

# Contingency Plan for Desert Locust Outbreaks, Invasions and Upsurges



2023



**भारत सरकार**

Government of India

**कृषि एवं किसान कल्याण मंत्रालय**

Ministry of Agriculture & Farmers Welfare

**(कृषि एवं किसान कल्याण विभाग)**

(Department of Agriculture and Farmers Welfare)

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## **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 guidelines to the locust field offices, State Governments and other stake holders during locust incursion/upsurge. This contingency plan is duly approved for adoption in December, 2023.

Date: 11.12.2023



**(Dr. J. P Singh)**  
Plant Protection Adviser

# **Contingency Plan for Desert Locust Outbreaks, Invasions and Upsurges Locust Warning Organization (LWO) – India**

## **1. Introduction and back ground**

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, formation of teams, available resources, short fall and ways and means of obtaining additional resources and deployment of resources and required actions.

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

Apart from Ministry of Agriculture and Farmers Welfare, Department of Agriculture and Farmers Welfare, other ministries such as Ministry of Home Affairs, 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 Mainyu. 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 poly phagous 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 were observed after 1962 but large scale upsurges were reported during 1978, 1993, 2019 and 2020.

### 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 in stars in solitarious hoppers. In each in star, there is a growth and change in characteristic coloration.

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

## **Adult**

The 5<sup>th</sup> 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 sexually '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.

<b>Stage</b>	<b>Weeks</b>	<b>Comments</b>
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 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 have adopted 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 (SDA) of Rajasthan and Gujarat to monitor the presence of desert locust and ecological conditions. During the survey, an assessment is made to determine if locust numbers have crossed the so-called economic threshold level (ETL) in which there are more than 10,000 adults/km<sup>2</sup> and 5-6 hoppers/bush that may require control.

The constant watch and surveys are undertaken in sandy areas with green vegetation and about two weeks after rain has fallen. 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 midday 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 efficient and it would be harmful to the environment. In addition to LWO, concerned state authorities are requested to keep constant watch over the development of locust activities and inform to the nearest Locust Circle Office if any development is seen for further action if required.

## 1.6 Previous control campaigns

India witnessed several locust plagues and upsurges since 1812 to 2020. Several control campaigns were conducted and recent upsurge and control campaign conducted was during 2022-2023.

Year	Period	Type and stage of locust	Area treated (ha)	Quantity of Pesticides used (l)	Name of the Pesticide
2002-03	02.07.2002-07.07.2002	Loose swarms of desert/ Migratory locust population	42	42	Malathion 96% ULV
2005-06	09.05.2005-05.12.2005	Loose pink swarm and hoppers	16,640	10,476 1,883	Malathion 96% ULV Fenitrothion 96% ULV
2007-08	24.04.2007-30.09.2007	Loose pink/ yellow swarm and hoppers	536	536	Malathion 96% ULV
2010-11	04.10.2010 - 08.11.2010	Hoppers/ fledgling	4,700	4,700	Malathion 96% ULV
2016-17	June, 2016	Migratory Locust etc.	1,205	1,928	Chloropyriphos 20% EC
2016-17	4.11.2016	Tree locust etc.	40	40	Malathion 96% ULV
2017-18	28.10.2017	Tree locust etc.	40	40	Malathion 96% ULV
2019-20	22.05.2019-17.02.2020	Desert Locust swarms mature (yellow), immature (pink)& hopper bands, groups	4,03,488	3,14,646	Malathion 96% ULV
2020-21	11.04.2020-26.08.2020	Desert Locust swarms mature (yellow), immature (pink)& hopper bands, groups	2,87,986	2,45,590	Malathion 96% ULV Lamdacyhlothrin 5% Deltamethrin 2.8 % EC Chlorpyriphos 50 % EC Imidacloprid 6%



2022-23	10.08.2023- 17.08.2023	Solitary, Transient, Gregarious, solitary hoppers	836	418	Malathion 96% ULV
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## 2. Resources:

### 2.1 Available in the Locust Warning Organization

Manpower	Sanctioned	Filled	Vacant
Officers	16	11	4
Trained Technical	90	40	50
Assistants	98	31	67
Drivers	46	29	17

Three nos. of Desert Locust Information Officers are posted in various schemes.

