8	267	0	7790	43353	13334	64744
Ganjam	22	15880	2920	1300	0	0	20100
Kalahandi	13	10657	4247	28872	48483	5647	97906
Nuapada	5	20440	3522	5124	32784	14431	76301
Koraput	2	0	0	3089	528	0	3617
Nowrangpur	10	0	0	15360	0	8633	23993
Boudh	3	0	0	11636	11214	17647	40497
Nayagarh	8	0	4210	3930	21194	36521	65855
Bargarh	10	2440	10749	4117	42650	27182	87138
Deogarh	3	1494	1631	1653	920	0	5698
Jharsuguda	5	0	3479	0	0	0	3479
Sundargarh	5	25034	1434	0	0	0	26468
TOTAL	119	87981	49567	128247	302426	136497	704718

From the above background it is evident that out of the 2/3rd of the cultivated rainfed land in the state almost 8-10 lakh hectares are prone to impacts of moisture stress or drought resulting in reduction of crop yield and production.

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.

Odisha have been a constant victim of cyclonic weather at regular intervals and the intensity and frequency of these are on the rise very often inflicting damage to standing crop in addition to the colossal loss of life and properties.

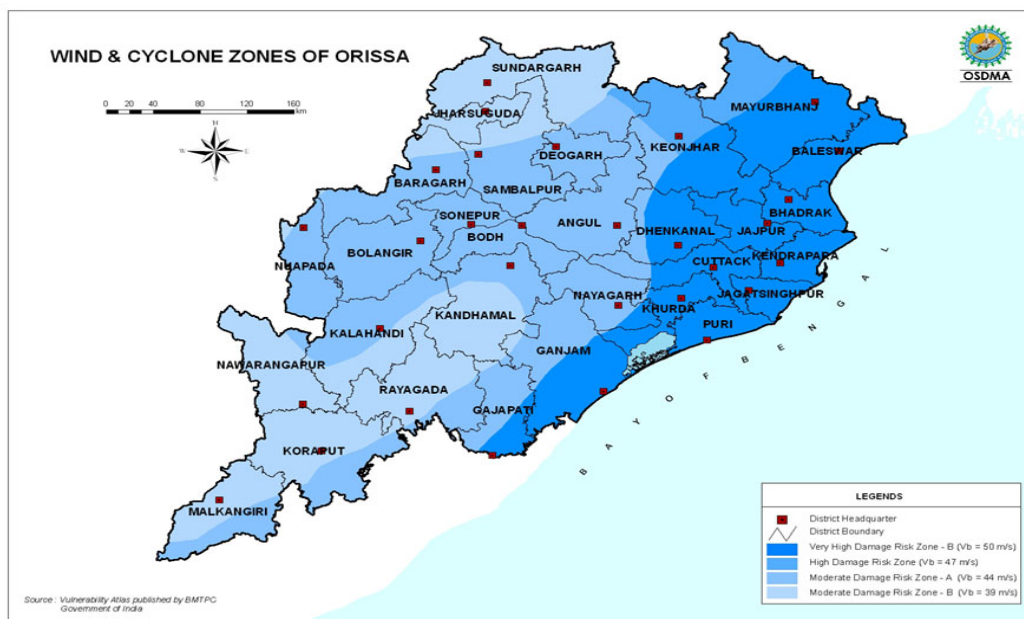


Table 2.8 Major cyclones in Odisha between 1970-2003

Sl. No.	Date	Undivided districts affected	Damage losses
1	September 7-14, 1971	Ganjam, Puri and Cuttack	Considerable crop loss
2	September 20-25, 1971	Koraput	Considerable crop loss
3	October 26-30, 1971	Crossed Odisha Coast near Paradip	Severe crop loss. Max. wind speed 150 -170 KMPH
4	September 7-14, 1972	Ganjam, Puri and Cuttack	Severe crop loss due to flood and heavy rain. Max. wind speed 175 KMPH
5	September 20-25, 1972	South Odisha	Considerable crop loss. Max. wind speed 136 KMPH
6	November 3-9, 1973	Balasore, Cuttack	Considerable crop loss. Max. wind speed 100 KMPH
7	September 14-28, 1981	Cuttack and other coastal as well as interior districts	Considerable crop loss.
8	May 31 to June 5, 1982	Puri, Cuttack & Balasore	Severe crop loss.
9	October 9-14, 1984	Mainly Cuttack & Balasore	Severe crop loss.
10	September 17-21, 1985	Puri, Ganjam & Cuttack	Severe crop loss.
11	October 13-17, 1985	Mainly Balasore	Considerable crop loss.
12	October 29-30, 1999	Mainly Cuttack with all coastal districts	17000 sq Km of Agriculture land was devastated.

Table 2.9 District-wise impact of Super Cyclone 1999

Sl. No.	District	No. of Blocks affected	Total Agricultural land affected (Ha)
1	Balasore	8	138000
2	Bhadrak	7	179000
3	Cuttack	14	197000
4	Dhenkanal	8	138000
5	Jagatsinghpur	8	101000
6	Jajpur	10	176000
7	Kendrapara	9	136000
8	Keonjhar	3	125000
9	Khurda	8	80000
10	Mayurbhanj	9	221000
11	Nayagarh	2	80000
12	Puri	11	162000
Total		97	1733000

From the table it is clear about the formidable risk involved with a super cyclone affecting as much as little more than 17 lakh hectares. Our state being a coastal district has suffered and prone to such super calamities.

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. There is problem of sand casting in the coastal areas.
4. There is also risk of saline inundation due to sea water ingress in the coastal tracts.
5. The supporting infrastructures are likely to suffer severe damage impairing the restorative measures.
6. The loss to life and properties are so great that the restoration of agriculture is relegated to a lower priority.
7. 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. The Bengal famine during 1942 was the result of such an epidemic form of Brown Spot of rice. 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. In case of paddy there was two major pests incidence during last five years viz. Swarming caterpillar and Brown Plant Hopper which resulted in devastation of thousands hectares of wet land paddy. Similarly there was major pest incidence in pulses viz. Spodoptera in Black gram and YMV in Green gram resulting in huge crop loss which may be denoted as disaster for the farmers. Further the normal pest incidence of other crops varies from 4-10%. 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.

Table 2.10 Major incidences of pest/ disease attack in odisha

Year	Season	Crop	Pest	Pest attack area in ha.	Major districts
2007-2008	Kharif	Paddy	Swarming caterpillar	26374	Kalahandi, Bolangir, Cuttack, Koraput, Puri, Keonjhar
2008-2009	Kharif	Paddy	Swarming caterpillar	9270	Kalahandi, Sonapur, Bolangir, Nuapada, Boudh
2008-2009	Rabi	Black gram	Cutworm	4873	Cuttack, Puri, Kendrapara, Jagatsinghpur, Khurda
2009-2010	Kharif	Paddy	Swarming caterpillar	91961	Sambalpur, Sundargarh, Jharsuguda, Nuapada, Sonapur, Deogarh, Nawarangpur, Malkanagiri, Kalahandi
			BPH	11098	Puri, Kalahandi Nawarangpur Koraput, Khurda
2010-2011	Rabi	Mung	YMV	15228	Bolangir, Cuttack,

Year	Season	Crop	Pest	Pest attack area in ha.	Major districts
					Puri, Ganjam, Khurda, Angul
2011-2012	Rabi	Nursery paddy	Foot rot	4702	Boudh, Sonapur Sambalpur
		Black gram	Cut worm	9190	Jajpur, Kendrapada

Apart from this the endemic districts are as follows:

Pest/ Disease

Endemic Districts

Swarming Caterpillar in paddy	Kalahandi, Nupada, Bolangir, Sonapur, Sambalpur, Bargarh, Deogarh, Jharsuguda, Sundergarh, Koraput, Malkangiri, Rayagada, Nawarangpur and costal districts like Jagatsinghpur, Puri
Brown Plant Hopper in paddy	Kalahandi, Nuapada, Ganjam, Koraput and some of the coastal districts.
Blast in paddy	Cuttack, Bolangir, Ganjam, Puri
YMV in pulses	Puri, Cuttack, Bolangir
Spodoptera in Blackgram	Cuttack, Puri, Jagatsinghpur, Kendrapara etc.
ESB and TSB Sugarcane	Nayagarh, Dhenkanal, Jagatsinghpur, Ganjam, Bolangir and Cuttack

The Directorate of Agriculture has already started two IPM based project namely e-Pest Surveillance and Pest Management Programme as well as Seed Treatment Campaign in all the Districts since 2010-11 for pest and disease control.

Table 2.11 Peak periods activity of major pests and diseases

Crop	Pest/ Disease	Peak activity period	Diposing factor/ Conduive agroclimatic condition	Areas most prone	Remarks
Paddy	Stem Borer	July-Nov & Feb-April	High humidity	All rice growing areas	Tillering & heading
	Gall midge	Aug-Oct	Good rainfall in May followed by a dry spell	Bargarh, Swamaptna, Dadaraghati	Tillering

Crop	Pest/ Disease	Peak activity period	Diposing factor/ Conduasive agroclimatic condition	Areas most prone	Remarks
	Leaf- folder	July-Nov & Feb-April	High humidity	All rice growing areas	Nursery to boot leaf stage
	BPH	Oct-Nov	Temp >30 ⁰ C, high humidity,	Western Odisha	Heading
	Swarming caterpillar	July	After flash floods	Western & Southern Odisha	Tillering
	Blast	July-Dec	Night temp. < 21 ⁰ C	All paddy growing areas	Tillering and Panicle
	Brown Spot	July-Nov	High humidity and temp.	All rice growing areas	Tillering stage
	BLB	July- Nov	High nitrogenous fert. use	All rice growing areas	Nursery & late tillering
	Sheath blight	July-Sept	High humidity	All rice growing areas	Tillering
	Sheath rot	Sept-Nov	High humidity	All rice growing areas	heading
	Tungro	July-Aug	Less rainfall	All rice growing areas	Early tillering
Pulses	Spodoptera (Kali mundi Poka)	Sept-Oct & March	-	All Mung & Biri growing areas	Vegetative
	YMV	Sept-Oct & Feb-March	Susceptible varieties (PDM 139)	All Mung & Biri growing areas	Vegetative
Oilseeds	Mustard aphid	Dec-Feb	Cool & humid condition	All mustard growing areas	Vegetative to maturity stage
Cotton	Boll worms	Aug-Nov	High yielding & hybrid varieties	Kalahandi, Bolangir, Rayagada, Nuapada, Ganjam	Squaring to boll development
	Mealy bug	Oct-Dec	Longer dry spell	Kalahandi, Bolangir, Rayagada, Nuapada, Ganjam	Boll dev., <i>Bt</i> - cotton varieties highly susceptible

Some general strategies adopted for Pest and Disease Control:

- Surveillance in pest prone areas.
- Monitoring the major pests like Swarming Cater Pillar, YSB, Blast , BLB of Paddy and YMV, Cutworm in pulses and collar rot , infestation of Spodoptera in Groundnut by traps and lures etc.
- Critical inputs provided to counter intense pest and disease attack.
- Capacity building of field functionaries and farmers on a regular basis.
- There is a need to build up season specific pest maps on endemic areas
- 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 SAUs/ ICAR institutes etc.
- Plant protection equipments are being made available to the farmers at subsidized rate to reach a mandate of atleast 1 sprayer per 5 ha.

Toxicity/ heavy metal contamination

With the advent of a scientific revolution the sudden spurt of demand for modern gadgets and livelihood aids has led to mushrooming of industries. As a result, the ever increasing volume of effluents and the wastes from industries and 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.

Further, the rich mineral resources in the state have attracted greater mining activities leading to pollution of the air. That too the dusts gathering on the leaves of the plants reduce the photosynthetic activity. All these, affect the production and productivity of crops in the vicinity at large. Although the impact of these have not been of calamity proportions, but if these go on unchecked the problem shall assume such proportions within a very short span of time. Would we like to call upon another calamity knocking at the door!?

**Table 2.12 Risk analysis Matrix
Agriculture**

Sl No.	Hazard/Disaster	Risk level	Risks
1	Flood/ Heavy Rain	High	<ul style="list-style-type: none">• Damage is caused to very large areas,• partial or complete crop damage,

Sl No.	Hazard/Disaster	Risk level	Risks
			<ul style="list-style-type: none"> • Flood induced pest and diseases inflict further damage, • Sand cast and soil erosion involve greater restoration cost, • Irrigation resources, roads and communication disrupted which delays the restoration process, • The Production and productivity of crops greatly reduced. • Quality of produce is immensely affected too.
2	Drought/ Moisture stress	High	<ul style="list-style-type: none"> • Damage is caused to very large areas as 2/3rd of the crop grown is rainfed and the entire state is prone to drought, • A larger area being covered under paddy the damage is more since the water requirement of the crop is relatively high compared to other crops. • Frequency of drought is once in every two years. • Can occur coupled with flood and pose a heavy demand for restoration plan. • Production and productivity greatly reduced. • May trigger incidence of some pests like mealy bug resulting in further damage. • Water availability from water resources may go down resulting in lesser crop coverage.
3	Cyclone/ High Wind/ Tornado/ tidal waves, Hailstorm etc	Modrate To high	<ul style="list-style-type: none"> • Damage is caused to large areas in specific regions of occurrence; Cyclones in coastal districts mostly, Tornados and Hail storms almost any place etc. • Partial or complete crop damage of aged or maturing crops due to submergence, saline inundation, lodging of crop, shattering of flowers/ pollens/ grains. • Frequency: Once in every 7 years
4	Pest and Diseases	Low	<ul style="list-style-type: none"> • Damage is caused specifically affected areas, • partial or complete crop damage, • Can be brought under control through timely plant protection measures. • Quality of produce is reduced. • Production and productivity is decreased.

