

# Contingency Plan for Desert Locust Invasions, Outbreaks and Upsurges



**भारत सरकार**

**Government of India**

**कृषि एवं किसान कल्याण मंत्रालय**

**Ministry of Agriculture & Farmers Welfare**

**(कृषि, सहकारिता एवं किसान कल्याण विभाग)**

**(Department of Agriculture, Cooperation and Farmers Welfare)**

**वनस्पति संरक्षण, संगरोध एवं संग्रह निदेशालय,**

**Directorate of Plant Protection, Quarantine & Storage**

**एन.एच.४, फरीदाबाद/ NH-IV, Faridabad-121001**

# CONTENTS

<b>Endorsement.....</b>	<b>3</b>
<b>Review &amp; Amendment.....</b>	<b>4</b>
<b>Control &amp; Distribution of the contingency plan.....</b>	<b>5</b>
<b>1. Introduction and background .....</b>	<b>5</b>
1.1 Ministries and other agencies involved .....	5
1.2 Desert Locust threat and past history .....	5
1.3 Locust Biology .....	6
1.4 Correlation of locust biology with field operations.....	7
1.5 Preventive control strategy .....	7
1.6 Previous control campaigns.....	8
<b>2. Resources.....</b>	<b>9</b>
2.1 Available in the Locust Warning Organization.....	9
2.2 Pesticides used for Desert Locust control .....	10
2.3 Aircraft for locust control.....	11
2.4 Emergency fund .....	11
<b>3. Resource and team mobilization .....</b>	<b>11</b>
<b>4. Routine activities of Locust Warning Organisation.....</b>	<b>12</b>
<b>5. Advanced planning and preparedness.....</b>	<b>12</b>
5.1 Preparation of survey schedule.....	13
5.2 Updating of contingency plan .....	13
5.3 Testing of the contingency plan .....	14
<b>6. Actions taken before locust high alert or swarm incursion.....</b>	<b>14</b>
<b>7. Triggering of the plan .....</b>	<b>14</b>
<b>8. Implementation of contingency plan in case of outbreak, invasion or upsurge.....</b>	<b>15</b>
8.1 Outbreak .....	15
8.2 Invasion .....	15
8.3 Upsurge .....	15
8.4 Implementation and execution of locust control campaign.....	16
8.5 Daily activity during control operations.....	16
8.6 Role of additional stakeholders .....	17
<b>9. Mopping up and post-control operations.....</b>	<b>18</b>
Annex 1. Existing control potential of LWO/LCOs/FSIL .....	21
Annex 2. Additional control potential of LWO/LCOs/FSIL.....	20
Annex 3. Setup of Locust Warning Organisation (LWO).....	21
Annex 4. Administrative structure of locust control and research .....	22
Annex 5. List of officers of LWO/LCOs/FSIL to be contacted during locust threat.....	23
Annex 6. Definitions of technical terminology .....	25-27
Annex 7. Suppliers of camping equipment for hire .....	28
Annex 8. Suppliers of protective clothing.....	29
Annex 9. Details of Medical Toxicologist.....	30

### Endorsement

This contingency plan is prepared by the locust division of Directorate of Plant Protection, Quarantine & Storage (Dte of PPQ&S), Faridabad-121001 for undertaking locust emergency measures to ensure that the activities are performed in accordance with the guidelines and procedures laid down in this contingency plan. This contingency plan will render guidance to the locust field offices, state governments and other stake holders during locust incursion/upsurge. This contingency plan is duly approved for adoption on the....day of May, 2019.

  
(Rajesh Malik)

Plant Protection Adviser  
Dte. of Plant Protection, Quarantine & Storage,  
NH-IV, Faridabad-121001

## Review & Amendment

This contingency plan will be subject to review as may be decided by the Plant Protection Adviser. This contingency plan will be updated and revised if necessary and circulated to the stake holders. The holders of this should ensure that the current edition of this contingency plan is being used.

### Control & Distribution of the contingency plan

The master copy of this standard will be held with Plant Protection Adviser, Dte of Plant Protection Quarantine & Storage, Faridabad and controlled copy will be distributed by Joint Director (LCR) to all the stake holders. Any clarifications/enquiries regarding this contingency plan should be made to the Joint Director (LCR), Dte of PPQS, Faridabad-121001.

Controlled Copy Holder	Copy No.
Plant Protection Adviser, Dte of Plant Protection Quarantine & Storage, Faridabad	1
Joint Director(E/PP), Locust Control & Research, Dte of Plant Protection Quarantine & Storage, Faridabad	2
Deputy Director(E/PP), Locust Control & Research, Dte of Plant Protection Quarantine & Storage, Faridabad	3
Deputy Director (E/PP), Locust Warning Organisation, Jodhpur.	4
Locust Circle Office: Bhuj, Palanpur, Jalore, Barmer, Jaisalmer, Bikaner, Suaratgarh, Phalodi, Nagaur and Churu	5-14
Field Station on Investigation of Locust (FSIL) , Bikaner	15
Director of Agriculture, Govt. of Rajasthan, Jaipur	16
Director of Agriculture, Govt. of Gujarat, Gandhinagar	17
IG, Border Security Force (BSF): Jodhpur and Gandhi Nagar	18-19
DIG, BSF: Sri Ganganagar, Bikaner, Barmer and Gandhinagar	10-23
Joint Director of Agriculture, Govt. of Rajasthan: Jodhpur, Bikaner, Sriganganagar and Sikar.	24-27
Joint Director of Agriculture, Govt. of Gujarat: Mehsana and Rajkot	28-29
Deputy Director of Agriculture, Govt. of Rajasthan: Distt Jalore, Barmer, Jodhpur, Jaisalmer, Bikaner, Nagaur, Churu and Sriganganagar	30-37
Deputy Director of Agriculture, Govt. of Gujarat Distt. Kutch and Banaskantha	38-39
District Collector: Kutch and Banaskantha	40-41
District Collector: Barmer, Jaisalmer, Bikaner, Sriganganagar, Jodhpur, Jalore, Nagaur and Churu	42-49
Director, Central Arid Zone Research Institute (CAZRI), Jodhpur	50
Vice Chancellor, Agriculture University, Jodhpur and Bikaner	51-52
Mr. Keith CRESSMAN Senior Locust Forecasting Officer, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy	53

# **Contingency Planning for Desert Locust Outbreaks, Invasions and Upsurges**

## **Locust Warning Organization (LWO) – India**

### **1. Introduction and background**

This contingency plan is meant to guide LWO in responding to a Desert Locust emergency (outbreak, invasion and upsurge). It includes the assistance required from different stakeholders and their contribution and role, a calendar of activities, the type of strategy to be adopted, the formation of teams, available resources, short fall and ways and means of obtaining additional resources, and the deployment of resources and required actions.