Transport	Recession	Outbreak	Upsurge*
Survey vehicles	11	11	-
Control vehicles	56	56	-
Heavy vehicles for supply of pesticides and control equipment	02	02	-
Vehicles for transporting essential items (food, water, misc)	-	-	-
<b>Total</b>	<b>69</b>	<b>69</b>	<b>-</b>
Sprayers	Functioning		Under repair
Handheld (MicroUlva, Ulva+)	43		17
Vehicle-mounted (Micronair AU8115)	46		2
Vehicle-mounted (UlvaMast)	31		15

Other equipment	
eLocust3	35 (09 Activated)
eLocust3g	55 (to be activated during out break, upsurge)
Walkie-talkies	4
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

\* Vehicle numbers must be strengthened during the upsurge.

\*\*No of teams will be redeployed from another scheme of the Directorate after orientation training.

## 2.2 Pesticides used for Desert Locust control

Malathion 96% ULV is registered for use in Desert Locust control in India. Presently, 4,185 Litres of Malathion 96% ULV is available at various LCOs. In addition to this a buffer stock of 10,000 Litres of Malathion 96% ULV is available at LCO Bikaner under preparedness plan. An agreement with **HIL (India) Ltd.** has been finalized under which the company will supply the required quantity of pesticide as per the requirement. M/s HIL will keep ready stock of 8000 litres of Malathion 96% technical reserve and on receiving demand from the Directorate of PPQ&S, it will supply the desired quantity of Malathion 96% ULV formulation to the Locust Circle Offices within 7-10 days of the supply order.

## 2.3 Aircraft for locust control

Government of India does not possess its own aircraft for locust control operation. Ministry of defense has given assurance to the Ministry of Agriculture for deployment of 5 nos. of Mi-17 Helicopters for aerial spray of pesticide in the event of any locust outbreak, upsurge. Purchase order for procurement of 5 nos. of Helicopter mounted aerial spray kits (CDA atomizer AU 6539 with GPS tracker) is placed with M/s Micron Sprayer Limited, UK. Two nos. of atomizers have already been imported and are under installation. Other three will be supplied in due course of time after successful installation and trial of already imported two kits.

## 2.4 Emergency fund

Provision of fund is always kept in the annual budget of Locust Scheme. At the time of locust emergency, the funds are diverted immediately from other schemes of the Department of Agriculture & Farmers Welfare, Ministry of Agriculture & Farmers Welfare to meet the expenditure. This emergency fund is released once an emergency has been declared by Plant

Protection Adviser, Dte. of PPQ&S in consultation with FAO Desert Locust Information Service (DLIS) in Rome.

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

There are 11 Locust Circle Offices, adequate manpower, vehicles, control equipment and personal protective equipment are available. However, during locust emergency additional manpower and vehicles are mobilized from various field officers of Directorate of PPQ&S for locust control activity.

The following teams will be constituted to organize control operations.

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

The airstrips has 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.

All field officers involved in locust control are provided with internet facility and computer peripherals for e-communication. The use of elocust3 and elocust3m pro are being encouraged by officials involved in locust survey and control. Due to development of irrigation facilities and economic activities there is a considerable improvement of mobile network in the Scheduled Desert Area, which helps in increased use of elocust3m and elocust3mPro. In areas closer to Pakistan border and areas having mobile network deficiency, eLocust3g will be deployed.

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

- Keep constant vigil through field surveys to prevent crop losses due to locust attack in approximately 2.05 lakh sq. km. Scheduled Desert Area (SDA) in the States of Rajasthan and Gujarat.