Sl No.	Hazard/Disaster	Risk level	Risks
5	Toxicity/ pollution	Low	<ul style="list-style-type: none"> • The damage is concentrated around industrial and mining areas mostly. • Enhanced levels of toxic substances in the Agri-produce reducing their quality. • Decreased plant vigour and yield.

Horticulture

Hazard Disaster	Vulnerable locations	Risk
Flood	Flood prone areas	<ol style="list-style-type: none"> 1. High for non perennials like vegetables, betel vine, spices and ornamentals, medicinal and aromatic crops. Fruit crops like banana, papaya and pineapple will damage. 2. Low for new perennial plantations. 3. Low to moderate to departmental buildings and farms and protected structures.
Drought	Southern and Western Odisha	<ol style="list-style-type: none"> 1. Low to Crop (Area)and production loss 2. Low to moderate in new plantations
Cyclone	Coastal Areas	<ol style="list-style-type: none"> 1. High for both perennials and non perennials. 2. Moderate to high to departmental buildings and farms. 3. Moderate to high to protected structures in Govt and private sector.
Earth quake	Seismic zones	Low
Heat wave	Western Odisha	Low
Hail storm	Anywhere in the State	Low
Fire	Anywhere in the State	Low
Tsunami	Coastal belt	Low
Disease	Anywhere in the State	Low
Insect, pest	Anywhere in the State	Low
Chemical Poisoning	Industrial areas	Low

Capacity of the Department to deal with the Disaster

Institutional

Agriculture Directorate through its field functionaries extending upto VAW Circle (approx 2 GPs) look into the assessment of crop loss inflicted or likely to be inflicted by any disaster and initiate prevention/ mitigation measures at appropriate time. There are input godowns across the entire state for storage of required agri-inputs like seed, pesticides, farm equipments etc which could be utilized in such emergent needs. The sister organizations OSSC and OAIC are taken help of for supply of such critical agri-inputs as restoration measures. 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 agriculture equipments, 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 VAW/ AO circle (consisting of approx. 2 GPs) cater to the implementation of programmes. They are responsible to give a firsthand 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 level. The District Agricultural officers working at Agriculture District level monitor the steps taken up by the AAO and converge in at the District level headed by a Deputy Director of Agriculture. The DDAs 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, pesticides, fertilizers, farm equipments are closely monitored by them.

The staff strength has been given in Organisational set up of the directorate.

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

The department has e-Pest Surveillance System, online Crop Weather Report System in place which aids monitoring of such disasters on a weekly basis and taking up necessary preventive and corrective measures.

The Fertiliser Monitoring System helps monitor supply and positioning of fertilizers at different locations in the state.

Besides, the seed monitoring is done to constantly keep an watch over prepositioning of quality seeds as required.

Infrastructural:

- All the DDA offices have been provided with FAX and e-mail facilities.
- The supervising officers have been provided mobility for monitoring and supervision of different government sponsored programmes.
- All the districts have input godowns which are used for storing and distribution of the critical agri-inputs and would come in handy in disaster management.
- Farm Information Advisory Centers have been established at block level, some of them with input godowns will be helpful in reaching out farmers with critical inputs as would be required.
- There are 8 biological control stations which are used for rearing bio-control agents used for pest and disease control. They function as preventive centers for checking pest and disease attack.
- Quality Control Labs across the state help to monitor the quality of agri-inputs in the supply chain. The Soil Testing Laboratories help to upkeep the soil health through fostering balanced use of fertilizers.
- The department has 62 Agriculture farms of which most of the farms are engaged in quality seed production. The farms also have seed processing plants, input godowns, threshing floors etc those may serve as important infrastructure needed for rejuvenating agricultural activities especially aftermath of a disaster.
- Besides, there are 3 Regional Institutes for Training on Extension (RITEs) and 3 state level training institutes (IMAGE, Minor Irrigation and Water Use Training Institute, OFMRDC) which are utilized for capacity building of all stake holders. There are training halls at block levels 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.
- The department has promoted establishment of agro service centers which can serve important role in enabling the farmers of the region to complete agricultural operations on time.

- Establishment of Private Lift Irrigation points have been promoted to bring more areas under assured irrigation and aid farmers in providing life saving irrigation during periods of moisture stress.

DoH is performing plantation works which are affected by natural calamities, planting materials and seeds of vegetables, spices and ornamental crops are being supplied at subsidised rate as support to the farmers.

Gaps in the existing capacity

Agriculture

1. Although the existing structure extends upto VAW Circle level there exist a large number of vacancies in almost all the cadres which is likely to impair disaster mitigation & restoration programmes and need to be filled up soon.

Sl. No	Category of Post	Sanctioned Strength	In Position	Vacancy Position
1	Addl. Director of Agril. (Extn.)	1	1	0
2	Addl. Director (Engg.)	1	0	1
3	Joint Director Agril.	3	3	0
4	Joint Director (Engg.)	1	1	0
5	Dy. Director of Agril.	41	14	27
6	Executive Engineer (Agril.)	4	2	2
7	District Agril. Officer	100	0	100
8	Gr. B Agril. Officers (AAO/SMS)	1166	627	539
9	Asst. Agril. Engineer	91	86	5
10	Agril. Overseer	1568	1297	271
11	Village Agril. Worker – Regular	1205	980	225
12	Village Agril. Worker – Contractual	2013	1793	220
13	Village Agril. Worker- Total	3218	2773	445
14	Junior Engineer (Agril.)	5	3	2

2. 3016 Village Agricultural Worker Posts need to be created, so that, there shall be one VAW per GP.
3. The Control Rooms need to be provided with fax and net connectivity so that information could flow. The connectivity up to block level is desirable.
4. The Block level FIAC buildings have been provided which lack additional staff like watchman and peon which need to be provided for watch and ward of the stock and store and making these vibrant units for implementation of Agricultural programmes and information dissemination.
5. 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.

6. 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.
7. 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.
8. 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.
9. Funds need to be provided for organizing capacity building exercises at state, district and block levels on disaster management.

Name of the Programme	Level	Unit cost (Lakh Rs.)	Nos	Total cost (Lakh Rs.)
One day seminar / workshop-cum-awareness programme	State	2.00	2	4.00
One day training programme at district level for field functionaries	District	1.00	30	30.00
One day training programme at block level for farmers	Block	0.40	314	125.60
Preparation of IEC materials and miscellaneous expenses				2.40
	Total			162.00

10. Calamity resistant storage infrastructure at vulnerable points need to be in place.

Horticulture

1. Large scale vacancy (50%) and inadequate staff position at grass root level delays the assessment and supply of assistance also gets delayed. However assessment is being done along with Agriculture Directorate and Revenue Department for crop loss.
2. Department personnel need to be trained regarding management of disasters
3. 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 agriculture.

Flood

1. Planting submergence tolerant varieties; (*Swarna sub-1, Barsha Dhan, Jayanti Dhan, IR-64 sub-1, Tulasi, Panidhan, Hanseshwari* etc) of paddy in flood prone areas.
2. Raising community nurseries in relatively higher patch of land in the submergence/ flood prone areas and transplanting after flood water recedes.
3. Contour ploughing, contour planting etc are adopted to promote infiltration and reduce the runoff impact.
4. Adoption of **Sunken raised bed method** in areas prone to regular submergence.
5. **Rice –fish farming systems** are adopted in some of the submergence prone areas.
6. Wrapping and propping sugarcane crop to protect them from lodging during submergence is another important practice.
7. Construction/ restoration of check dams, embankments, field bonds/ contour bonding before the onset of monsoon.
8. In areas with greater gradient of slope, *pucca* water/ drainage outlets are constructed to protect the farm land from breaking of bonds followed by soil erosion/ sand cast during heavy downpours.
9. Blocked Drainage channels could be opened up adequately.
10. Catchments could be treated appropriately to reduce run-off and soil erosion.
11. Long and medium term weather forecasts are desirable for reducing the impact.
12. 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.
7. 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.

FLOOD PREPAREDNESS

Mostly, all the coastal districts are flood prone. In addition, the districts of Kalahandi, Koraput, Rayagada, Sambalpur, Boudh, Subarnapur and parts of other districts are also affected by flood.

1. Control rooms equipped with phone, FAX and Internet will function at district and state level from beginning of the kharif season.
2. Online Crop Weather situations will be monitored and appropriate corrective/ mitigating measures would be taken up depending on the situation thereof.
3. The extension machinery is kept in readiness with contingent plan to tackle any such eventuality arising out of natural calamity.

4. *Infrastructure readiness*: There are input godowns at district and block levels which will be utilised for pre-positioning of different seeds and other inputs for any emergent need following damage by natural calamities/ flood.

5. **Input Positioning in vulnerable points.**

a. Seed

On an average (1953 to 2011) 3.28 lakh hectares of different crops are affected by flood to various degrees. Paddy being the major crop being affected by flood there in to be sufficient reinforcement measures depending on stage of the crop and the extent of damage. 5% of the paddy seeds distributed (*about 30000 quintals*) and 1600 quintals of non paddy seeds will be kept in reserve for such emergent needs. Besides, seeds of pulses, oilseeds will also be kept in reserve for making good the crop damage on account of late season flood.

Recommended short duration paddy seeds of varieties like-Heera Khandagiri, Udaygiri, Kalinga-III, Vandana, Kalyani-2, Satabdi, Sneha, Annada, Pathara, Parijat, Lalata, Konark, Bhoi, Sarathi etc suitable for such emergency situations in line with the Contingency Plan will be prepositioned in the input godowns/PACS. Odisha State Seeds Corporation the major player in the seed distribution process has been advised accordingly.

Table 3.1 District-wise buffer stock of seed to be maintained

Sl. No.	District	Quantity of seed to be kept reserve (in qtls)		
		Paddy	Non-Paddy	Total
1	Angul	424	125	549
2	Balasore	2727	81	2808
3	Bargarh	50	10	60
4	Bhadrak	2316	37	2353
5	Bolangir	867	76	943
6	Boudh	177	9	186
7	Cuttack	3080	166	3246
8	Deogarh	73	9	82
9	Dhenkanal	179	22	201
10	Gajapati	44	8	52
11	Ganjam	2140	204	2344
12	Jagatsingpur	2531	63	2594
13	Jajpur	2147	89	2236
14	Jharsuguda	267	21	288
15	Kalahandi	2597	182	2779
16	Kendrapara	2231	141	2372
17	Keonjhar	80	12	92
18	Khurda	1568	23	1591
19	Koraput	288	91	379

Sl. No.	District	Quantity of seed to be kept reserve (in qtls)		
		Paddy	Non-Paddy	Total
20	Malkangiri	147	18	165
21	Mayurbhanj	372	31	403
22	Nawarangpur	74	14	88
23	Nayagarh	356	36	392
24	Nuapada	587	7	594
25	Phulbani	20	8	28
26	Puri	3339	44	3383
27	Rayagada	76	28	104
28	Sambalpur	122	7	129
29	Sonepur	1090	30	1120
30	Sundargarh	31	5	36
	Total	30000	1597	31597

Particularly for up-medium land, where there is no scope for revival of paddy, *pre-rabi* crops like blackgram, greengram, horsegram, sesame and cucurbits will be taken up.

b. Fertiliser

Similarly, 5% of the seasonal requirement of fertilisers will be kept positioned as reserve by the manufacturers C/F agents at their district godowns for enabling immediate supply after flood waters recede and restoration measures resume.

c. Pest & Disease Management

After the flood water recedes very often the crops are infested with various pests and diseases; swarming caterpillar, Brown Plant Hopper, Bacterial and fungal diseases, inflicting a lot of damage to different crops. Year wise area affected due to pest and diseases in the state during last 8 years gives an idea as to what kind of preparedness is necessary.

Year	Area affected due to pest and disease incidence (in lakh hectares)		
	Below ETL	Above ETL	Total
2005-06	2.73	0.47	3.20
2006-07	0.79	0.18	0.97
2007-08	0.99	0.21	1.20
2008-09	0.33	0.05	0.38
2009-10	0.54	1.09	1.63
2010-11	0.24	0.01	0.25
2011-12	0.14	0.09	0.23
2012-13	0.29	0.13	0.42

Recommended Pesticides and plant protection equipments (power sprayer, Power duster, Sprayers etc) are kept ready and farmers and their resources organized at the district/block/ GP level for post flood situations in endemic areas.