#### **1.1 Ministries and other agencies involved**

Apart from Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare, other ministries such as Ministry of Home, Ministry of Defence, Ministry of External Affairs, Ministry of Civil Aviation, Ministry of Communication, State departments and other relevant stakeholders are to be involved for their role and responsibilities during the locust control/locust emergency. The role and responsibilities of these stakeholders has been defined in implementation part of the plan.

#### **1.2 Desert Locust threat and past history**

Historically, the Desert Locust has always been a major threat to man's well-being. The Desert Locust is mentioned as curse to mankind in ancient writings viz. Locust problems in Southwest Asia have a long history and probably began when crops were first cultivated. Several species of locust occur in the region but the Desert Locust (*Schistocerca gregaria*) is by far the most important. Locusts are mentioned in Sanskrit literature in particular in the epic poem Mahabharata where Karna includes locusts in a "poetically beautiful" speech when he encounters his rival Arjuna on the battlefield. The earliest known Sanskrit text dates to about 400 BCE but the poem is thought to have existed as early as 750 BCE. Equally ancient mention is made in the Iranian Zoroastrian Vendidad where the locust is one of the xrafstra or evil creations of Angra Mainya. Locusts are mentioned in the Al-Araf chapter 7 of the Koran. The magnitude of the damage and loss caused by the locusts is very gigantic beyond imagination as they have caused the starvation due to its being polyphagous feeder, and on an average small locust swarm eats as much food in one day as about 10 elephants, 25 camels or 2500 people. Locust do cause damage by devouring the leaves, flowers, fruits, seeds, bark and growing points and also by breaking down trees because of their weight when they settle down in masses.

It has been estimated that in India damage to crops caused by locusts was about Rupees 10 crore during 1926–31 plague cycle. During 1940–46 and 1949–55 locust plague cycles, the damage was estimated at Rs. 2.00 crore each and it was Rs. 50.00 lakhs during the last locust plague cycle (1959–62). Although no locust plague cycles have been observed after 1962, however, during 1978 and 1993, large scale upsurges were reported.

### 1.3 Locust Biology

The Desert Locust has three distinct stages: (i) egg, (ii) hopper and (iii) adult.

#### **Egg**

Eggs are laid in pods in moist sandy soil at a depth of about 10-15 cm at an interval of 7–10 days. Gregarious females usually lay 2-3 egg pods having an average of 60-80 eggs/pod. Solitarious females lay 3-4 times having 150-200 eggs in average. The rate of development of eggs depends on soil moisture and temperature, but in general it is about two weeks. No development takes place below 15°C. The incubation period is 10–12 days when the optimum temperature is between 32–35°C.

#### **Hopper**

After incubation is complete, the eggs hatch and wingless nymphs (hoppers) emerge. There are 5 instars in gregarious and 5-6 instars in solitarious hoppers. In each instar, there is a growth and change in characteristic coloration.

<b>Hopper</b>	<b>Appearance</b>
1st Instar	Newly hatched are white but turns black in 1-2 hours
2nd Instar	Head is larger and pale colour pattern is conspicuous.
3rd Instar	Two pairs of wing buds projects on each side of thorax
4th Instar	Colour is conspicuously black and yellow.
5th Instar	Colour is bright yellow with black pattern.

The rate of development of hoppers depends on temperature. It takes 22 days when the mean air temperature is hot say about 37°C and may be delayed up to 70 days when the mean temperature is below 22°C. In general, it takes about six weeks from hatching to fledging, or about one week per instar.

#### **Adult**

The 5th instar nymph molts into adult stage. This change is called 'fledging' and the young adult is called a 'fledgling' in which its wings are still soft and cannot fly. After a few days, the wings harden and sexual 'immature adult' is capable of flight. The immature adult stage is most injurious and capable of long distance travel. Under optimal conditions the adult may mature in 3 weeks and under cooler and drier conditions, it may take up to 8 months. In general, however, it usually takes about 4 weeks before an adult is ready to reproduce. If vegetation dries out, the adults will leave the area and fly with the wind (downwind) in search of green vegetation and favorable breeding conditions. Solitarious adults fly for only a few hours at night while gregarious adults (swarms) fly during daylight.

Young immature gregarious adults are pink in color but older ones become dark red or brown in cold condition. On maturation, gregarious adults become bright yellow. Males mature before females. Oviposition commences within two days of copulation.

## 1.4 Correlation of locust biology with field operations

The timing of field operations, both survey and control, must be correlated with the development rate and behavior of locusts.

Stage	Weeks	Comments
Egg (laying – hatching)	2	10-15 cm under the surface in sand
Hopper (hatching – fledging)	6	5-6 instars: one week/instar
Adult (fledging – egg laying)	4	Fledgling, immature, mature
<b>Total lifecycle</b>	<b>12</b>	

Gregarious adults (swarms) migrate in the direction of the wind (downwind) at the wind speed and can cover a maximum distance of up to about 150 km/day. The direction and speed of the wind determine the displacement of adults and swarms.

Before they can take off, a settled swarm must warm up in the early morning shortly after sunrise by basking in the sun. Swarms then fly throughout the day until just before sunset when they land and remain settled on the ground throughout the night.

Hoppers are active throughout the day and will not move more than about 500m or 1 km in a single day. They can be treated throughout the entire day; whereas, swarms can only be treated in the early morning before take-off or in the late afternoon once they have landed.

A control campaign mounted against hopper bands that resulted from local breeding is likely to last about 4–6 weeks, and a subsequent campaign against the adults may be required for a further 4 weeks. A control campaign against invading swarms is likely to be very short in duration because the adults will quickly mature and lay eggs. As it may not be possible to prevent egg-laying completely, a subsequent campaign will be required for controlling hopper bands.

## 1.5 Preventive control strategy

All countries affected by desert locust generally adopt a preventive control strategy for the management of desert locust in order to reduce the frequency, duration and intensity of plagues. This strategy consists of regular surveys to provide early warning and contingency planning to allow early and effective response before the situation becomes out of control.

LWO (comprising of all field units) undertakes regular surveys in the scheduled desert area of Rajasthan and Gujarat to monitor the presence of desert locust and ecological conditions. During the survey, an assessment is made to determine, if the locust numbers have crossed the economic threshold level (ETL) which is 10,000 adults/ha. and 5-6 hoppers/bush that may require control.



The constant watch and surveys are undertaken in desert areas with green vegetation (surface) and about two weeks after receiving the rain. These surveys are done regularly during the entire year, but most importantly from May to November when desert locust activity is considered at its peak due to congenial breeding conditions. This coincides with the monsoon season in Rajasthan and Gujarat. During this time, the frequency of surveys is doubled from May to November as compared to December to April. The surveys are undertaken from sunrise to mid-day and for a few hours in the evening before sunset in the temperature range of 20–38°C. Whenever and wherever the population of desert locust is found exceeding the economical threshold level, immediate control measures are pressed into operation. Control operations are not conducted when locust numbers are low, isolated and scattered because this would not be effective and it would be harmful to the environment. In addition to LWO, concerned state authorities should also be requested to keep constant watch over the development of locust activities and inform to the nearest Locust Circle office, if any development is seen and further action is required.