- Indo-Pak Border meetings for exchange of locust situation information between two countries to effectively monitor the situation and ensure preparedness to tackle the emerging locust threat, if any.
- Advise state functionaries, BSF personnel, Panchayat Raj Institutions to inform the nearest LWO office if any locust activity is observed in their areas for needful action.
- Avoid upsurge of locust population in SDA and entry of locust swarms into India through prompt control operations in bordering areas.
- Train the farmers, State functionaries, locust staff and other stake holders on latest locust control technologies.
- Issuance of Desert Locust Situation Bulletin at fortnightly intervals to inform all concerned stakeholders about prevailing locust situation in India.
- 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**

- 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.
- Training programme for State functionaries, BSF and LWO staff.
- Contingency plan to be updated regularly.
- Meeting with other stakeholders are held for planning the survey and control strategy as and when required.
- Permission for holding monthly meetings between the locust officers of India and Pakistan (June–November) to be obtained from Ministry of External Affairs.
- Procurement of pesticides to maintain buffer stock.
- Conducting Cholinesterase test for the staff engaged in locust control work to see any adverse effects of pesticides.
- Locust Unit at Directorate's Headquarter, Faridabad and 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.

- Provision of funds to be kept for dealing locust emergency as per the situation.
- Provision of standby aircrafts/ helicopter for control operation if the situation so warrants.

### **5.1 Preparation of survey schedule**

- 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.
- The surveys are conducted in the entire border/ coastal areas along with Indo-Pak border in the States of Gujarat and Rajasthan.

### **5.2 Updating of contingency plan**

- 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, aircraft, trained manpower, survey and control equipment, protective clothing, first-aid kits, etc.
- Review of available resources with LWO is done in every six months 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.
- 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 Joint Director (E) and Plant Protection Adviser at Directorate H.Q. Faridabad, Officer In charge, LWO Jodhpur, In-charges of Locust Circle Offices.

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

Mock drill exercise in full scale is organized in the beginning and ending of the summer breeding seasons i.e. in the months of May/June, November & December every year to test the practically ground implementation of the prepared contingency plan and to plug the gaps if any. The said mock drill will be organized by LWO, Jodhpur and at all 10 LCO's every year.

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

- All the plant protection equipment's are checked for their working conditions. If required, repairing of the same is done to make them fully operational.
- Similarly, all the vehicles are tested for their working conditions and needful is done.
- Mock drill 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.
- Refresher trainings to the locust staff and staff of State Department are organized.
- An emergency meeting among the State Chief Secretaries and Senior Officers of DAC&FW/ Directorate of PPQ&S is organized to finalize immediate deployment of resources in the threat prone areas.
- Telephonic discussions with the State agriculture authorities like Secretary Agriculture, Director of Agriculture and District Collectors of threat prone districts for arranging immediate assistance and cooperation to fight with locust emergency.
- Intensify the Desert Locust surveys in threat prone areas to detect any locust swarm invasion.
- Regular liaison with FAO through e-mail or telephone.
- In-charges of LWO, Jodhpur and other field functionaries are instructed to take stock of the situation by deploying the teams in threat prone areas for conducting survey and control operation.
- Control rooms to be established at district level.
- Meetings with District Collectors to be organized to discuss the prevailing locust situation and steps taken to control the locust infestation.
- Indian Air force to be sensitized on requirement of Helicopters for undertaking the aerial spraying against locust swarms.
- Meteorological Department is approached to provide daily wind pattern during locust emergency.
- Public awareness is created through electronic and print media.
- District and Village level committees are formed 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 Ministry of Agriculture & Farmers Welfare, Department of Agriculture & 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 locust information officers and the surveying teams. The plan will be executed within 24 hours of its trigger.

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

### **8.1 Outbreak**

- There are 10 locust circle offices, and one LWO Jodhpur, each circle has control potential for treating about 300 ha/day. In case of emergency, pesticide from the storage site can be mobilized within 6–10 hours and technical manpower from other schemes can be mobilized for undertaking control operations.
- At present there is stock of around 14,185 Liters of Malathion 96% ULV is available against minimum buffer stock of 10,000 liters.
- Memorandum of Agreement is made with **M/S HIL (India) Ltd.** to supply pesticide on emergency requirement.