6. *Making provisions for drainage of flood water wherever feasible.*

Lack of adequate drainage, often enhances damage to crop stand due to submergence especially after heavy rains and floods. The situation is further worsened due to silting on the leaf surface reducing the plant vigour due to leaf senescence and reduced photosynthetic activity.

7. Machineries will be requisitioned/ kept in reserve to remove the sand casted area. The cost of removing sand cast over an area of 1 acre of an average depth of 20 cm (near embankment 30 cm and away-10 cm) will be around ₹35500/-. Necessary steps will be taken through the revenue department in this regard.

8. Repair of lift Irrigation; defunct pumps, restoring power supply and restoration of other irrigation sources.

9. Agro service Centers housing selected farm machineries would be activated, organized and their services utilized to take up farm operations as would be required.

Horticulture

There is no mechanism related to this Directorate for prevention / mitigation but we may assist after the occurrence through capacity building, awareness and assistance through input supply.

Particulars	Measures required
Creation of awareness in vulnerable areas to mitigate the disaster.	Awareness on crop planning, community nursery raising, crop after flood / drought, water use efficiency, micro-irrigation, pest / disease prevention measures, anti hail nets, concept of farm pond, protected structures etc.
Capacity building of existing staff	<p>a. State level: One day training cum awareness programme on supervision, monitoring and preventive measures Creation of a pool of Resource Person</p> <p>b. District level: Workshop on management of flood, cyclone etc.</p>
Capacity building in private sector (NGOs / PRI members / lead farmers	<p>a. District level: Workshop on management of flood, cyclone etc.</p> <p>b. Block level: Disaster specific management planning.</p>

Particulars	Measures required
Public awareness through IEC activities	a. Electronic media b. Print media c. Supply of leaflets
Creation of water resources / reservoirs	a. Community irrigation tank b. Farm pond c. Deep bore well d. Shallow tube wells e. Adoption of micro-irrigation

Integration into its development plans and projects, the measures for prevention of disaster and mitigation (please refer to guidelines issued by the Revenue Department in this regard);

- a. Hazard resilient design for new institutions in the hazard prone areas.
- b. The existing departmental buildings in the flood/cyclone prone areas would be assessed for vulnerability.
- c. Department would incentivize to private service providers and volunteers willing to assist during emergency.
- d. Disease/pest surveillance system will be strengthened
- e. The departmental training centres like School of Horticulture, Khordha, Horticulture Training Institute, Sambalpur & Kalinga, Kandhamal will integrate disaster management training.
- f. Disaster linked insurance will be actively pursued
- g. Included in the Monthly Review Meeting agenda.

Provision of funds for prevention of disaster, mitigation, capacity-building and preparedness;

There is no special provision of funds for prevention of disaster, mitigation, capacity building and preparedness. However, after the occurrence funds will be required for supply of inputs to the farmers.

Requirement of funds for Capacity Building

Name of the Programme	Level	Unit cost (Lakh Rs.)	Nos	Total cost (Lakh ₹.)
One day seminar / workshop cum awareness programme	State	2.00	1	2.00
One day training programme at district level	District	1.00	30	30.00
One day training programme at block level	Block	0.40	314	125.6
Preparation of IEC materials				2.40
	Total			160.0

Drawing up mitigation, preparedness and response plans, capacity-building, data collection and identification and training of personnel in relation to disaster management.

Measures necessary for preparedness and capacity-building -

Particulars	Measures required
Control room	Creation of control room at State level (Directorate of Horticulture) and equipped with adequate staff, communication facility like telephone, FAX, Internet, Computer, Printer, Inverter, stationeries etc.
Coordination	Coordination among inter-departmental personnel at district and block level.
Disaster management plan	District specific disaster management plan has to be prepared by ADH/DDH based on vulnerability and submitted to the district administration.

DISASTER CONTINGENT PLAN

FLOOD

A. Excess rainfall

Upland

- ❖ Non-paddy crops like row spaced vegetables, ginger and turmeric should be grown in broad bed of width 1.0 m. alternated with furrow of 30 cm to a depth of 15 cm for easy disposal of excess water.

B. Flood

Early Flood (upto mid-August)

Medium/low land

- ❖ Select rice varieties like Tanmayee, Mrunalini, Jagabandhu, Kanchan, Ramachandi, Durga, Uphar, Sarala, Varshadhan for semi-deep low lands. Swarna Sub-1 is suggested for flash flood situations.
- ❖ If damage is more than 50% re-transplant rice crop of medium duration group.
- ❖ In partially damaged fields, allow the rice plants to stand upright. Do not go for beushaning as it may further reduce the plant population.
- ❖ Weed out the rice field, make gap filling and top dress N and K to boost the growth if situation permits.

Late flood (September)

If flood occurs during mid August to early September.

- ❖ Transplant 40-65 days old seedlings after flood water recedes.
- ❖ Make up plant population by transplanting clonal tillers detaching from the old clumps, wherever possible.
- ❖ Broadcasting/line sowing of sprouted seeds of relatively short duration rice varieties in soft puddle after flood water recedes.
- ❖ Apply moderate dose of fertilizer (40-20-20 kg N-P₂O₅-K₂O/ha).
- ❖ Particularly in up-medium land, where there is no scope for revival of rice, go for *pre-rabi* crops like blackgram, greengram, horsegram, sesame and cucurbits.
- ❖ Wash out the mud from the paddy leaves by spraying water just after receding of flood water.

Plant population

- ❖ Raise nursery by Dapog method to transplant wherever possible.
- ❖ Maintain a buffer nursery in the backyard/highland area to ensure adequate plant population in the field after flood damage.

Fertilizer application

- ❖ Reduce nitrogen application and apply recommended dose of P and K as basal to increase flood resistance.
- ❖ Apply moderate dose of NPK at beushaning, if not applied earlier.
- ❖ Top dress N and K in flood affected areas if situation permits.

Insect pest management occurring due to heavy rainfall/ flood

Rice

- ❖ Generally, the pests like swarming caterpillar, *Spodoptera mauritia* appear after a long dry spell followed by heavy rainfall. The pest also occurs after the receding of the flood. The recommendation to control the pest is as follows.
 - Regular surveillance to locate appearance of swarming caterpillars.
 - When they cross the ETL viz., one larva / hill the pest menace can be brought under control by spraying the crop with chlorpyrifos 20 EC @ 5 ml/lit. of water or quinalphos 25 EC @ 4 ml/lit. or triazophos 40 EC @ 2 ml/lit. or dichlorvos 76% SL @ 12.5 ml./10 lit. of water.
 - To prevent migration of larvae from one field to other, the bunds of the field should be dusted heavily with chlorpyrifos 1.5% D @ 25 kg/ha.
 - The brown plant hopper (*Nilaparvata lugens*) and white backed plant hopper (*Sogatella furcifera*) cause severe loss in *Kharif* paddy during September to November. The pests havoc could be minimized (below ETL i.e. 5-10 hoppers / hill) by spraying monocrotophos 36% SL @ 2 ml / lit. of water or triazophos 40 EC @ 2 ml/lit. of water.
 - Insecticides should be applied in the afternoon hours preferably.

Sugarcane

- ❖ In flood situation, the stalk borer and white fly will attack the crop. Wherever possible, the drainage of excess water from the field may be undertaken. After drainage, spray the crop with imidacloprid 17.8% SL @ 3ml / 10 lit of water or Dimethoate 30 EC @ 2ml / lit of water. To manage the internode and top shoot borer, release the parasitoid, *Trichogramma chilonis* @ 50,000 adults/ha, 5-6 times at 7-10 days interval at evening hour. Detrashing of older leaves may be done to reduce stalk borer and mealybug infestation.

Oilseeds, Vegetables, Cotton

- ❖ In these crops due to high humidity the black aphid population may increase. The pest population will be decreased by application of neem formulation (1500 ppm) @ 5 ml/lit of water when the populations is low or spraying the crop with dimethoate 30 EC @ 2 ml/lit of water or imidacloprid 17.8% SL @ 3 ml/10 lit of water, if the population is high.
- ❖ Regular surveillance work should be taken up in all crops in order to know the incidence of various insect pests and initiate the control strategies.

Disease management

- ❖ Cloudy weather with intermittent drizzling during *kharif* may result in severe occurrence of bacterial leaf streak and bacterial blight in rice. It is advised to spray the crop immediately after each rain storm with streptocycline (0.015%) or plantomycin (0.1%) or bacrinol (0.15%).
- ❖ Post flood affected areas where vegetable is grown are likely to be affected by bacterial wilt disease. Therefore, total package of practices starting from planting need to be followed as given below.
 - Mix the soil with stable bleaching power @ 25 kg/ha at the time of final land preparation and transplant seedling after 5-7 days.
 - Seedling root dip for 30 minutes in 0.015% streptocycline or 0.15% plantomycin.
 - Perform soil drenching to the base of the plants with a solution of carbendazim (0.15%) and streptocyclin (0.015%) at 10 days after planting (DAP), 25 DAP and 40 DAP coinciding with intercultural operations.
- ❖ Spray Metalaxyl 8% + Mancozeb 64% (Ridomil MZ) @ 0.2% against downy mildew diseases of cucurbit crops.
- ❖ A protective spray with mancozeb @ 0.3% may be given to pulse crops (greengram and blackgram) against *Cercospora* blight disease.

DROUGHT

I. Drought Preventive Measures

Among the different *kharif* crops the upland rice is most affected by drought. Therefore, diversified land use with low duty non-paddy crops is the best option in these lands. In real sense the technology available to mitigate drought are mostly preventive in nature and requires early planning. The age-old adage “Prevention is better than cure” thus holds good in drought management. Therefore it is imperative to have a long term policy and planning at the beginning of the season for judicious use of water, land and crops in a particular locality for best results. The major thrust in drought mitigation in rainfed areas should be on rain water management through *in-situ* conservation and water harvesting through on-farm reservoirs/ capturing runoff from local catchments/ flash flood water from local streams to recycle at the time of need. Some of the important preventive measures that can be adopted early in the season to mitigate the impact of drought and augment sustainable crop production are elaborated below.

A. Upland

1. Select efficient crops and cropping systems matching the length of growing season. Some of the promising non-rice crops for rainfed uplands are maize, cowpea, arhar, blackgram, rice bean, ragi, groundnut, sesame, castor, pumpkin, sweet potato, elephant foot yam, yam, tapioca, yambean, arrowroot, colocassia.
2. Choose short duration varieties Rudra, Shankar, Zhu 11-26, Heera, Kalinga-III which possess faster rate of growth, deep and penetrating root system and ability to escape drought.
3. Grow moisture stress tolerant upland rice varieties like, Jaldi Dhan 6 (80 days), Sahabhazi Dhan (90 days), Vandana (90 days), Mandakini (100 days) and Jyotirmayee (95 days).
4. Store rain water to use as life saving irrigation. On-farm water harvesting structures lined with 6:1 soil : cement mortar of 6 cm thickness in 10% land area helps to harvest the rainwater for providing protective irrigation.
5. Perform off season ploughing to conserve moisture, reduce pest and weed problem and to facilitate early sowing.
6. Plough and sow the crops across the slope to develop a ridge and furrow type of land configuration for effective soil moisture conservation to overcome drought for longer period.
7. Follow partial mechanization to ensure timeliness and precise of operations (desired depth and tilth) to utilize land, rainfall and other natural resources effectively.
8. Apply lime @ 0.15 to 0.25 LR on soil test basis or 500 kg lime / ha as blanket dose mixed with FYM @ 5.0 t/ha in furrows at the time of sowing in acid soils.
9. Adopt intercropping/mixed cropping system in recurrent drought prone areas as mentioned below:

Sl. No.	Intercropping	Row ratio	Set specification (cm)	Row distance of intercrop (cm)
ARHAR BASED				
1.	Arhar + groundnut	2:6	30-210-30	30
2.	Arhar + sesame/niger	2:4	30-150-30	30
3.	Arhar + greengram/ blackgram	2:3	30-120-30	30
4.	Arhar + ragi	2:4	30-100-30	20
5.	Arhar + rice	2:5	30-90-30	15
6.	Arhar + rice (mixed broadcast)	40:60	Seed rate ratio of individual crop for broadcasting	
7.	Arhar + radish•	2:2	30-90-30	30
8.	Arhar + okra	2:2	30-90-30	30
MAIZE BASED				
9.	Maize + arhar	2:2	30-90-30	30
10.	Maize + cowpea	2:2	30-90-30	30
11.	Maize + cowpea (fodder)	2:1	30 cm uniform row	30
12.	Maize + runner bean*	2:2	30-120-30	40
13.	Maize + yam*	Two rows of maize grown at 30 cm distance in both sides of yam planted in mounds at 90 cm x 90 cm to act as live staking		
RICE BASED				
14.	Rice + groundnut	4:1	Uniform row	15
15.	Rice + greengram / blackgram	4:1	Uniform row	15
16.	Rice + greengram / blackgram	2:1	In drought year, if rice fails, pulse crop is maintained and in a normal year pulse is cut for fodder and rice is maintained	
17.	Rice + okra	4:2	75-30-75	30
18.	Rice + radish•	4:2	75-30-75	30

* Suitable for inland hilly districts.