## 1.6 Previous control campaigns

India has witnessed several locust plagues and upsurges since 1812 to 1997. More recently, there have been several control campaigns that were conducted. Since December 2011, no locust upsurges have taken place.

Year	Period	Type of campaign	Area treated (ha)	Pesticides used (Kgs/Lit)	Pesticide
1993	July to October, 1993	Yellow/Pink desert locust hoppers & swarms (190 Nos) (Jaiasmer, Barmer, Jalore, Bhuj)	310482	688255 30934 47577 36860	BHC 10 % Dust Dieldrin 18% Malathion ULV Fenitrothion ULV
1997	July to October, 1997	Yellow/Pink desert locust hoppers & swarms (04 Nos) (Jaisalmer & Barmer)	23596	7974 3660	Fenitrothion ULV Malathion ULV
2002	July, 2002	Migratory locust population (Jodhpur)	42	42	Malathion 96% ULV
2005	September to December, 2005	Loose pink swarm and hoppers (Jodhpur, Bikaner, Jaisalmer)	16,640	10,476 1,883	Malathion 96% ULV Fenitrothion 96% ULV
2007	April to September, 2007	Loose pink/ yellow swarm and hoppers (Jodhpur, Bikaner, Jaisalmer)	536	536	Malathion 96% ULV
2010	October to November, 2010	Hoppers/ fledgling (Jaisalmer)	4,700	4,700	Malathion 96% ULV
2016	June, 2016	Migratory Locust, etc. (Leh area of J&K)	1205	1928	Chloropyriphos 20% EC
2016	November, 2016	Tree locust etc. (Jodhpur)	40	40	Malathion 96% ULV
2017	November, 2017	Tree locust etc. (Jodhpur)	40	40	Malathion 96% ULV



## 2. Resources:

### 2.1 Available in the Locust Warning Organization

Manpower	Current	Shortage
Officers	17	-
Trained Technical	37	-
Locust Information Officers	02	-
Assistants	31	-
Drivers	33	01

Note: There are a total of 22 (Roadworthy).

Transport	Recession	Outbreak	Upsurge
Survey vehicles	08	22*	22*
Control vehicles	15	30*	30*
Heavy vehicles for supply of pesticides and control equipment	-	05*	05*
Vehicles for transporting essential items (food, water, misc)	-	06*	06*
<b>total</b>	<b>23</b>	<b>63*</b>	<b>63*</b>
*in case of additional requirement, additional vehicles will be hired or mobilized from other Schemes/ Departments.			

Sprayers	Functioning	Under repair
Handheld (MicroUlva, Ulva+)	(69+27) 96	34
Vehicle-mounted (UlvaMast/ UlvaMast V3E)	(17+03) 20	23
Vehicle-mounted (Micronair AU8115)	12	01

**Note:** There are a potential of 17 vehicle-mounted sprayers available but suitable vehicles which are capable for fitting of these sprayers, would be needed.

Other equipment			
eLocust3	35		
Camping	Provision to hire when needed (see Annex 4)		
Protective	available		
Teams	Recession	Outbreak	Upsurge*
<b>Survey</b>			
Technical officer	1	1	1
Assistant	1	1	1
Driver	1	1	1
Vehicle	1	1	1
Number of teams (regular)	11	22	33*
Number of teams (special border)	5	10	15
Number of teams (special monitoring)	2	4	6
<b>Control</b>			
Technical officer	1	1	2
Assistant	1	1	2
Driver	1	1	1
Vehicle	1	1	1
Number of teams	11	22	33*
*In case of requirement, more number of teams will be mobilised from another scheme of the Directorate/ other Departments. Basic orientation training will be conducted by the Incharge of locust field units before utilising them in undertaking survey and /or control programme.			

Based on the available technical manpower, control equipments and vehicles, The existing control potential comprising of LWO,LCOs and FSIL is approximately 3115 ha per day, 21805 ha per week and 93450 ha per month (**Annexure-1**). In addition to this, additional control potential 2265 ha per day can be increased subject to providing the additional technical manpower, vehicles etc. as indicated in **Annexure -1A**.

### Map of Schedule Desert Area (SDA)



## 2.2 Pesticides use for Desert Locust control

Malathion 96% ULV is used in Desert Locust control in India. A buffer of minimum 5000 liters of Malathion 96% ULV will be maintain at specific LCOs from where pesticide can be mobilised for immediate requirement. In 2014, an agreement had been signed with **Hindustan Insecticides Limited (HIL)** with the provision that the company will supply the required quantity of pesticide. M/s HIL will keep ready stock of 8000 litres Malathion 96% technical reserve and on receiving demand from the Directorate of PPQ&S, will supply the desired quantity of Malathion 96% ULV formulation to the Locust Circle Offices within 7-10 days of the supply order. However, in case of requirement of larger quantity of Malathion 96% ULV, HIL needs 25-30 days to supply the pesticide.

## **2.3 Aircraft for locust control**

Government of India does not possess its own aircraft for locust control operations. At present no aviation agency is available in India for controlling desert locust. However, efforts will be made through the concerned Ministries for supply of aircrafts with spraying kits for desert locust control purpose. When aerial control operations are required, Joint Secretary (Plant Protection), Government of India is authority for execution of contingency plan on the recommendation of Plant Protection Adviser, Directorate PPQ& S. Faridabad

## **2.4 Emergency fund**

Provision of fund for plan expenditure is always kept in the annual budget of Locust Scheme in which the amount varies from year to year based on requirements as assessed by various field units, Headquarters, Faridabad and DAC&FW. However, at the time of locust emergency, the funds can be diverted immediately from other schemes of the Department of Agriculture Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare to meet the exigencies. These emergency funds are released once an emergency has been declared by Plant Protection Adviser in consultation with FAO Desert Locust Information Service (DLIS) in Rome.

## **3. Resource and team mobilization**

All the 11 Locust Circle Offices are self-sufficient, in normal locust situation, in term of manpower, vehicles, control equipments, and personal protective equipments. Each Circle Office has control potential for treating about 300 hectare areas per day. In case of emergency, pesticide from storage site can be mobilized to the control sites within 6–10 hours. It is the responsibility of the LWO to submit requirement of additional funds, pesticides, additional man power with sufficient justifications and well in advance to cater such needs. Procurements of consumable/ non consumable stores including protective clothing required during locust control operations as per provisions of GFR-2017 and other rules applicable.

The following teams are constituted to organize control operations.