### **8.2 Invasion**

- India is most at risk of a swarm invasion just before the onset of the seasonal monsoon in Rajasthan and Gujarat during June and July by swarms originating in the Arabian Peninsula and Horn of Africa.
- In case of a swarm invasion, LWO should follow the relevant contingency plan, including the provision of availing five Mi-17 helicopters from Indian Air force for aerial control.

### **8.3 Upsurge**

- In case of upsurge, extra staff and vehicles from other divisions of Directorate of PPQ&S and from State Govt. will be deployed. 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. Any remaining untrained staff may be given short training on control operations before deploying them to the field. The time required for such arrangements is about one week.
- Funds for this activity will be transferred from other Schemes of the Ministry of Agriculture & Farmers Welfare, Department of Agriculture & Farmers Welfare as stated earlier.

### **8.4 Implementation and execution of locust control campaign**

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

- Locust reporting – reporting of swarm movement or their settling spot etc.
- Conduction of surveys to confirm the presence of Locust swarm / hopper bands.
- Tracking of locust swarm to ascertain the swarm settling site.
- Deployment of control teams for controlling the settled swarm.
- Evaluation of control operation/ mortality in the afternoon.
- Recording of the control data in e-Locust3 & eLocust3m pro.
- Planning for locust control and survey work for next day.

### **8.5 Daily activity during control operations**

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

- Report of swarm movement / hopper bands/ settled swarm.
- Deployment of ground/ aerial control teams.
- Earmarking of infested area/ site on map.



- Positioning of control teams/ pesticides/ aircrafts/ POL at control sites.
- Issue of pesticides, control equipment, protective clothing, POL and other store items required for control operation.
- Reporting/receiving of control data from field.
- Compilation of field data like area treated and mortality achieved.
- Compilation of control data, pesticides consumption and review of remaining stock position and additional requirement in respect of vehicles/ pesticides/ POL.
- 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
- Briefing to Pilot/ ground crew/ aerial parties/ ground control teams regarding control operation to be taken.
- Daily review of progress of campaign and planning for next day operation.

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

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.

## **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.

### **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 operation.

### **Ministry of External Affairs.**

Permission to participate in Indo-Pak locust officer's border meeting along with BSF.

### **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 Government**

The State Departments are sensitizing to report following:

- To report locust information to LWO.
- To provide assistance in form of vehicles and manpower during locust control campaign.
- To conduct survey, surveillance and control of locust in cropped areas.
- To create awareness among public and farmers about locust.
- To provide facilities to LWO staff during locust survey and control campaign.