- Radish cv. Pusa Chetaki suitable for *Kharif*.

10. Adopt integrated farming system. Apart from crop component, inclusion of animal components and some ancillary enterprises like bee keeping, mushroom cultivation, goatery, poultry, planting fruit trees, timber species will diversify production and impart stability to production system.

11. Practice tree based farming systems and grow different field crops in the alleys (alley width 6 to 8m.).

Sl. No.	System	Tree species	Campanion crops
1.	Agri-silvi for class II & III land	<i>Acacia mangium</i> <i>Dalbergia sissoo</i> <i>Tectona grandis</i> <i>Casuarina equisetifolia</i> <i>Gmelina arborea</i>	Maize/cowpea/ greengram/ blackgram/ sesame
2.	Silvi-pastoral for class V & VI land	<i>Leucaena leucocephala</i> <i>Dalbergia sissoo</i> <i>Acacia auriculiformis</i> <i>Albizzia lebbeck</i>	Hybrid napier/ Guinea/ Stylo/ Dinanath / Thin napier
3.	Agri-horti for class II & III land	Guava/ custard apple/ mango/ pomegranate	Arhar/cowpea/ niger/okra

12. Follow principles of watershed management as follows:

- *In situ* soil and water conservation measures like contour farming, cover cropping, bunding, trenching, terracing, ridge and furrow method of planting.
- Provide vegetative barriers (*Vetiver* filter strips) in un-bunded upland to check soil loss and conserve rain water.
- Manage water ways through check dams, stone structures, and brushwood structures on natural streams / nallahs to store water.
- Water harvesting (digging ponds and lining) in 10-12% area.
- Utilize harvested water through micro-irrigation methods (drip/sprinkler).
- Moisture conservation through mulching.
- Gully plugging through stacking of locally available pebbles filled in empty cement bags across water ways. Growing of grasses in water ways is also helpful in reducing soil erosion.
- Grow erosion permitting crops (maize and arhar) and erosion resisting crops (greengram, blackgram, cowpea and rice bean) in alternate strips of recommended width for various slopes.

Slope	Strip width of erosion resisting crop (m)	Strip width of erosion permitting crops (m)
1%	9.0	45.0
1-2%	6.0	24.0
2-3%	4.5	13.5

- Construct a series of percolation tanks in light textured soils to recharge the profile and for supplemental irrigation.
- Provide suitable waste weir structures in the field bunds of rice for safe disposal of excess water in medium and low lands.
- Strengthen village institutions to enable people's participation.

13. *Follow suitable agronomic practices as follows :*

- Apply a portion of FYM in the seed furrows at the time of sowing to conserve moisture to prevent seedling mortality from early drought.
- Grow short duration rice varieties such as Mandakini, Jyotirmayee, Annanda, Pathara, ZHU XI-26, Shankar, Jogesh, Sidhanta, Khandagiri, Kalinga-III, Heera, Vandana, Anjali and RR 166-645 or tall varieties like Brown Gora, Surajmukhi, Saria.
- Sow non-paddy crops like ragi, maize, arhar, greengram, blackgram, cowpea, guar, sesame, groundnut, castor in place of upland rice.
- Vegetables come up well in drought/low rainfall years. Utilize the ponds, reservoirs and water bodies for growing tomato, cauliflower, radish, brinjal, runner bean in the inland hilly districts and cowpea, guar, lady's finger and chilli in coastal plains.
- Adopt broad bed and furrow (BBF) method of planting for growing groundnut, vegetables, turmeric and ginger for facilitating drainage of excess water during high intensity rainfall.
- Weeds extract more moisture as compared to crop plants during dryspell. Use herbicides in line sown rice in medium land situation to discontinue the practice of 'beushaning'. Weeds can be taken care by mechanical weeding in case of failure of rainfall.

B. Medium / low land

- Go for direct sowing of rice as soon as monsoon touches Kerala i.e. before onset of monsoon in Odisha.
- Under late sown condition, choose rice varieties maturing relatively 10 days less than the prescribed recommended varieties.
- Rainwater management in medium and low lands is crucial for mitigation of drought and improvement in production. A technology for storing excess rain water in refuges in medium/low land has been standardized by devoting 10% of the cultivable area. The objective is to minimize runoff by encouraging its entry into the soil (*in-situ* water conservation) and capturing that which cannot get into the soil. In the first step, the field bund is strengthened by raising the dyke height to 45 cm with provision of weir at 20 cm height for spilling over excess water to runoff collection tank (refuge). The refuge is constructed at the lower reach of the plot with top width 3.0m, bottom width 2.0m and depth 1.8m. The length of the refuge is equal to the width of the plot. This technology is based on the principle that out of total annual rainfall (1500 mm) nearly 50% of the

rainfall comes from a few intense showers resulting in higher runoff. On the other hand, in certain years there is a break in rainfall at a stretch for 10-12 days during crop growth period. This long stretch of dry period affects the rice crop adversely. The excess runoff discharged over the weir height during intense showers in the early season if collected in the refuge can provide protective irrigation to mitigate the intermittent drought in rice crop.

II. Drought Ameliorative Measures / Contingent Measures

It is difficult to define the exact crop and weather scenario during an anticipated drought or dry spell. Hence, it is really a difficult task to delineate rigid contingent measures well in advance of the cropping season applicable to all situations. However, there are three distinct periods of *kharif* season relating to crop growth stage and associated farm practices. Depending on the rainfall onset and pattern of distribution, seven types of scenarios have been projected and required contingent measures have been suggested below.

A. Early season drought (June 10 to July 31)

Scenario 1: Early onset and sudden stoppage of monsoon

Scenario 2: Late onset, uplands not covered till mid-July

B. Mid season drought (August 1 to September 15)

Scenario 3: Non-paddy crops in uplands affected

Scenario 4: *Beushaning* of rice delayed

Scenario 5: Transplanting of rice delayed / seedlings over aged

Scenario 6: *Beushaned*/transplanted rice affected at early vegetative stage.

C. Late season drought (September 16 to October 31)

Scenario 7: Medium and low land rice affected at vegetative / reproductive stage.

A. EARLY SEASON DROUGHT (June 10 to July 31)

Scenario 1: Early onset and sudden stoppage of monsoon

Under such a situation there is more likelihood of mortality of sprouts and seedlings and difficulties in sowing.

(a) Upland

- ❖ When there is more than 50% mortality, resow the crop up to July after receipt of sufficient rain water. It is always wise to raise low water requiring non-paddy crops like ragi (Suvra, Bhairabi, Dibyasinha, Godavari), greengram (K-851,

Sujata, Durga, Kamdev, PDM-54), blackgram (T-9,Pant-U-19,Pant-U-30, Ujala and Sarala), cowpea (SEB-2, Pusa Barsati, Utkal Manik), sesame (Uma, Usha, Nirmala, Prachi), ricebean (RBL-6, RBL-35, BRB-1), castor (Jyoti, Kranti, Harita). If mortality is less than 50%, the crops may be gap filled.

- ❖ Cultivate vegetables-cowpea, guar, radish, runner bean, okra, early cauliflower, brinjal, tomato wherever possible.
- ❖ Niger (Deomali, Alasi-1, Utkal Niger 150) and horsegram (Urmi) to be sown in August.
- ❖ In wide as well as close spaced line sown crops complete hoeing, weeding followed by ridging to the base of the crop rows at 20 days after sowing for *in-situ* moisture conservation.

(b) Medium and low land

- ❖ If rice population is less than 50%, resow the crop. Select medium duration varieties (125 days) for coastal districts. Sprouted seeds may be direct seeded or fresh seedlings of early varieties (listed earlier) may be raised for transplanting. The sprouted seeds can be sown in the lines by seed drill.
- ❖ If the rice population is more than 50% carry out weeding and adjust the plant population by *Khelua* (removing and redistributing the hills) and clonal propagation.
- ❖ Raise community nursery of rice for transplanting at a reliable water source to save time for further delay.
- ❖ Sow the seeds at 5-6 cm depth by *punji* method (6 - 8 seeds at one point) at a spacing of 20 cm x 10 cm and cover it with a mixture of FYM:SSP (10:1) to avoid seedling mortality due to moisture stress in lowland. Use a seed rate of 100 to 120 kg per ha to maintain 400 - 600 plants/m².
- ❖ In saline soil use FYM/green leaf manure, use aged seedlings for transplanting, gap fill the crop by clonal propagation.

Scenario 2 : Late onset, uplands not covered till mid-July

- ❖ Sow drought tolerant non-paddy crops like ragi, greengram (OBGG 52, OUM 11-5, K 851, Sujata), blackgram (B 3-8-8, Ujala, T 9, Pant U 19, Pant U 30), cowpea, guar, sesame, castor in place of upland rice.
- ❖ Maize, cowpea maybe grown in the first week of August to meet the fodder crisis.
- ❖ Niger (Deomali, Utkal Niger-150, Alasi-1) and horsegram (Urmi) are to be sown in August.
- ❖ Grow sweet potato varieties like Gouri, Shankar, Samrat, Shree Nandini, Shree Bhadra, Shree Ratna in the ridges and allow the furrows to conserve rain water.

- ❖ Grow vegetables like tomato, cauliflower, knol-khol, radish, brinjal, runner bean in the inland hilly districts and cowpea, guar, lady's finger and chilli in the coastal plains.
- ❖ Apply full P,K and 20% N of the recommended dose as basal along with well decomposed organic manure for early seedling vigour.
- ❖ Major emphasis should be given on *in-situ* rain water conservation, harvesting excess run-off for its recycling to make provision for life saving irrigation.

B. MID SEASON DROUGHT (August 1 to September 15)

Scenario 3: Non-paddy crops in uplands affected

- ❖ Complete hoeing and weeding in non paddy crop fields to provide dust mulch.
- ❖ Weeding groundnut after 45 days of sowing disturbs the pegging process. Under such a situation prune the weeds with the help of sickle
- ❖ Apply post emergence spray of quizalofop ethyl 5% EC @ 0.05 kg/ha in 500 litre of water (2ml/litre of water) at 20-25 day after sowing to control grassy weeds in groundnut/jute.
- ❖ Spray 0.5% KCl or 0.5% KH_2PO_4 + 0.3% borax to legumes to overcome drought situations.
- ❖ Foliar application of 2% urea at pre-flowering (25 days after sowing) and flowering stage of greengram and blackgram is helpful to mitigate drought.
- ❖ Spray 1% urea in brinjal. Take up spraying measures against mealy bug and mite which are more prevalent in dry weather.
- ❖ Withheld top dressing of nitrogen. Resume top dressing after receipt of rain.
- ❖ Remove the borer affected tillers/late formed tillers/dried leaves in sugarcane and follow wrapping and propping in chains. Stripe out the lower 4-5 leaves.
- ❖ Spray planofix or Celmone 10 ppm (2 ml in 9 litre of water) at 45 days and 20 ppm (4 ml in 9 litre of water) 10 days later to prevent boll shedding in cotton.
- ❖ Spray 2% urea in late planted jute to encourage growth.
- ❖ Top dress nitrogen to ginger and turmeric @ 60 and 30 kg/ha, respectively after receipt of rainfall followed by mulching.
- ❖ Practice mulching with organics to extend the period of moisture availability.
- ❖ Thin out to the extent of 25% and use the removed plants as feed/mulch.
- ❖ Close the drainage holes and check the seepage loss in direct sown medium land rice regularly.

Scenario 4: *Beushaning* of rice delayed

- ❖ Do not practice *beushaning* (blind cultivation) in rice, if the crop is more than 45 days old.
- ❖ Weed out the field without waiting for rainfall.
- ❖ Go for gap filling using seedling of same age or clonal tillers to have a uniform distribution of plant.
- ❖ Strengthen the field bunds and close the holes to check seepage loss.
- ❖ Withhold N fertilizer application up to receipt of rainfall.

Scenario 5: Transplanting of rice delayed

Generally in this case rice seedlings are over aged.

- ❖ Seedlings up to 45 and 60-70 days old can be transplanted in case of medium and late duration rice varieties, respectively without much reduction in yield.
- ❖ Remove the weeds and follow plant protection measures against blast in the nursery.
- ❖ Pulverize the main rice field in dry conditions, if it is not ploughed earlier to save time in final puddling.
- ❖ Use tractor/power tiller/tractor mounted rotavator for speedy land preparation/puddling to cover more area with less time.
- ❖ Follow close transplanting using 5-7 seedlings/hill
- ❖ Apply 50% recommended nitrogen at the time of transplanting.
- ❖ Apply life saving irrigation to maintain the nursery seedlings in good health.
- ❖ Do not top dress nitrogen in nursery.