- i. Survey Team
- ii. Control Team
  - a) Micro Ulva/ Alwa Plus Team
  - b) Ulva Mast/ Ulva Mast V3E Team
  - c) Micronair AU 8115 Team
  - d) Aerial spraying Team (if required)
- iii. Supply Team
- iv. Maintenance Team

The airstrips have been identified at Barmer and Jaisalmer, in Rajasthan and Bhuj in Gujarat to be used for aerial operations and reconnaissance during locust emergency, if required.

The total requirement of heavy and light vehicles is assessed based on severity of locust infestation and invasion. The Government of Rajasthan, Gujarat and other schemes of the Directorate of Plant Protection, Quarantine & Storage will be requested to provide required numbers of 4WD vehicles along with drivers to LWO to be used for carrying pesticide, equipments, undertake control measures and for use to supplement surveys and other logistics support, especially during upsurges.

Each of the 11 Circle Offices are equipped with wireless sets for quick transmission of information pertaining to locust operations and logistics within locust field units and to the Field HQ Jodhpur. Detail of organizational setup is given at **Annex 2 &3**. Every circle office is provided with computers with email facility to transmit any locust survey and control data to LWO field HQ Jodhpur and Central HQ Faridabad through Internet. All survey and control results and field observations are transmitted in real time via satellite to field HQ Jodhpur and Central HQ Faridabad and to FAO DLIS using eLocust3. In case additional survey and control teams will be mobilized to the field locations, an equal number of eLocust3 units will be arranged temporarily from FAO DLIS within shortest duration. The contact detail of various field officers who can be contacted during locust emergency is given at **Annex 4**.

#### **4. Routine activities of Locust Warning Organisation**

- a. Keep constant vigil through field surveys to prevent crop losses due to locust attack in approximately 2 lakh sq. km. Scheduled Desert Area (SDA) in the States of Rajasthan and Gujarat
- b. Indo-Pak Border meetings for exchange of current locust situation between the two countries for effective monitoring the situation and ensure preparedness to tackle the emerging locust threat, if any.
- c. Advise state functionaries, BSF posts/Defence posts, Panchayat Raj Institutions to inform the nearest LWO office if any locust activity is observed in their areas for needful action.
- d. Avoid upsurge of locust population in SDA and entry of locust swarms into India through prompt control operations in bordering areas.
- e. Train the farmers, State functionaries, locust staff and other stake holders on latest locust monitoring and control technologies.
- f. Issuance of Desert Locust Situation Bulletin at fortnightly intervals to inform all concerned stakeholders about prevailing locust situation in India.
- g. Conduct research at Field Station for Investigation on Locust (FSIL) at Bikaner on bio-efficacy of pesticides and bio-pesticides for locust control.

#### **5. Advanced planning and preparedness**

Available resources have already been explained above. However, advanced planning is required as follows:

- a. State Governments of Rajasthan, Gujarat, Haryana and Punjab are kept informed about the probable locust threat well in time. They are advised to keep their field functionaries in readiness to cope up with the situation
- b. Training programme for State field functionaries, BSF/Defence and LWO staff in the SDA.
- c. Contingency plan to be updated regularly.
- d. Meeting with relevant authorities along with LWO are held for planning the survey and control strategy as and when required.
- e. Permission for holding monthly meetings between the locust officers of India and Pakistan (June–November) to be obtained from the competent authority.
- f. Procurement of pesticides to maintain buffer stock.
- g. Conducting Cholinesterase test for the staff engaged in locust control work to see any adverse effects of pesticides.
- h. Locust Unit at Directorate's Headquarters, Faridabad in consultation with Locust Warning Organization, Jodhpur monitor the global ecological conditions and locust situation along the Red Sea coast and winter/ summer breeding areas of Southwest Asia region (Pakistan, Iran and Afghanistan) which can cause possible threat to India. National Locust situation is also monitored and reviewed periodically.
- i. Provision of funds to be kept for dealing locust emergency as per the situation.

## **5.1 Preparation of survey schedule**

- a. An annual meeting of officers and officials of Locust Warning Organization (LWO) is held usually in April or May wherein the locust survey schedule and contingency plan is discussed and finalized to combat the impending locust threat by undertaking the survey and surveillance work in Schedule Desert Area of Rajasthan and Gujarat.
- b. The surveys are also conducted in the entire border/ coastal areas along with Indo-Pak border in the States of Gujarat and Rajasthan for timely detection of any locust incursion near bordering areas.

## **5.2 Updating of contingency plan**

- a. The contingency plan is updated to ascertain the requirement and availability of the resources required for locust control e.g. emergency fund, pesticides, communication equipment, vehicles, trained manpower, survey, control equipment, protective clothing, first-aid kits, aircraft etc.
- b. Review of available resources within LWO is done prior to active locust season so that nothing could remain unnoticed for effective control campaign in case of locust threat. The contingency plan is updated based on the resources and locust threat perception obtained through field surveys and FAO forewarning.
- c. If any shortcoming is observed during updating of the contingency plan, higher authorities are made aware of the matter and immediate steps are taken to resolve the same. The updating is done by a team consisting of Officer In charge, LWO Jodhpur/ In-charges of Circle Offices at field level and submit to Joint Director (E) and Plant Protection Adviser at

Directorate H.Q. Faridabad to review the same. Final and updated plan will be approved and implemented by the Plant Protection Advisor.

### **5.3 Testing of the contingency plan**

Mock drill exercise in full scale is to be organized in the beginning of the summer breeding seasons i.e. in the months of May/June every year to test the practically ground implementation of the contingency plan and to plug the gaps, if any. The said mock drills will be organized by LWO, Jodhpur in consultation with Plant Protection Adviser, Directorate of PPQ&S every year.

## **6. Actions taken before locust high alert or swarm incursion**

- a. All the plant protection equipments are checked for their working conditions and ensure timely maintenance, if required.
- b. All the survey and control vehicles are tested for working condition and needful maintenance is done.
- c. Refresher training to the locust staff is organized.
- d. Mock drills to be organized before commencement of the locust season to ensure the capability of all infrastructures required at the time of Desert locust control operation.
- e. In-charges of LWO, Jodhpur and other field functionaries will intensify the Desert Locust surveys in threat prone areas to detect any locust swarm invasion.
- f. Regular liaison with FAO through e-mail or telephone.
- g. Control rooms are established at LWO Offices and Locust Circle Offices at district level.
- h. Sensitization to the Senior Officers of DAC&FW & State authorities for timely deployment of resources in to the locust threat prone areas.
- i. Interaction with the state agriculture authorities including Director of Agriculture and District Collectors of locust threat prone districts for arranging immediate assistance and cooperation to deal with locust emergency.
- j. Meetings with District Collectors are organized by LWO/LCOs to discuss the prevailing locust situation and steps taken to control the locust infestation.
- k. Public awareness is created through electronic and print media.
- l. District and Village level committees are formed in consultation with the District collectors and Joint Directors Agriculture, State Department of Agriculture of respective States to monitor progress of the locust control programme.