### **State Department of Health**

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

### **Pesticide manufacturing firms**

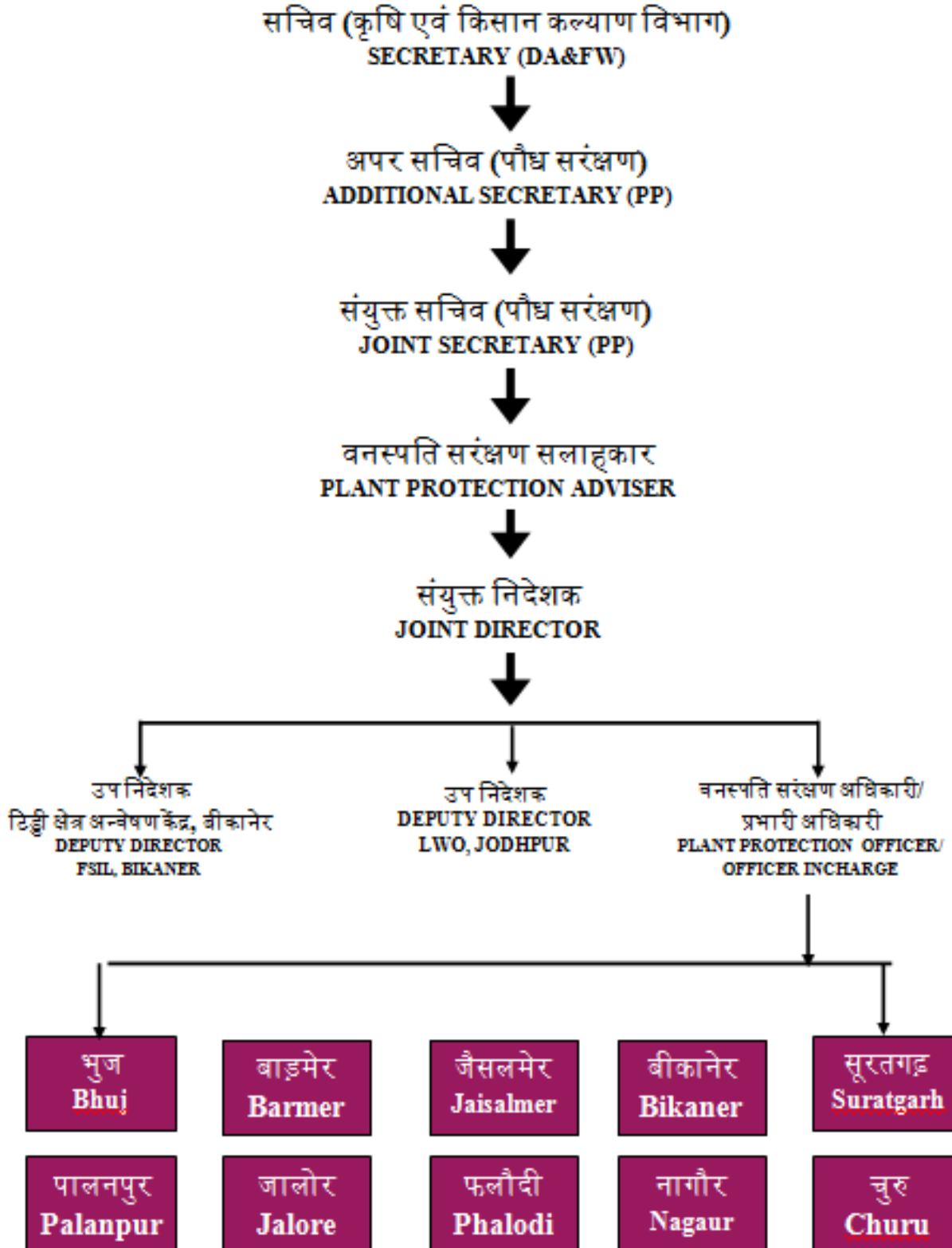
- To arrange supply of required quantity of pesticides on short notice during locust emergency.