Scenario 6: *Beushaned/transplanted* rice affected at early vegetative stage

- ❖ Provide protective irrigation through recycling of harvested rain water.
- ❖ Remove the weeds and follow plant protection measures against blast in the nursery if existing.
- ❖ Withhold N fertilizer application up to receipt of rainfall.
- ❖ Apply Potassic fertilizers wherever soil moisture allows or wait up to receipt of rainfall.
- ❖ Strengthen the field bunds and close the holes to check seepage loss.

C. LATE SEASON DROUGHT (September 16 to October 31)

Scenario 7: Medium and low land rice affected at vegetative / reproductive stage

It occurs as a result of early cessation of monsoon rains. The management practices are as follows.

- ❖ Provide protective irrigation through recycling of harvested rain water.
- ❖ Provide irrigation at critical stages such as flowering, grain filling, etc. in alternate furrows in wide spaced crops.
- ❖ Crops like cowpea, maize, greengram may be harvested for fodder purpose to avoid their failure as grain crops.
- ❖ When the soil becomes hard it is difficult to uproot groundnut from the field, sprinkle water from water harvesting structures/nallahs to soften the soil.
- ❖ Under situation of complete failure of *kharif* crop dismantle it. In such situation or where land is remaining fallow, sow (dibble) the pre-*rabi* crops.
- ❖ The ideal pre-*rabi* crops with residual moisture condition are horsegram, castor, niger, blackgram, ricebean and sesame in uplands and well drained medium lands.
- ❖ Pre-position inputs, particularly seeds for the *rabi* crop.

Insects pest management

The following insect/pests and diseases appear more frequently under drought situation for which it requires constant vigilance to take up timely control measures.

Rice

- ❖ In rice the mealy bug attack will be more. Thus the plants will look yellow, stunted and whitish. Mealy bugs are seen when the leaf sheath is detached. The pest can be controlled by spraying with dimethoate 30 EC or methyl demeton 25 EC @ 1 lit/ha in 500 lit of water.
- ❖ The problem of termites will be seen in rice, maize and other standing cereal crops which can be tackled by soil drenching with chlorpyrifos 20 EC @ 4-5 ml/litre of water or by adding chlorpyrifos 1.5% dust @ 20 – 25 kg/ha before final land preparation.
- ❖ Grasshopper menace is also seen in rice. The pest can be tackled by dusting chlorpyrifos 1.5% dust @ 25 kg/ha on the crop and field bunds.

Pulses

- ❖ In arhar termite attack will be noticed. The pest attack can be reduced as suggested in case of rice.
- ❖ In greengram, blackgram, cowpea, country bean, the spread of YMV by insect vector (*Bemisia tabaci*) may increase. Greengram cv. PDM 139 should not be grown as it is highly susceptible to the vector. Regular surveillance in the fields is essential. Manage the crop from insect vectors by spraying of dimethoate 30 EC @ 1 lit/ha or imidacloprid 17.8% SL @ 125 ml/ha at 10-15 days interval.
- ❖ Alternatively, spraying with Ha NPV @ 250 LE/ha or Bt formulation @ 1.0 kg/ha can be effective against *Spodoptera litura*, *Helicoverpa armigera* and leaf eating caterpillars.

Oilseeds

- ❖ In groundnut crop termites and white grub incidence is expected to be more. Methods suggested in rice may be followed to reduce the pest infestation.
- ❖ Incidence of leaf miner in groundnut may increase which can be managed by spraying with monocrotophos 36 SL or Triazophos 40 EC @ 1 litre/ha at fortnight intervals.

Vegetables

- ❖ In vegetable crops the incidence of mites is expected to increase under drought situation. The pest menace can be brought down by spraying of dicofol 18.5 EC @ 2 ml/lit or propargite 57 EC @ 2 ml/lit or fenazaquin 10 EC @ 1 ml/lit of water.

Cotton

- ❖ In cotton the incidence of sucking pests like Jassids, thrips and mites may increase. Spraying the crop with imidacloprid 17.8 % SL / thiamethoxam 25% WG / acetamiprid 20% SP @ 1 ml/4 lit or 1 g/4 lit of water will decrease the pest attack.
- ❖ The problem of termite attack in the crop can be managed in the same manner as suggested in case of rice.

Disease management

- ❖ Drought condition during the month of August-September onwards shall result in severe incidence of foliar blast and brown spot diseases in rice. It is advised to spray the crop with tricyclazole (Beam/Team) @ 0.06% or Ediphenophus (Hinosan) @ 0.1% or Kasugamycin @ 0.15 to 0.2% at 10-12 days intervals during drought period.

- ❖ Early drought result in late transplanting of rice which makes the crop vulnerable to sheath rot and sheath blight diseases. Maintenance of field sanitation followed by two spray at 10 days interval with validamycin (0.3%) or propiconzole (Tilt 0.15%) or carbendazim (0.15%) are advised.
- ❖ Bacterial wilt in most of the vegetables and other crops may occur in severe form during drought and period following drought. Basal soil drenching twice with streptomycin (0.015%) or plantomycin (0.15%) or bactrinol (0.15%) at 5 - 7 days interval during dry period is advised.
- ❖ ***Alternaria* and *Cercospora* blight** : There is every chance of occurrence of *Alternaria* and / or *Cercospora* blight in oilseeds, vegetables and cucurbits during the period from September to December. Protective spray with mancozeb @ 0.3% or carbendazim + mancozeb combined fungicide @ 0.2% may be done.
- ❖ There is every chance of pod rot of groundnut cultivated after rice crop. For this the groundnut seeds should be treated with carbendazim 50% WP @ 2g/kg of seed or Kasugamycin @ 1 ml/lit. The soil should be inoculated with bio control agent like *Trichoderma viridae* @ 2 kg along with decomposed FYM @ 62.5 kg/ha during earthing up.
- ❖ There is every possibility of occurrence of downy mildew disease in cucurbits during October to December. Give two sprays with Thiophanate Methyl (Topsin M) @ 0.15% or metalaxyl 8% + Mancozeb 64% (Ridomil - MZ) @ 0.2% at 12 days interval.

The prevention, mitigation and preparedness for natural disasters certainly needs capacity building of all extension personnel for taking up timely and appropriate measures for restoration of the normal agricultural activities. Other such steps taken are as under:

- Control rooms are made operational with the start of the cropping season at district and state levels which are constantly engaged in gathering information on crop weather situations.
- Every year, orientation trainings for the extension personnel are taken up at state and district levels before each cropping season (Kharif & Rabi). (There could be disaster specific capacity building exercises if funds are placed.)
- Prepositioning of inputs is monitored regularly at block level by the AAO and his staff, district level by DAO/ DDA and JQCI and state levels by JDA (Farm and Seeds), JDA (SP &C), DDA (Extension), DDA (PP) for various critical inputs.
- District-wise strategies are drawn up for successful cropping in close consultation with allied departments (Horticulture, Water Resources, Irrigation etc).
- Weekly crop weather reports, pest and disease incidences are gathered from all corners of the state online.

Fund requirement:

Sl. No.	Items	Estimated Av. fund requirement (in lakh ₹)	Remarks
1	Funds needed to provide free inputs; seeds, fertilizer, pesticides for seriously affected areas sustaining 75% above crop loss.	5000.00	--
2	Assistance for land preparation.	500.00	--
3	Removing sand cast and loose soil in the affected areas	900.00	--
4	Assistance for restoration of Private Lift Irrigation Points, Dug wells etc	100.00	--
5	Transport Assistance for relocating critical inputs at vulnerable points	38.00	
5	Repair and restoration of infrastructure.	1000.00	--
6	Capacity Building	162.00	--
	TOTAL	7700.00	

Chapter 4: Response Plan

Agriculture Directorate

Crop production in the state is much dependent on the Monsoon. Thus everyday rainfall is recorded at the block headquarters and evaluated for impact on crop stand. Natural disasters are closely watched, especially during kharif season, since 2/3rd of the crops are grown rained. Weekly crop weather watch reports are generated on-line and transmitted by each district to the Control Room at the Directorate. The Control room functions every day from 8 AM to 8 PM and such incoming reports are monitored. Regular monitoring of crop weather reports atleast once every week at the state level gives a first-hand indication of occurrence of natural calamities. However, in case of flash floods/ cyclones/ hailstorms etc the entire reporting system is activated almost immediately and first hand (eye estimate) reports of damage generated within 24 hours. Basing on the reports from the respective districts the response mechanism as regards technical support, agri-input supply, pest and disease outbreak measures are kept in readiness. The amelioratory measures start as soon as possible after the extent of damage is assessed in real time basis. The extension functionaries at the grass root level take a note of the damages and report them almost every day during such an emergency.

Appointment of Nodal Officers

Level	Name of the Nodal officer(s)
State	Addl. Director of Agriculture (Extension)
District	DDA
Block	AAO of the concerned block

Control rooms district and state headquarters

	District	Contact Person	e-mail address	Contact no. of the Control Room
	Directorate	Chief Statistician	dafstat.dag@nic.in	0674 – 2323374 0674 – 2391327 (FAX)
1	Angul	Dy. Director of Agriculture	ddaangul.dag@nic.in	06764 – 230351
2	Balasore	-do -	ddabls.dag@nic.in	06782 – 262127
3	Bargarh	-do -	ddabargarh.dag@nic.in	06646 – 233354
4	Bhadrak	-do -	ddabdk.dag@nic.in	06784 – 250906
5	Bolangir	-do -	ddabolangir.dag@nic.in	06652 – 250195
6	Boudh	-do -	ddaboudh.dag@nic.in	06841 – 222004
7	Cuttack	-do -	ddactc.dag@nic.in	0671 – 2442264

	District	Contact Person	e-mail address	Contact no. of the Control Room
8	Deogarh	-do -	ddadeogarh.dag@nic.in	06641 – 226252
9	Dhenkanal	-do -	ddadkl.dag@nic.in	06762 – 224662
10	Gajapati	-do -	ddagaja.dag@nic.in	06815 – 222243
11	Ganjam	-do -	ddabmp.dag@nic.in	0680 – 2290239
12	Jagatsingpur	-do -	ddajspur.dag@nic.in	06724 – 220061
13	Jajpur	-do -	ddajaj.dag@nic.in	06728 – 222056
14	Jharsuguda	-do -	ddajhar.dag@nic.in	06645 – 272408
15	Kalahandi	-do -	ddabhatna.dag@nic.in	06670 – 230751
16	Kandhamal	-do -	ddakandhamal.dag@nic.in	06842 – 253773
17	Kendrapara	-do -	ddaken.dag@nic.in	06727 – 232212
18	Keonjhar	-do -	ddakeonjhar.dag@nic.in	06766 – 255596
19	Khurda	-do -	ddakhu.dag@nic.in	06755 – 220523
20	Koraput	-do -	ddakoraput.dag@nic.in	06854 – 251423
21	Malkangiri	-do -	ddamal.dag@nic.in	06861 – 230242
22	Mayurbhanj	-do -	ddabaripada.dag@nic.in	06792 – 252743
23	Nawarangpur	-do -	ddanaba.dag@nic.in	06858 – 222017
24	Nayagarh	-do -	ddanaya.dag@nic.in	06752 – 252332
25	Nuapada	-do -	ddanua.dag@nic.in	06678 – 211099
26	Puri	-do -	ddpuri.dag@nic.in	06752 – 223007
27	Rayagada	-do -	ddaraya.dag@nic.in	06856 – 222148
28	Sambalpur	-do -	ddasambalpur.dag@nic.in	0663 – 2402944
29	Sonepur	-do -	ddason.dag@nic.in	06654 – 220461
30	Sundargarh	-do -	ddasng.dag@nic.in	06622 – 273861

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

Level	Name of the Head of the IRT	Team members of IRT	Role / Responsibility
State	Director of Agriculture And food Production, Odisha.	1. ADA (Extension) 2. JDA (Farm & Seeds) 3. JDA (Information) 4. JDA (Engineering) 5. Chief Statistician 6. ADA-II 7. FA-cum-CAO	1. Coordinate with State Government and other line Departments. 2. Ensure Reporting of the affected area and assess damage thereof. 3. Assess the staff and other logistic requirement for operation. 4. Ensure availability of funds at District and block level to meet contingency expenses.