## **7. Triggering of the plan**

The Officer-in-charge, LWO, Jodhpur is fully responsible for triggering the plan in case of locust invasion, outbreak and upsurge after getting the administrative approval and financial sanction from the competent authority of the Directorate of Plant Protection, Quarantine & Storage, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Government of India. The plan is triggered based on the information of the current locust

situation and expected developments as indicated by the results of national surveys and assessment by the LWO Desert Locust Information Officers, duly supplemented and confirmed by FAO.

Execution of contingency plan will start after thorough consideration of locust situation and getting feedback from the surveying teams and desert locust information officer. The plan will be executed within 24-48 hours of its trigger.

## **8. Implementation of contingency plan in case of outbreak, invasion or upsurge**

### **8.1 Outbreak**

- i. An outbreak campaign against locally-bred hopper groups and hopper/ adult are likely to occur between June to October depending upon local ecological conditions.
- ii. The LWO comprising of eleven Locust Circle Office are having manpower, vehicles, control equipments, and personal protective equipment. Each Circle has control potential for treating about 300 ha/day. In case of emergency, pesticide from the storage sites can be mobilized within 6–10 hours and technical manpower from other schemes can be mobilized for undertaking control operations. For additional requirements proposal will be submitted by the locust field units (LCOs) to the LWO, Jodhpur on priority.
- iii. During locust threat LWO should maintain a buffer stock of 5000 liters of Malathion 96% ULV. Additional quantity 8000 litres, if required may be obtained from **M/S Hindustan Pesticides Ltd. (HIL)** within a week as per contract between the firm and the Govt. of India, Ministry of Agriculture & Farmers Welfare. For more quantity HIL may require advance intimation of 25-30 days. Therefore, the same should keep in mind prior considering the supply of pesticides.

### **8.2 Invasion**

- i. India is most at risk of a swarm invasion just before the onset of the seasonal monsoon in Rajasthan and Gujarat, in other words, during May and July swarms originating in the Arabian Peninsula and Horn of Africa will reflect in the warning to be received from FAO-DLIS.
- ii. In case of a swarm invasion, LWO should follow the relevant contingency plan.

### **8.3 Upsurge**

- i. In case of locust upsurge, extra staff and vehicles from other divisions of Directorate of PPQ&S and from State Govt. will be deployed to meet the exigencies. The said practice has already been applied in past operations. Staff to be seconded should be trained in locust control operations from time to time. Remaining untrained staff may be given short training on survey and control operations before deploying them to the fields.
- ii. Ministry of Agriculture & Farmers Welfare, Department of Agriculture, and Cooperation & Farmers Welfare will make fund requirements to deal the locust upsurge.



## 8.4 Implementation and execution of locust control campaign

If any indication of locust threat is received, an alert is to be issued to the State Agriculture/Horticulture authorities of Rajasthan, Gujarat, Haryana and Punjab. Other relevant Ministries like Ministry of Home Affairs, Defence, Science and Technology, Civil Aviation, Communication, Pesticides Manufacturing Firms and Aircraft Companies etc. also to be requested for providing needful assistance during a locust emergency, if required. Different steps involved are as under:

- i) Locust reporting – reporting of swarm movement or their settling spot etc.
- ii) Conduction of surveys to confirm the presence of Locust swarm / hopper bands.
- iii) Chasing of locust swarm to ascertain the swarm settling site.
- iv) Deployment of control teams for controlling the settled swarm.
- v) Mopping up operation.
- vi) Recording of the control data in e-Locust3.
- vii) Evaluation of control operation/ mortality in the afternoon.
- viii) Planning for locust control and survey work for next day.
- ix) Winding up of control operation.

For better understanding the various terminologies related to locust and its control operations are given at **Annex 5**.

## 8.5 Daily activity during control operations

The following types of activities are performed daily during control operations:

- i) Report of swarm movement/ / hopper bands/ settled swarm.
- ii) Earmarking of infested area/ site on map.
- iii) Deployment of control teams.
- iv) Positioning of control teams/ pesticides/ POL at control sites.
- v) Issue of pesticides, control equipment, protective clothing, POL and other store items required for control operation.
- vi) Reporting/ receiving of control data from field.
- vii) Compilation of field data like area treated and mortality achieved.
- viii) Compilation of control data, pesticides consumption and review of remaining stock position and additional requirement in respect of vehicles/ pesticides/ POL.
- ix) Preparation of daily locust situation report and appraising the locust situation to the competent authorities of State Government and Central Government as well as FAO
- x) Daily review of progress of campaign and planning for next day operation.

The item wise financial requirement for the activities like expenditure on pesticides purchase, POL, labour charges, daily paid workers, stationary, general store, motor parts, TA and DA, protective clothing, hiring of vehicles and job works etc. are assessed in advance and the provision is made as an emergency fund to combat the locust threat in advance. The detail of

suppliers for camping equipments is given at **Annex 6** and suppliers of protective clothing at **Annex 7**.

## **8.6 Role of additional stakeholders**

### Ministry of Home Affairs

To advise BSF authorities to extend help and to provide facilities in border surveys, arranging Indo-Pak border meetings and extend help in reporting of locust population/swarm through BSF staff.

### Ministry of Defence

To provide wireless sets (High Frequency and Very High Frequency), trained manpower during locust emergency. Also to coordinate during locust survey in prohibited areas of Defence establishments.

### Ministry of Earth Sciences

India Meteorological Department to provide relevant meteorological data.

### Ministry of Civil Aviation

To grant permission from Air Traffic Control (ATC) for flying aircraft during locust control operations.

### Ministry of Communication

To renew the wireless telegraph license granted to operate the wireless communication network of Locust Warning Organization.

### Ministry of Information and Broadcasting

To collaborate with Locust Warning Organization concerning media and news coverage of the locust emergency. The designated and appropriate spokespersons from LWO will do the needful.

### Departments of State Governments

The State Government Departments will be reporting the following:

- a. To report locust information to LWO/LCOs.
- b. To provide assistance in the form of vehicles, pesticides and manpower during locust control campaign.
- c. To conduct survey, surveillance and control of locust in cropped areas.

- d. To create awareness among public and farmers about locust.
- e. To provide facilities to LWO staff during locust survey and control campaign.
- f. Create pre treatment awareness in the bird sanctuaries to avoid any harmful effect of pesticides.
- g. Create post treatment awareness in the treated areas to the concerned Departments, villagers, Nomads etc not to allow grazing of cattles, birds or other public activities till the harmful effect of pesticide is not evaded.

#### State Department of Health

- a. To administer baseline ChE tests of pesticide spray operators at the beginning of the campaign
- b. To follow during the campaign, the health of these operators and administer final ChE test.

#### Role of Medical Toxicologist, Directorate of PPQ&S

Co-ordinate with the State Departments for ChE tests, awareness on Do's and Don't of pre-treatment and post treatment control operations to avoid health risk for human etc. Details of Toxicologist are given at **Annexure-9**.