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

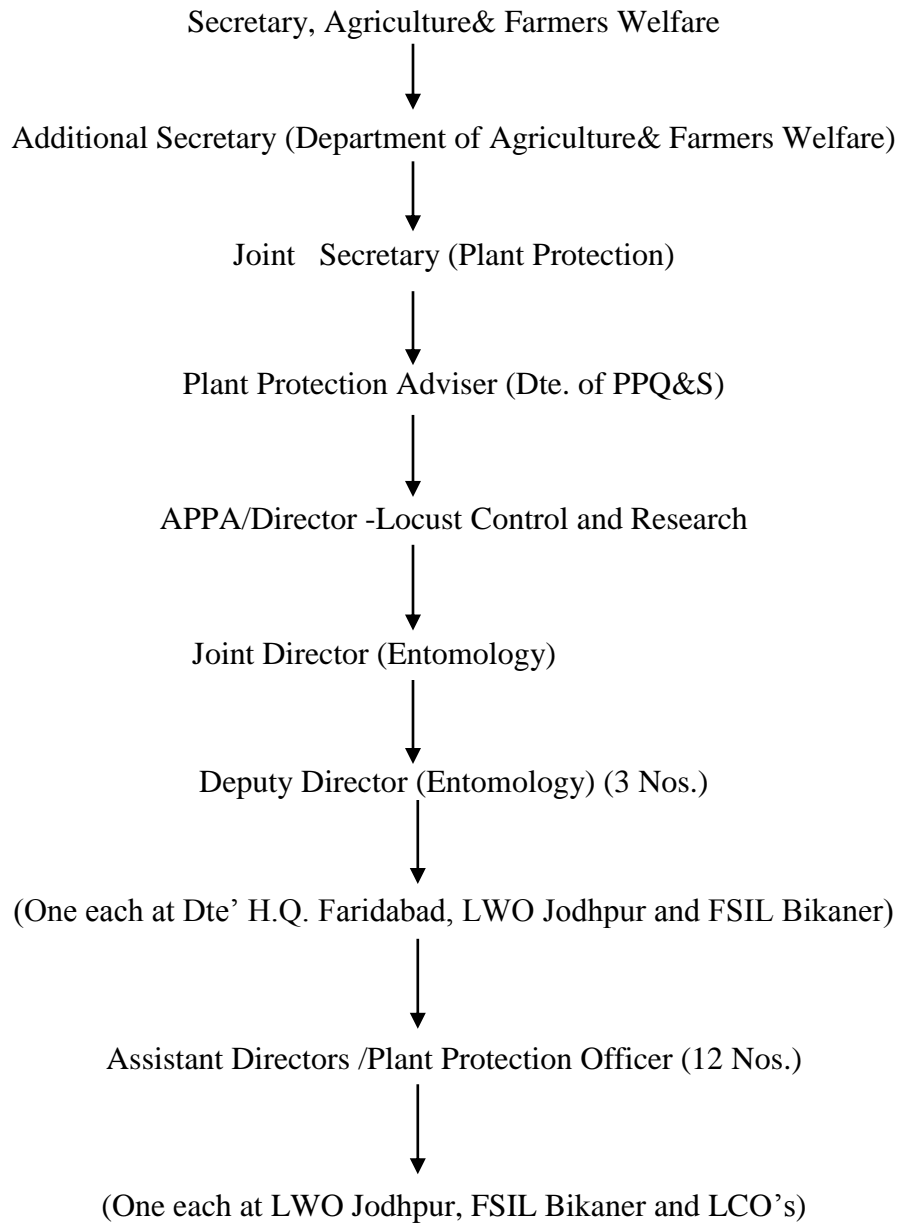
- Control teams on return to their HQ deposit the leftover pesticides and non-consumable store items to In-Charge of the office.
- In-Charges of control operation are to ensure that all the control equipments are properly cleaned by the mechanics before relieving the control team officials for their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

**Annexure 1. Setup of Locust Warning Organisation (LWO)**

**टिड्डी चेतावनी संगठन का विभागीय प्रारूप  
ORGANISATIONAL SETUP OF LWO**



## Annexure 2. Administrative structure of Locust Control and Research



### **Annexure 3. 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:**

1. **Light:** 1 – 20 mm of rainfall.
2. **Moderate:** 21 – 50 mm of rainfall.
3. **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.

## Annexure-4: List of approved pesticides for control of Desert Locust

### A. Pesticides approved used for control of Desert Locust in Scheduled Desert Area only

S.No.	Name of pesticides	Dosage	
		a.i.(gms)/ha	Formulations (gm/ml) / ha
1	Malathion 96% ULV	925	1000
2	Malathion 5%DP	925	20000
3	Fenvalrate0.4%DP	80-100	20000-25000
4	Quinalphos 1.5%DP	375	25000

### B. Pesticides approved used for control of Desert Locust on crops, Acacia& othertrees.

S.No.	Name of pesticides	a.i.(gms)/ha	Formulations (gm/ml)/ha
1	Chloropyriphos 20%EC	240	1200
2	Chloropyriphos 50%EC	240	500
3	Deltamethrin 2.8%EC	12.5	500
4	Deltamethrin 1.25% ULV	12.5	1000
5	Diflubenzuron 25%WP	60*	240
6	Fipronil 5%SC	6.25	125
7	Fipronil 2.92%EC	6.25	220
8	Lamdacyhalothrin5%EC	20	400
9	Lamdacyhalothrin10%WP	20	200
10	Malathion 50% EC	925	1850
11	Malathion 25% WP	925	3700

\*Only for hoppers control