Level	Name of the Head of the IRT	Team members of IRT	Role / Responsibility
			<ol style="list-style-type: none"> 5. Plan and arrange necessary inputs for response measures 6. Manage the fund and maintain financial records 7. Maintain an inventory of all related guidelines, procedures, action plans, district maps and Contact numbers. 8. Develop the media messages up to date status of disaster mitigation and response work 9. Document the lessons learnt. 10. Circulate printing material on Contingent and DM Plans. 11. Capacity Building
District	DDA	<ol style="list-style-type: none"> 1. DAO(s) 2. Agronomist 3. PPO 4. ADA (Input) 5. Scientist KVK/Other ICAR institution 6. Head Clerk (as representative for Accounts) 	<ol style="list-style-type: none"> 1. To coordinate with Directorate, District Authorities and line departments at District level. 2. To prepare and activate district disaster plan 3. To manage the overall response activities in the field 4. To develop the media messages. 5. To mobilise resources for response measures 6. To collect and store disaster related information for post incident analysis. 7. Capacity Building
Block	AAO	<ol style="list-style-type: none"> 1. AHO 2. BTM 3. 2 nos. AO/VAW 4. Revenue representative 5. Others (from FIAC) 	<ol style="list-style-type: none"> 1. To supervise collection of disaster related information and report to the District IRT. 2. To prepare and activate disaster plan at block level 3. To coordinate with District Authority, AHO and Tahasildar/ BDO, PRI members etc 4. To implement the plan 5. To ensure availability of resources for response measures 6. Capacity Building

Reporting procedures and formats;

(a) Crop weather watch group report (by the Districts)

DISTRICT:-

SEASON:-

WEEK ENDING-

1 CROP COVERAGE

Sl no.	Name of the crop	Normal area ('000' hect)		Area covered last year ('000' ha)		Area covered this year ('000' hat)		Whether sowing is e/n/l	Crop condition v/n/p	Estimated yield (kgs/ha)	Remarks
		I	UI	I	UI	I	UI				
1										

2. RAINFALL (In mm)

R=Rainfall

RD=No. of rainydays

	April		May		June		July		August		September	
	R	RD	R	RD	R	RD	R	RD	R	RD	R	RD
(a) Normal												
(b) Actual												
(c) Effect of rainfall on major crops												

3. Progress of agricultural operations

Agricultural Operation	Paddy		Other crops (specify)
	Last year	Current year	
I.Sowing			
(a) Broadcasted			
(b)Transplanting			
II.Beausaning			
(a) Total Area to be beausaned.			
(b) Area beausaned so far.			
III.Harvesting			

4. Crop damage if any due to (drought/flood/cyclone/pestattacks)

(Area in hect.)

Name of the Crop	Total area covered so far	Area affected.	Anticipated damage (in hect)				Cause of damage
			< 25%	25% to 75%	50% to 75%	> 75%	
Paddy							
Other crops							
.....							
.....							

5. Input supply

SEED			FERTILISER		PESTICIDES	
Name of the crop	Quantity (In quintal)		Name	Quantity sold (In M.T)	Name	Quantity sold
	Received	sold				
Paddy			Urea		Liquid (In Ltrs)	
Non-paddy(Specify)			D.A.P.		Dust (In Qtls)	
1.Dhanicha			S.S.P.		Granules (In Qtls)	
2.Biri			M.O.P.		WP (In Qtls)	
3.Mung			Others			
4						
5						

6. Irrigation

Name of the crop	Major	Medium	Minor	Lift			Others	Total
Paddy								
Other cereals								
Pulses								
....								
TOTAL								

(b) Initial reporting of natural disaster

District	Block	No. of GPs/ULBs affected	No. of Villages affected	PADDY	NON-PADDY	TOAL

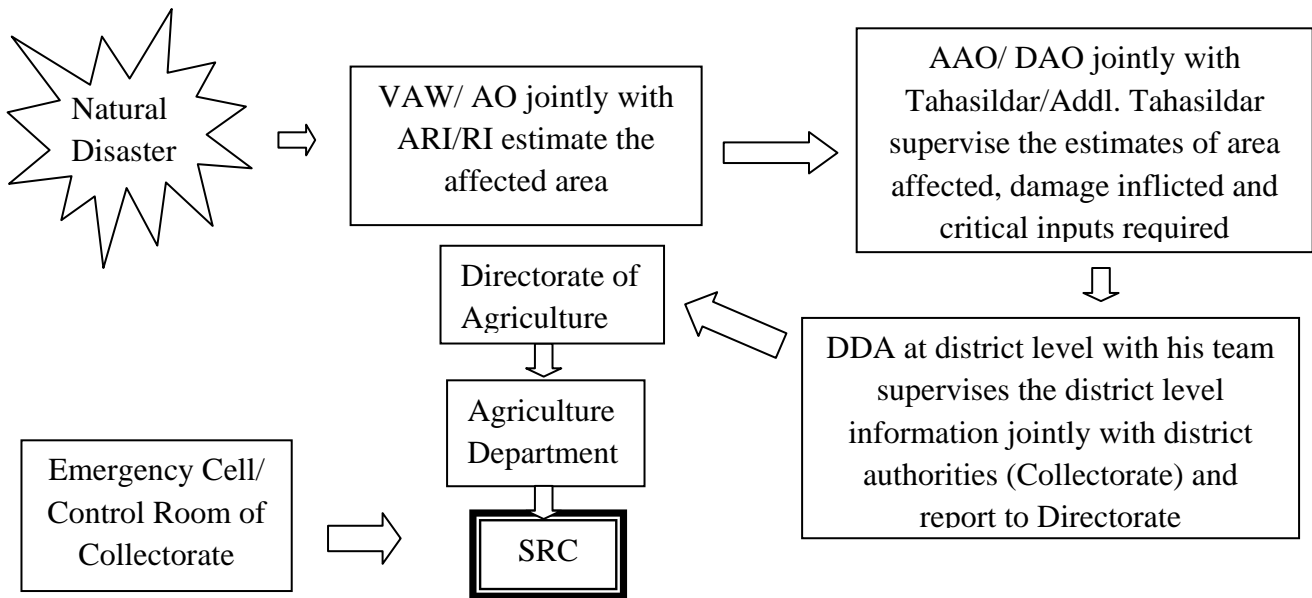
(c) After Assessment of Damage

Districts	No of Blocks	No of Vill./UIBs	Crop						
			Area affected (in hectares)						
			0-10%	11-25%	26-50%	51-75%	>75%	Total	

(d) Calculation of assistance for Agricultural input subsidy – SMF

Sl. No	Name of affected district	Total agricultural area affected (in ha.)	Total agricultural area where crop loss is >50%	Out of (4) area belonging to SMF			Assistance sought for different categories of crops			Total assistance sought (₹in lakh) (8+9+10)
				Rain-fed	Irrigated	Perennial	Rain-fed (₹3000 x Col.5)	Irrigated (₹6000 x Col.6)	Perennial (₹8000 x Col.7)	
1	2	3	4	5	6	7	8	9	10	11

Flow Diagram of the Reporting Procedures



Role of NGOs and Voluntary Sector and coordination thereof;

Progressive farmers, Krushak sathis, Gramya Krushak Manch, PRI members are taken help of in assessing crop damage and taking up mitigation and restoration measures thereof. The coordination with NGOs & voluntary sector is generally at the District and block levels. They have been participating in agricultural development programmes and will be vital links to reach every individual affected farmer.

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, Krushak sathis, Gramya Krushak Manch, PRI members etc by the Village Agricultural Workers/ Agricultural Overseers working at GP level under the supervision of Block Level Asst. Agriculture Officer and Tahasildar. The area affected and the extents of damage are classified (0-25%, 25-50%, 50-75%, 100%) for assessing the crop loss after a lag period of 1-2 weeks. 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.

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.

Sl. No.	Name of the agency	Regular duty	Role during disaster situation	Role supposed to be played during				
				emergency response (rescue, medical first aid, shelter)	Relief and recovery	Prevention	Mitigation	Prepared-ness
1	Directorate of Agriculture	Implement different programmes for Agriculture Development	Provide technical support on implementing the contingent plan. Organise restorative measures. Extend input assistance	Assess area affected and report. Assess the damage and put forth requirement of critical inputs.	Provide technical support on implementing the contingent plan. Organise restorative measures. Extend input assistance. Coordinate with sister departments for such measures.	Provide technical support and organize Capacity Building for all stake Holders. Generate awareness on responding to crop weather predictions.	Provide input assistance, facilitate indemnity payment for crop insured, technical support on overcoming disaster. Conduct crop cutting experiments to assess the quantum of loss in physical and financial terms.	Assist farmers with choosing appropriate preventive way of crop husbandry; choice of tolerant vars, timely agricultural operations, Organise plant protection measures in pest and disease affected regions, Storage of critical inputs at vulnerable locations.
2	OSSC	Production and distribution of seeds	Proper distribution of seeds with a reserve/ buffer stock earmarked for Disaster	Locate appropriate varieties required to be supplied after disaster. Stock them at suitable locations before the actual restoration measures start.	Ensure supply of appropriate varieties of different seeds.	Ensure production and distribution of appropriate tolerant varieties in disaster prone areas. Proper maintenance of Godowns and buffer stock.	Ensure supply almost immediately with start of the restoration measures.	Proper maintenance of Godowns and buffer stock.

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.

Sl. No.	Natural Calamity	Responsibility	Response Time line	Who is responsible
1	Flood	Estimate of Area under Sumergence/ inundation/ Sand Cast	24 hours	RI /ARI &VAW/AO at GP level Tahasildar & AAO at block level Collector & DDA at District level Rvenue and DM Deptt. at state level
		Assessment of Damage	After 7 days of submergence/ receding of flood	-Do-
2	Drought/ Moisture Stress	Area under moisture stress	At regular intervals during the cropping season	-Do-
3	Cyclone/ Hailstorm/ Tidal waves	Area affected by submergence/ saline inundation/ sand cast/ lodging of crops etc	Immediate after occurrence	-Do-
4	Pest & Disease attack	Area affected	24 hours in case of emergencies/ as Monitored through e-pest surveillace On a weekly basis.	VAW/AO at GP level AAO at block level DDA/PPO at District level DDA (Plant Protection) at State Level

Identification of suppliers for departmental supplies and pre-contracting for supplies in case of emergencies

Odisha State Seeds Corporation is the official seed supplier and is directed to keep seed stock stand by for such emergencies. Besides, Odisha Agro Industries Corporation also would be a key agent during a disaster management programme for supply and distribution of critical inputs. Fertiliser and pesticides are monitored for prepositioning by the manufacturers/ CF Agents in buffer godowns/ wholesalers/dealers to meet such eventualities. The National Seed Corporation is also taken help of for supply of some non-paddy seeds.

Horticulture Directorate

After issue of warning, the State and District Control room will be activated to function round the clock in the concerned district.

DDH/ADH will be responsible to provide all support to control room at district level.

The control room will collect, collate and transmit information regarding matters relating to the natural calamities and relief operations undertaken

Appointment of Nodal officer

Level	Name of the Nodal officer
State	Joint Director of Horticulture
District	DDH/ADH of the concerned district
Block	AHO of the concerned block

State Level:

Designation	E-Mail	Telephone No.
Joint Director	supportdho.od@nic.in	0674-2556750 Fax: 0674-2551978

District Level:

Designation	E-Mail	Telephone No.
DDH Angul	ddhangul.od@nic.in	06764-236460
DDH Balasore	ddhbalasore.od@nic.in	06782-264153
DDH Bolangir	ddhbolangir.od@nic.in	06652-250521
DDH Cuttack	ddhcuttack.od@nic.in	0671-2342965
DDH Dhenkanal	ddhdhenkanal.od@nic.in	06762-224496
DDH Gajapati	ddhgajapati.od@nic.in	06815-222228
DDH Ganjam	ddhganjam.od@nic.in	0680-2292990
DDH Kalahandi	ddhkalahandi.od@nic.in	06670-230328
DDH Kandhamala	ddhkandhamal.od@nic.in	06842-253093

Designation	E-Mail	Telephone No.
DDH Keonjhar	ddhkeonjhar.od@nic.in	06766-253498
DDH Koraput	ddhkoraput.od@nic.in	06852-250886
DDH Malkangiri	ddhmalkanagiri.od@nic.in	06861-230250
DDH Mayurbhanj	ddhmayurbhanj.od@nic.in	06792-252586
DDH Nawarangpur	ddhnawarangpur.od@nic.in	06858-222069
DDH Nayagarh	ddhnayagarh.od@nic.in	06753-252331
DDH Puri	ddhpuri.od@nic.in	06752-272235
DDH Rayagada	ddhrayagada.od@nic.in	06856-222185
DDH Sambalpur	ddhsambalpur.od@nic.in	0663-2401208
DDH Sundargarh	ddhsundargarh.od@nic.in	06622-273042
ADH Bargarh	adhbargarh.od@nic.in	06646-232647
ADH Bhadrak	adhbhadrak.od@nic.in	06784-250046
ADH Boudh	adhboudh.od@nic.in	06841-211277
ADH Deogarh	adhdeogarh.od@nic.in	06641-226437
ADH Jagatsinghpur	adhjagatsinghpur.od@nic.in	06724-220078
ADH Jajpur	adhjajpur.od@nic.in	06728-224742
ADH Jharsuguda	adhjharsuguda.od@nic.in	06645-272459
ADH Kendrapara	adhkendrapara.od@nic.in	06727-220371
ADH Khurda	adhkhurda1.od@nic.in	06755-220553
ADH Nuapada	adhnuapada.od@nic.in	06671-232264
ADH Sonapur	adhsonapur.od@nic.in	06654-221356

//////////////////////////////////////**Constitution of the Incident Response Teams (IRTs) at all levels with provision of delegation of authority;**

The IRTs at various levels are as follows.