#### Aircraft companies

To provide aircrafts/helicopters on hire basis for locust control work.

#### Pesticide manufacturing firms

To arrange supply of required quantity of pesticides on short notice during locust emergency.

### **9. Mopping up and post-control operations**

- a. Control teams on return to their HQ deposit the leftover pesticides and non-consumable store items to In-Charge of the locust office.
- b. In-Charges of control operations are to ensure that all the control equipments are properly cleaned before relieving the control team officials for their respective headquarters.
- c. In-Charges of control teams have to prepare a consolidated report on operations conducted and submit the same to Field HQ. for further action.
- d. In-Charges of control teams have to ensure that all the bills pertaining to locust control operations must be properly docketed, verified and passed.
- e. A meeting should be organized with all persons involved in the control campaign to identify and discuss any shortcomings and difficulties.
- f. The contingency plan should be updated to address the shortcomings to avoid reoccurrences in future campaigns.

## Annexure-1

### Existing Control Potential of LWO/LCOs/FSIL

Name of Station	Micronair (Vehicle Mounted Sprayer)		Ulva Mast / Ulva Mast V3E (Vehicle Mounted Sprayer)		Ulva Plus/Micro Ulva (Hand operated Sprayer)		Total area coverage		
	No. of teams	Area Covered per day In hectare	No. of teams	Area Covered per day in hectare	No. of teams	Area Covered per day in hectare	Per day	Per Week	Per month
LWO, Jodhpur	1	200	1	125	2	10	335	2345	10050
LCO, Bikaner	1	200	0	0	0	0	200	1400	6000
LCO, Barmer	1	200	0	0	0	0	200	1400	6000
LCO, Jaisalmer	1	200	1	125	1	5	330	2310	9900
LCO, Suratgarh	1	200	0	0	0	0	200	1400	6000
LCO, Churu	1	200	0	0	0	0	200	1400	6000
LCO, Nagaur	1	200	1	125	1	5	330	2310	9900
LCO, Phalodi	1	200	1	125	1	5	330	2310	9900
LCO, Jalore	1	200	1	125	1	5	330	2310	9900
LCO, Palanpur	1	200	1	125	1	5	330	2310	9900
LCO, Bhuj	1	200	0	0	0	0	200	1400	6000
FSIL Bikaner	0	0	1	125	1	5	130	910	3900
<b>Total</b>	<b>11</b>	<b>2200</b>	<b>7</b>	<b>875</b>	<b>8</b>	<b>40</b>	<b>3115</b>	<b>21805</b>	<b>93450</b>

## Additional Control Potential\* of LWO/LCOs/FSIL

Name of Station	Micronair (Vehicle Mounted Sprayer)		Ulva Mast / Ulva Mast V3E (Vehicle Mounted Sprayer)		Ulva Plus/Micro Ulva (Hand operated Sprayer)		Total area coverage		
	No. of teams	Area Covered per day In hectare	No. of teams	Area Covered per day in hectare	No. of teams	Area Covered per day in hectare	Per day	Per Week	Per month
LWO, Jodhpur	0	0	1	125	8	40	165	1155	4950
LCO, Bikaner	0	0	2	250	10	50	300	2100	9000
LCO, Barmer	0	0	2	250	10	50	300	2100	9000
LCO, Jaisalmer	1	200	2	250	10	50	500	3500	15000
LCO, Suratgarh	0	0	1	125	8	40	165	1155	4950
LCO, Churu	0	0	0	0	2	10	10	70	300
LCO, Nagaur	0	0	1	125	6	30	155	1085	4650
LCO, Phalodi	0	0	1	125	10	50	175	1225	5250
LCO, Jalore	0	0	1	125	8	40	165	1155	4950
LCO, Palanpur	0	0	0	125	4	20	145	1015	4350
LCO, Bhuj	0	0	1	0	8	40	40	280	1200
FSIL Bikaner	0	0	1	125	4	20	145	1015	4350
<b>Total</b>	<b>1</b>	<b>200</b>	<b>13</b>	<b>1625</b>	<b>88</b>	<b>440</b>	<b>2265</b>	<b>15855</b>	<b>67950</b>

**\*Subject to deployment of additional man power/ vehicle.**

Requirement of additional officers for supervising survey, control and logistic support=22 Nos

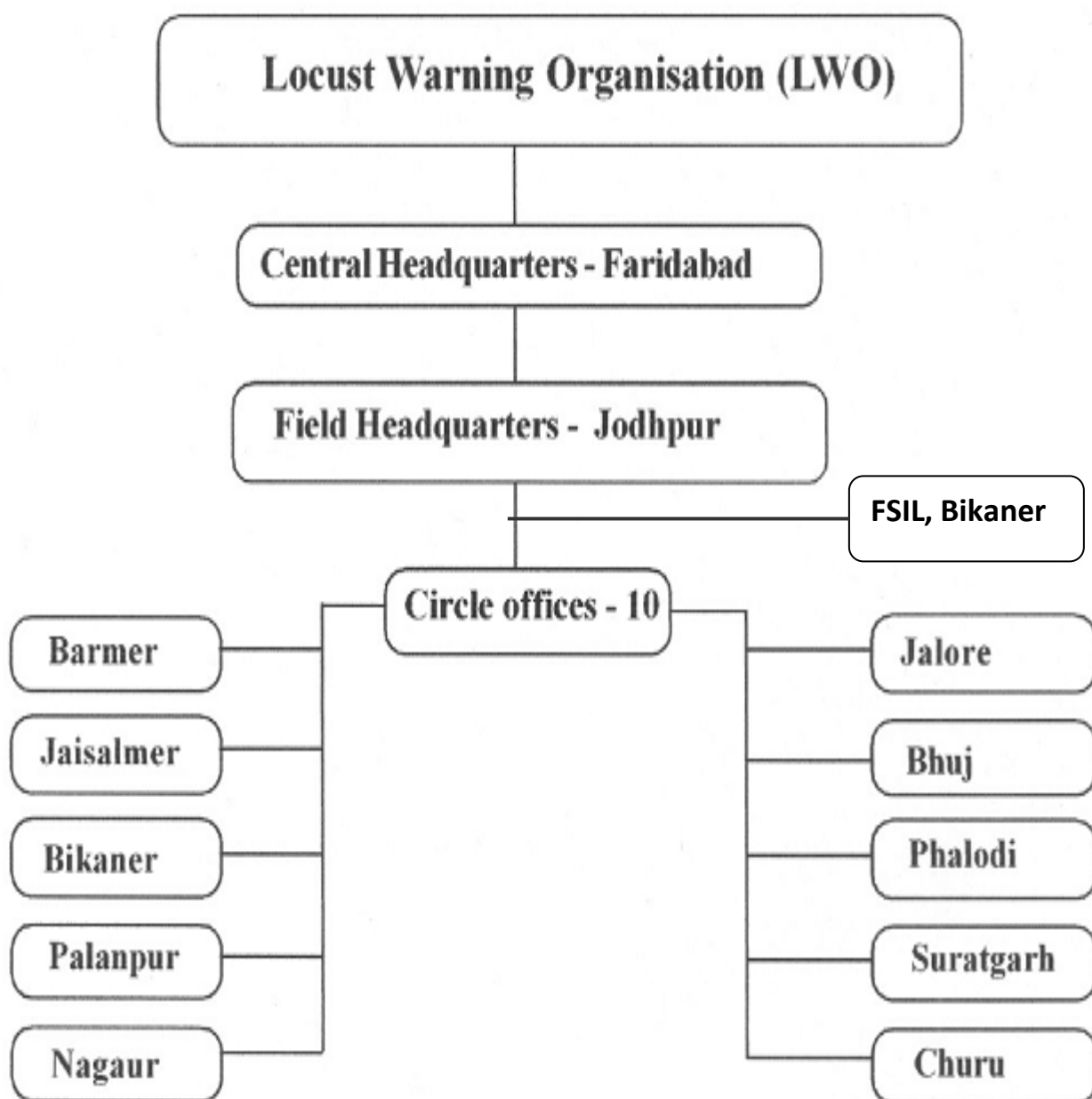
Requirement of additional technical staff (APPO/SA/TA) = 100 Nos