Level	Name of the Head of the IRT	Role / Responsibility
State	Joint Director of Horticulture	<ol style="list-style-type: none"> 1. Coordinate with State Government , Central Government and other line Department 2. Assess the staff and other logistic requirement for operation

		<ol style="list-style-type: none"> 3. Ensure availability of funds at District and block level to meet contingency expenses 4. Develop the media messages up to date status of disaster mitigation and response work 5. Plan and arrange necessary inputs necessary for response measures 6. To manage the fund and maintain financial records 7. Maintain an inventory of all related guidelines, procedures, action plans, district maps and Contact numbers. 8. Document the lessons learnt
District	DDH/ADH of the concerned district	<ol style="list-style-type: none"> 7. To coordinate with Directorate and District Authority and Deputy Director of Agriculture at District level. 8. To prepare and activate district disaster plan 9. To manage the overall response activities in the field 10. To develop the media messages 11. To mobilise resources for response measures 12. To collect and store disaster related information for post incident analysis
Block	AHO of the concerned block	<ol style="list-style-type: none"> 6. To coordinate with District Authority, AAO and Tahasildar / BDO 7. To prepare and activate disaster plan at block level 8. To implement the plan 9. To ensure availability of resources for response measures 10. To collect and report disaster related information

Reporting procedures and formats;

Reporting procedure:

Source	To	Officer responsible
Block	Subdivision	AHO
Subdivision	District	ADH
District	District Administration	DDH / ADH
	State Centre	

The assessment and reporting is being done along with staffs from Directorate of Agriculture and Food Production, Odisha and Revenue Department.

Reporting format:

Sl.No.	District	Block	Village	GP	Name of the Farmer	Crop	Damaged Area (Area in Ha.)	% of Damage

Role of NGOs and voluntary Sector and Coordination thereof;

The NGOs and Voluntary Organisations may assist during awareness programme, selection of beneficiaries, supply of crucial inputs to the bonafied farmers as well as dissemination of technologies.

System of assessing the damage from any disaster;

Based on acreage of crop damage. However damage to the infrastructures has to be done on assessment of actual loss.

There are a lot of vacancies in the field level and it is practically becoming difficult to immediately assess the extent of damage caused by any disasters. Therefore we need to take necessary steps to fill up the posts to strengthen the capacity to deal with situation.

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;

Hazard Disaster	Vulnerable locations	State Level Response
Flood	Flood prone areas	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Arrangement for supply of critical inputs such seeds, planting materials to the districts. 3. Arrangement of resources for reconstruction / repair of departmental buildings and farms and protected structures.
Drought	Southern and Western Odisha	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Arrangement for supply of critical inputs such seeds, planting materials to the districts.

Hazard Disaster /	Vulnerable locations	State Level Response
Cyclone	Coastal Areas	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Arrangement for supply of critical inputs such seeds, planting materials to the districts. 3. Arrangement of resources for reconstruction / repair of departmental buildings and farms and protected structures.
Earth quake	Seismic zones	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Arrangement of resources for reconstruction / repair of departmental buildings and farms and protected structures.
Heat wave	Western Odisha	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss.
Hail storm	Anywhere in the State	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss.
Fire	Anywhere in the State	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss.
Tsunami	Coastal belt	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss.
Disease	Anywhere in the State	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Supply of critical preventive chemicals
Insect, pest	Anywhere in the State	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Supply of critical preventive pesticides
Chemical Poisoning	Industrial areas	<ol style="list-style-type: none"> 1. Arrangements for assessment of damage and crop loss. 2. Advice regarding specific soil amendments in the affected areas

Identification of suppliers for departmental supplies and pre-contracting for supplies in case of emergencies; and

The seeds are being procured from Odisha State Seeds Corporation Ltd or other Government owned agencies. Similarly planting materials are being procured from Departmental farms, registered private nurseries, Odisha Agro Industries Corporation ltd and other Government owned agencies.

Chapter 5

Relief, Rehabilitation and Reconstruction

Norms of relief, if applicable.

Input assistance extended as per CRF Norms of the Central Government & Ex-gratia by State Govt.

Minimum Standards of relief.

The minimum entitlement of a farmer is as per CRF norm and *Ex-gratia* from the State Govt. (as of now the minimum entitlement of a farmer stands at ₹1000/- (₹250/- from CRF + ₹750/- as *Ex-gratia* from State Govt.)

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.
- Restoration assistance for sand casted areas.
- Reconstruction/ repair/ restoration of departmental buildings, farms, equipments etc.

Financial mechanism

CRF assistance is provided by the SRC, Revenue & DM Deptt. after assessment of damage by the District Administration. Besides, more funds would be necessary for the restoration initiatives. The input assistance is paid in cash (A/c Payee Cheque) by the Revenue & DM Department through its field functionaries. The other required fund is proposed to be provided to the Agriculture Department. In turn the Department will place the funds with the respective directorates. The Directors will place the funds with the officers at District level for utilization.

Revised proposals for Input Assistance to Calamity affected farmers from Calamity Relief Fund (CRF) and National Calamity Contingency Fund (NCCF)

Type of Assistance	Norms of Assistance Existing	Norms of Assistance to be revised
Input Assistance to affected farmer	Rainfed crops - ₹ 2000/- per ha	₹5000/- per ha
	Irr. Crops - ₹4000/- per ha	₹10000/- per ha
	Perennial Crops - ₹6000/- per ha	₹15000/- per ha
Minimum Assistance to affected farmer	Rainfed & Irr. Crops - ₹250/-	₹1000/-
	Perennial Crops - ₹500/- per ha	₹2000/- per ha

Action Plan for Reconstruction – ‘Building back better’

- Providing Input assistance towards crop loss sustained on account of natural calamities.
- Regular Capacity building exercises to combat impact of natural disasters.
- Prepositioning of critical agri-inputs and maintaining reserve/ buffer stock for meeting any emergency.
- Drawing up district-wise strategies for meeting such mitigation requirements.
- Regular Crop weather watch analysis and taking up steps as and when required.
- Constant extension support throughout the cropping season.
- Restoration of supporting infrastructure on a priority basis.
- Facilitating adequate crop insurance coverage.
- Facilitating soft term loans and revised moratorium periods for repayment.
- 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 (86%) 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.

The Directorate of Agriculture has a printing press manned by personnel for media management who are constantly on the process of disseminating farmer centric information, gathered from experts of the department and scientists of OUAT and ICAR institutions, through various mass media like, leaflets, posters, booklets, tailored TV and radio programmes etc.

Department website i.e. www.orihort.in will be updated with disaster related plans, procedures, circulars, guidelines, documents, best practices, reports, trained human resources. Inclusion of case studies on disaster response in Quarterly magazine 'Udyan Sandesh' Department will collaborate with OUAT/ ICAR and other Government institutions to organize seminar to share best practices

Identification of Knowledge institutions and mechanism of knowledge sharing;

The State Agriculture University provides the blue print of the contingent measures to be taken up in cases of such natural disasters and the booklet is circulated among field functionaries for making them aware of the technical support they are needed to render. Besides, ICAR institutions like, Central Rice Research Institute, CIPMC, Directorate of Water Management, Central Institute of Fisheries and Aquaculture etc can be of immense help. The KVKs can be taken advantage of, on a regional basis for such 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.

Documentation of best practices and uploading of the same in the departmental websites

The Contingent Plan is uploaded in the website and best practices are being uploaded and need to be done on case to case basis.

**Chapter 7:
Review and Updating, & Dissemination of Plan**

DM Plan is a “living document” – would require regular improvement and updating – at least once a year

The Contingent Plan prepared by the Directorate with the technical input from the SAU (OUAT) is upgraded every year and would continue to be done. The IRT will sit at least twice a year (well ahead of the cropping season) to effect regular improvements or remove bottlenecks in the Disaster Management Plan.

System of updating – who, when and how?

Accordingly the DM Plan/ Contingent Plan is and would be updated by the Wing of the directorate dealing with the Disaster/IRT with the technical help of the Odisha University of Agriculture & Technology, Bhubaneswar.

Level	Who	When	How
Agriculture			
State	Director of Agriculture And food Production, Odisha.	1. Pre Kharif 2. Pre Rabi	<ul style="list-style-type: none"> • State level meeting with IRT and experts from OUAT/ CRRRI/ Dte. Of Water Management etc. • Workshop to be organized • Analysis of database and MIS.
District	DDA	1. Pre Kharif 2. Pre Rabi	<ul style="list-style-type: none"> • District level meeting with IRT and experts from KVK/ experts from line departments, NGOS etc. • Preparedness meetings. • Review and analysis of past experiences.
Block	AAO	1. Pre Kharif 2. Pre Rabi	<ul style="list-style-type: none"> • Group discussions/ meetings with farmers/ PRI members etc • Collection of feed backs and suggesting for improvement to address the local needs.
Horticulture			<ul style="list-style-type: none"> •
	Seminar/workshops will be organized at State and District for review and feedback will be taken for addition/deletion.		

Dissemination of Plan to stakeholders – how? – Printing of document, uploading in departmental website, meetings, seminars, etc

Agriculture

The booklet on Contingent Plan is printed and circulated every year by the directorate to its field functionaries. The same is also uploaded on Govt. website for different stake holders. Awareness campaigns, Farmers trainings are organized and such informations on disaster preparedness is disseminated to all the stake holders. Calamity control rooms collect information on occurrence of disasters as well as render necessary advisory to the information seekers.

Horticulture

A Standard Operating Procedure (SOP) and Formats will be prepared. SOP will be uploaded in the departmental website and shared with OSDMA.

Disaster management plan along with SOP will be supplied to all the field staff.

CROP WEATHER WATCH GROUP REPORT

DISTRICT:-

SEASON-

WEEK ENDING-

1 CROP COVERAGE

Sl No.	Name of the crop	NORMAL AREA ('000' hect)		AREA COVERED LAST YEAR ('000' hect)		AREA COVERED THIS YEAR ('000' hect)		Whether sowing is E/N/L	Crop condition V/N/P	Estimated Yield (Kgs/Hect.)	REMARKS
		I	UI	I	UI	I	UI				
1	HYV Paddy										
2	Local Paddy										
	Total Paddy										
3	Hyv. Maize										
4	Local Maize										
5	Ragi										
6	Hy. Jowar										
7	Local Jowar										
8	Hy. Bajra										
9	Local Bajra										
10	Small Millets.										
	Total Cereals										
11	Mung										
12	Biri										
13	Kulthi										
14	Cowpea										
15	Arhar										
16	Other Pulses										
	Total Pulses										
17	Groundnut										
18	Til										
19	Castor										
20	Niger										
21	Sunflower										
22	Soyabean										
	Total oilseeds										
23	Jute										
24	Mesta										
25	Sunhemp										
26	Cotton										
	Total Fibres										
27	Total Vegetables										
28	Total Spices										
	GROSS AREA										

2. RAINFALL (In mm)

R=Rainfall

RD=No. of rainydays

	April		May		June		July		August		September	
	R	RD	R	RD	R	RD	R	RD	R	RD	R	RD
(a) Normal												
(b) Actual												
(c) Effect of rainfall in major crops												

3. PROGRESS OF AGRICULTURAL OPERATIONS

	PADDY		OTHER CROPS (SPECIFY)
	LAST YEAR	CURRENT YEAR	
I.Sowing			
(a) Broadcasted			
(b)Transplanting			
II.Beausaning			
(a) Total Area to be beausaned.			
(b) Area beausaned so far.			
III.Harvesting			

4. CROP DAMAGE IF ANY DUE TO (DROUGHT/FLOOD/CYCLONE/PESTATTACKS)

(Area in hect.)