Requirement of additional Control Vehicles (Bolero camper vehicle /Utility) = 17

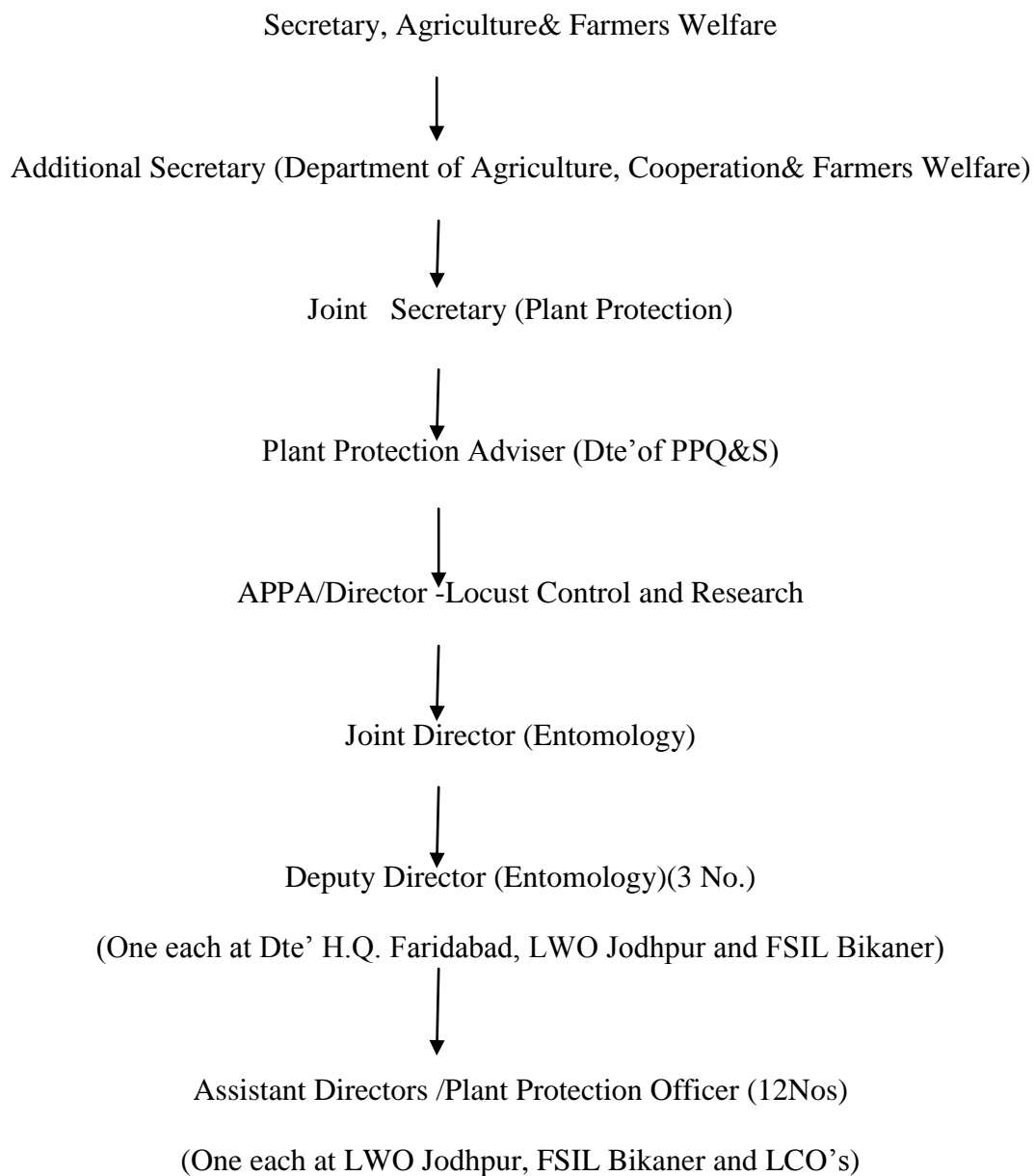
Requirement of additional Vehicles to carry ULVA plus teams = 22 Nos (4 teams in each vehicle)