Name of the Crop	Total area covered so far	Area affected.	Anticipated damage (in hect)				Cause of damage
			< 25%	25% to 75%	50% to 75%	> 75%	
PADDY							
(a) High							
(b) Medium							
(c) Low							
Total							
OTHER CROPS							
(Specify)							

5. INPUT SUPPLY

SEED			FERTILISER		PESTICIDES	
Name of the crop	Quantity (In quintal)		Name	Quantity sold (In M.T)	Name	Quantity sold
	Received	sold				
Paddy			Urea		Liquid (In Ltrs)	
Non-paddy(Specify)			D.A.P.		Dust (In Qtls)	
1.Dhanicha			S.S.P.		Granules (In Qtls)	
2.Biri			M.O.P.		WP (In Qtls)	
3.Mung			Others			
4						
5						
Total						

6. IRRIGATION

Name of the crop	Major	Medium	Minor	Lift			Others	Total
Paddy								
Other cereals								
Pulses								
Oilseeds								
Jute								
Cotton								
Sugarcane								
Vegetables								
Spices								
TOTAL								

Annexure-II

Districts	No of Blocks	No of Vill./UIBs	Crop						Value of the crop Damage
			Area affected (in hectares)						
			0-10%	11-25%	26-50%	51-75%	> 75%	Total	
State Total									

Annexure-III A

Calculation of assistance for Agricultural input subsidy – SMF (Small & Marginal Farmers)

Sl. No	Name of affected district	Total agricultural area affected (in ha.)	Total agricultural area where crop loss is >50%	Out of (4) area belonging to SMF			Assistance sought for different categories of crops			Total assistance sought (₹in lakh) (8+9+10)
				Rainfed	Irrigated	Perennial	Rainfed (₹3000 x Col.5)	Irrigated (₹6000 x Col.6)	Perennial (₹8000 x Col.7)	
1	2	3	4	5	6	7	8	9	10	11

Annexure-III B

Calculation of assistance for Agricultural input subsidy – Other than SMF (Small & Marginal Farmers)

Sl No	Name of affected Block	Total Agricultural area where crop loss is >50%	Out of (3) area belonging to farmers other than SMF			No. of farmers other than SMF affected by the instant calamity (Only)			No of farmers other than SMF affected by successive calamities			Assistance sought for different categories of crop						Total Assist. sought (In lakh)
												Affected first time			Affected for successive calamities			
			Rainfed	Irrigation	Perennial	Rainfed	Irrigation	Perennial	Rainfed	Irrigation	Perennial	Rainfed	Irrigation	Perennial	Rainfed	Irrigation	Perennial	
1	2	3	4A	4B	4C	5A	5B	5C	6A	6B	6C	7A	7B	7C	8A	8B	8C	7(A+B+C)+ 8(A+B+C)

Criteria based on crops for declaring calamity

The unit area for assessment of a calamity situation will be the G.P. level. At any time of the crop season in an area there will be several crops at different growth stages under different land situations. However, only most important criteria pointing to the calamity situation are placed below for their use in determining the calamity situation as indicators, although the affected crops in the area are not to be limited only to the indicator crops.

1. Drought

a) Early drought (1st June to 31st July)

The critical time limit for assessment is 31st July and the criteria to be followed are as follows. Fulfilling any one of the criteria will be considered as calamity.

- (i) 25% of sown area suffer from sprouting death (*Gaja Marudi*).

Or

Seedling death in rice nurseries exceeds 25%.

and

- (ii) Soil moisture stress will not allow further sowing in nursery/ main field.

b) Mid season drought (1st August to 15th September)

The critical time limit for assessment is 15th September and the criteria to be followed are as follows.

- (i) Beushaning and / or transplanting of rice is below 50% of the normal area covered under direct sowing / transplanting in that area.

Or

- (ii) Vegetative growth of Beushaned / transplanted rice crop is reduced by 50% in 25% of the crop area as evidenced from the reduced tiller number and general vigour of the crop.

c) Late season drought (16th September to 31st October)

The critical time limit for assessment is 31st October and the criteria to be followed are as follows.

- (i) Panicle emergence in rice crop is restricted to 50% in 25% of the standing rice crop area.

Or

- (ii) Grain filling in panicle is lowered by 30% in 50% of the standing rice crop area, which leads to chaffy grains.

Or

- (iii) Boll formation in cotton is adversely affected by 50% and/ or secondary boll formation is ceased.

2. Flood / submergence

Any one of following criteria, if fulfilled, will be considered to result calamity situation.

- (a) Seeds/ seedlings are washed away or rotten by 50% in the submerged area.
- (b) If rice crop at pre flowering stage is submerged for at least a week.
- (c) If rice crops at vegetative and reproductive stages are submerged between four to seven days and the mortality is at least 50%.
- (d) If the vegetable crops (both nursery and main field) are submerged for 24 hours or more.
- (e) The rice crop at maturity stage is submerged for 2 days.

1. Hail storm

If hailstorm occurs at any stage of non-paddy crops including Horticulture crops and post flowering stage of the rice crops, it will be considered to be a calamity.

2. Pest attack.

- i. In the cases of swarming caterpillar, Brown plant hopper (BPH) and white backed plant hopper (WBPH), the very appearance of the pests will be considered as calamity.
- ii. In case of all other pests (except those listed in the above section 5 (a)), a crop with pest attack exceeding ETL will be considered as calamity affected subject to the condition that crop area affected is more than 50 hectare, whether continuous / contiguous patch, in a locality.

3. Cyclone

If the standing crops in the cyclone hit area is damaged due to uprooting/ lodging / leaf shedding by 50%, the whole area will be considered as calamity affected.

Standard Operating Procedures (SOP) for disaster Management in Agriculture

Before Disaster

- Formulation of Disaster Management Plan(DMP).
- Preparation of contingent Plan.
- Capacity Building of field functionaries and all the stake holders.
- Repair and maintenance of Input godowns.
- Functioning of Control Rooms.
- Monitoring supply and pre-positioning of critical inputs at designated points near to the vulnerable areas.
- Regular monitoring of crop weather watch report and e-pest surveillance.
- Maintaining adequate trained staff at disaster prone areas and be in readiness.
- Early warning of anticipated disaster.
- Pre-locating resources useful for the amelioratory measures.

During disaster

- Field visit and reporting on affected areas within the specific time period.
- Management and handling of the prevailing situation.
- The IRTs will sit to address the issues /gaps those need to be attended.
- Co-ordinate with other departments/ agencies for mitigation measures.
- Assess the impact of disaster, collect feedback from the affected farmers and report to the proper quarters.
- Identify the priority areas and do the needful.
- Media Management.

After Disaster

- Assessment of the actual damage in the field.
- Meeting of IRTs to decide upon emergent issues and action to be taken.

- Assess the critical inputs required for restoration of agricultural operations.
- Ensure supply and distribution of the critical inputs in the affected areas.
- Implementing the DMP and contingent measures.
- Facilitate settlement of Insurance claims pertaining to Crop Damage.
- Coordinate with revenue authorities for crop damage compensation.
- Take up rehabilitation measures through creating awareness and counseling.
- Media management to communicate effectively.
- Review of actions taken and mapping of Gaps in the implementation of DMP
- Reporting and documentation.

List of NGOs/INGOs/CBOs working in the field of the department

List of NGOs/ CBOs working in the field of Agriculture are available at the District level.

Control rooms district and state headquarters

	District	Contact Person	e-mail address	Contact no. of the Control Room
	Directorate	Chief Statistician	dafstat.dag@nic.in	0674 – 2323374 0674 – 2391327 (FAX)
1	Angul	Dy. Director of Agriculture	ddaangul.dag@nic.in	06764 – 230351
2	Balasore	-do -	ddabls.dag@nic.in	06782 – 262127
3	Bargarh	-do -	ddabargarh.dag@nic.in	06646 – 233354
4	Bhadrak	-do -	ddabdk.dag@nic.in	06784 – 250906
5	Bolangir	-do -	ddabolangir.dag@nic.in	06652 – 250195
6	Boudh	-do -	ddaboudh.dag@nic.in	06841 – 222004
7	Cuttack	-do -	ddactc.dag@nic.in	0671 – 2442264
8	Deogarh	-do -	ddadeogarh.dag@nic.in	06641 – 226252
9	Dhenkanal	-do -	ddadkl.dag@nic.in	06762 – 224662
10	Gajapati	-do -	ddagaja.dag@nic.in	06815 – 222243
11	Ganjam	-do -	ddabmp.dag@nic.in	0680 – 2290239
12	Jagatsingpur	-do -	ddajspur.dag@nic.in	06724 – 220061
13	Jajpur	-do -	ddajaj.dag@nic.in	06728 – 222056
14	Jharsuguda	-do -	ddajhar.dag@nic.in	06645 – 272408
15	Kalahandi	-do -	ddabhpatna.dag@nic.in	06670 – 230751
16	Kandhamal	-do -	ddakandhamal.dag@nic.in	06842 – 253773
17	Kendrapara	-do -	ddaken.dag@nic.in	06727 – 232212
18	Keonjhar	-do -	ddakeonjhar.dag@nic.in	06766 – 255596
19	Khurda	-do -	ddakhu.dag@nic.in	06755 – 220523
20	Koraput	-do -	ddakoraput.dag@nic.in	06854 – 251423
21	Malkangiri	-do -	ddamal.dag@nic.in	06861 – 230242
22	Mayurbhanj	-do -	ddabaripada.dag@nic.in	06792 – 252743
23	Nawarangpur	-do -	ddanaba.dag@nic.in	06858 – 222017
24	Nayagarh	-do -	ddanaya.dag@nic.in	06752 – 252332
25	Nuapada	-do -	ddanua.dag@nic.in	06678 – 211099
26	Puri	-do -	ddpuri.dag@nic.in	06752 – 223007
27	Rayagada	-do -	ddaraya.dag@nic.in	06856 – 222148
28	Sambalpur	-do -	ddasambalpur.dag@nic.in	0663 – 2402944
29	Sonepur	-do -	ddason.dag@nic.in	06654 – 220461
30	Sundargarh	-do -	ddasng.dag@nic.in	06622 – 273861

Horoticulture

State Level:

Designation	E-Mail	Telephone No.
Joint Director	supportdho.od@nic.in	0674-2556750 Fax: 0674-2551978

District Level:

Designation	E-Mail	Telephone No.
DDH Angul	ddhangul.od@nic.in	06764-236460
DDH Balasore	ddhbalasore.od@nic.in	06782-264153
DDH Bolangir	ddhbolangir.od@nic.in	06652-250521
DDH Cuttack	ddhcuttack.od@nic.in	0671-2342965
DDH Dhenkanal	ddhdhenkanal.od@nic.in	06762-224496
DDH Gajapati	ddhgajapati.od@nic.in	06815-222228
DDH Ganjam	ddhganjam.od@nic.in	0680-2292990
DDH Kalahandi	ddhkalahandi.od@nic.in	06670-230328
DDH Kandhamala	ddhkandhamal.od@nic.in	06842-253093
DDH Keonjhar	ddhkeonjhar.od@nic.in	06766-253498
DDH Koraput	ddhkoraput.od@nic.in	06852-250886
DDH Malkangiri	ddhmalkanagiri.od@nic.in	06861-230250
DDH Mayurbhanj	ddhmayurbhanj.od@nic.in	06792-252586
DDH Nawarangpur	ddhnawarangpur.od@nic.in	06858-222069
DDH Nayagarh	ddhnayagarh.od@nic.in	06753-252331
DDH Puri	ddhpuri.od@nic.in	06752-272235
DDH Rayagada	ddhrayagada.od@nic.in	06856-222185
DDH Sambalpur	ddhsambalpur.od@nic.in	0663-2401208
DDH Sundargarh	ddhsundargarh.od@nic.in	06622-273042
ADH Bargarh	adhbargarh.od@nic.in	06646-232647
ADH Bhadrak	adhbhadrak.od@nic.in	06784-250046
ADH Boudh	adhboudh.od@nic.in	06841-211277
ADH Deogarh	adhdeogarh.od@nic.in	06641-226437
ADH Jagatsinghpur	adhjagatsinghpur.od@nic.in	06724-220078
ADH Jajpur	adhjajpur.od@nic.in	06728-224742
ADH Jharsuguda	adhjharsuguda.od@nic.in	06645-272459
ADH Kendrapara	adhkendrapara.od@nic.in	06727-220371
ADH Khurda	adhkhurda1.od@nic.in	06755-220553
ADH Nuapada	adhnuapada.od@nic.in	06671-232264
ADH Sonapur	adhsonepur.od@nic.in	06654-221356

Annexure-VI

List of suppliers relevant for the department

- Odisha Agro Industries Corporation Ltd., Satyanagar, Bhubaneswar
- Odisha State Seeds Corporation Ltd., Samantarapur, Bhubaneswar-2
- National Seeds Corporation Ltd., 150, Industrial Estate, Mancheswar, Bhubaneswar.
- State Farms Corporation of India ltd.
- Bhubaneswar Regional Cooperative Marketing Society, Bhubaneswar
- Orissa Consumer Cooperative Marketing Federation, Bhubaneswar
- Registered Private Nurseries inside the state (172 nos)
- NAFED, Bhubaneswar

Annexure-VII

Damage Assessment Formats

Agriculture

Districts	No of Blocks	No of Vill./ UIBs	Crop						Value of the crop Damage
			Area affected (in hectares)					Total	
			0-10%	11-25%	26-50%	51-75%	> 75%		
State Total									

Horticulture

Sl. No.	District	Block	Village	GP	Name of the Farmer	Crop	Damaged Area (Area in Ha.)	% of Damage