Requirement of additional Vehicles for other logistic support=15 Nos

### Annex- 3. Setup of Locust Warning Organisation (LWO)



#### **Annex 4. Administrative structure of locust control and research**





**List of officers of LWO/LCOs/FSIL to be contacted during locust threat**

<b>S.No.</b>	<b>Name of Officer</b>	<b>Designation</b>	<b>Station &amp; email</b>	<b>Mobile</b>
1.	Dr. J. P. Singh	Joint Director (Ento.)	Head, Locust Division, Dte. of PPQ&S, Faridabad	9818836622
2.	Dr. K. L. Gurjar	Dy. Director (PP)	Locust Division, Dte. of PPQ&S, Faridabad	9930419798
3.	Dr. S. Sundamoorthy	AD(PP)	FSIL, Bikaner lwo-bik-rj@nic.in	8124531485
4.	Shri Debasis Roy	AD(WS)	FSIL, Bikaner lwo-bik-rj@nic.in	7872243090
5.	Shri Mahesh Chandra	AD (PP)	LCO, Barmer lwcrg08@nic.in	9461965383
6.	Shri Balram Meena	AD (PP)	LCO, Jalore lcojalore@gmail.com	6377379158
7.	Shri Om Prakash	PPO(E)	LWO, Jodhpur lwo-jod-rj@nic.in	9521276370
8.	Shri Gokul Ram	PPO(E)	LWO, Jodhpur lwo-jod-rj@nic.in	7888394528
9.	Shri Dhanne Singh Pooniya	PPO(E)	LCO, Bikaner lwcrg09@nic.in	8826052003
10.	Shri Brijesh Kumar	PPO(E)	LCO, Churu lco-chu-rj@gov.in	9811712909
11.	Shri N.K.Meena	PPO(E)	LCO, Suratgarh lco.sog.dppqs@gov.in	9867500517
12.	Shri Pawan Kumar	PPO(WS)	LCO, Phalodi lcodppqs-jod-rj@gov.in	7888468443
13.	Shri K.L.Meena	PPO(WS)	LCO, Palanpur lwcrg09@nic.in	7738338456
14.	Dr. Rajesh Kumar	PPO(E)	LCO, Jaisalmer lwcrg04@nic.in	9971221539
15.	Shri K.V.Choudary	PPO(E)	LCO, Barmer lwcrg08@nic.in	9866426515
16.	Shri V. Shivgnanum	PPO(E)	LCO, Barmer lwcrg08@nic.in	7025114293
17.	Shri A.M.Baraiya	PPO(E)	LCO, Bhuj appolocust.bhuj-agri@gov.in	9898922950
18.	Shri Padam Singh	PPO(E)	FSIL, Bikaner lwo-bik-rj@nic.in	7691071073
19.	Shri S.C.Sharma	PPO(WS)	FSIL, Bikaner lwo-bik-rj@nic.in	8383004406

## Annex 6. Definitions of technical terminology

Locust is generally found in two phases:

- i) **Solitary:** When it is inactive and individual locust live scattered.
- ii) **Gregarious:** When it is very active, the individuals tend to remain together, breed rapidly and form swarms which leave the breeding grounds and invade far distant tracts and even cross many countries. In addition to difference in behaviour, the two phases can generally be distinguished by colour and some anatomical and morphological features. The two phases run into each other, as there are some individuals which are intermediate in habits and physique and are therefore considered to be in *transient* phase. Other terms generally used in locust are as under:

### ISOLATED (FEW)

- i) Very few present and no mutual reaction occurring.
- ii) 0-1 adult/400 m foot transect (or less than 25/ha.).

### SCATTERED (SOME, LOW NUMBERS)

- i) enough present for mutual reaction to be possible but no ground or basking groups seen:
- ii) 1-20 adults/400 m foot transect (or 25-500/ha).

### GROUP

- i) Forming ground and basking groups;
- ii) 20+ adults/400 m foot transect (or 500+/ha).

### ADULT SWARM AND HOPPER BAND SIZES

**VERY SMALL:** swarm: less than 1km<sup>2</sup> \* band: 1 – 25 m<sup>2</sup>

**SMALL:** swarm: 1 – 10 km<sup>2</sup> \* band: 25 – 2,500 m<sup>2</sup>

**MEDIUM:** swarm: 10 – 100 km<sup>2</sup> \* band: 2,500 m<sup>2</sup>-10 ha

**LARGE:** swarm: 100 – 500 km<sup>2</sup> \* band: 10 – 50 ha

**VERY LARGE:** swarm: 500+ km<sup>2</sup> \* band: 50+ ha

### RAINFALL:

**LIGHT:** 1 – 20 mm of rainfall.

**MODERATE :** 21 – 50 mm of rainfall.

**HEAVY:** more than 50 mm of rainfall.

## **OTHER REPORTING TERMS**

**BREEDING:** the process of reproduction from copulation to fledging.

**SUMMER RAINS AND BREEDING:** July – September/October

**WINTER RAINS AND BREEDING:** October – January/February

**SPRING RAINS AND BREEDING:** February – June/July

**DECLINE:** A period characterized by breeding failure and/or successful control leading to the dissociation of swarming populations and the onset of recessions: can be regional or major.

**OUTBREAK:** A marked increase in locust numbers due to concentration, multiplication and gregarisation which, unless checked, can lead to the formation of hopper bands and swarms.

**UPSURGE:** A period following a recessions marked initially by a very large increase in locust numbers and contemporaneous outbreaks followed by the production of two or more successive seasons of transient-to-gregarious breeding in complimentary seasonal breeding areas in the same or neighboring Desert Locust regions.

**PLAGUE:** A period of one or more years of widespread and heavy infestations, the majority of which occur as band or swarms. A major plague exists when two or more regions are affected simultaneously.

**RECESSION:** Period without widespread and heavy infestations by swarms.

**REMISSION:** Period of deep recession marked by the complete absence of gregarious populations.

### **WARNING LEVELS:**

#### **GREEN**

**Calm:** No threat to crops. Maintain regular surveys and monitoring.

#### **YELLOW**

**Caution:** Potential threat to crops. Increased vigilance is required: control operations may be needed.

#### **ORANGE**

**Threat:** Threat to crops. Survey and control operations must be undertaken.

#### **RED**

**Danger:** Significant threat to crops. Intensive survey and control operations must be undertaken.

## LOCUSTS REPORTED IN INDIA

Desert locust

(*Schistocerca gregaria*)



Migratory locust

(*Locusta migratoria*)



Bombay Locust

(*Nomadacris succincta*)



Tree locust

(*Anacridium sp.*)



### **Annex 7. Suppliers of camping equipment for hire**

<b>Name</b>	<b>Address</b>	
Kheraj Tents	Chain Pura jodhpur	8079455808
Handmade Tents	Ajit Colony jodhpur	8079450040
Jain Traders	Poata, jodhpur	8079451756
Village safari Tents	Jalamand jodhpur	8048561375
Anandram Bhubana Industries	Poata jodhpur	8041949318
Spider India	Housing board jodhpur	8042901415
Avtar Arts	Chopsani jodhpur	8043053241
Jodhpur tenyts	Umaid heritage jodhpur	8875310000
Jai Mata Kalika Tents Udhyog	Jalamand jodhpur	8079469257
Sri Govindam desert camp	Banar road jodhpur	8042904335
Handmade tents	Ajit colony jodhpur	022511700
Mahendra tent factory	Ratanada jodhpur	8046064733
Prajapathi Enginnering works	Jalamand jodhpur	9782388035

### **Annex 8. Suppliers of protective clothing**

Please note following firms where the protective clothing are available (If not available on GEM)

<b>Name</b>	<b>Address</b>	<b>Phone/Mobile No</b>
Mohnish Traders	Plot No. B-9, Industrial estate, New power house, Jodhpur	0291-2634011 0291-2613488
Fire Refill	Jodhpur	9928649210

## **Annex 9**

### **Details of Medical Toxicologist**

<b>Name &amp; Designation</b>	<b>Address</b>	<b>Contact</b>
Joint Director (Toxicology)	CIB&RC, Dte of PPQ&S, Faridabad	0129-2413002  cibsecy@nic.in