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List of Abbreviations

APC	Agriculture Production Commissioner
CBDM	Community Based Disaster Management
CBO	Community Based Organisations
CM	Campaign Manager
CMG	Crisis Management Group
CRF	Calamity Relief Fund
CSC	Community Service Centre
DA	Directorate of Agriculture
DAC	Department of Agriculture & Cooperation
DCA	Department of Civil Aviation
DCMO	District Chief Medical Officer
DLSAU	District Level Surveillance Advisory Unit
DM	Disaster Management
DMC	Disaster Management Cell
DMF	Disaster Mitigation Fund
DPPO	District Plant Protection Officer
DPPQS	Directorate of Plant Protection, Quarantine and Storage
DRM	Disaster Risk Management
EOC	Emergency Operations Centre
FAO	Food and Agriculture Organisation
GoI	Government of India
GoUP	Government of Uttar Pradesh
HPC	High Powered Committee
IDDR	International Decade for Disaster Reduction
IDRN	India Disaster Resource Network
IMG	Integrated Management Group
IPMC	Integrated Pest Management Centre
LSG	Local Self Government
LWO	Locust Warning Organisation
MO	Medical Officer
NAC	Notified Area Committee
NAIS	National Agricultural Insurance Scheme
NCC	National Cadet Corps
NCCF	National Calamity Contingency Fund
NCDM	National Centre for Disaster Management
NDMA	National Disaster Management Authority
NDMF	National Disaster Mitigation Fund



NDMRC	National Disaster Mitigation Resource Centre
NDRF	National Disaster Response Force
NSS	National Service Scheme
NYK	Nehru Yuva Kendra
PDPSAU	District Pest Surveillance and Advisory Unit
PM	Prime Minister
PPE	Personal Protection Equipment
RC	Relief Commissioner
RKBY	Rashtriya Krishi Bima Yojana
SDMA	State Disaster Management Authority
SDMP	State Disaster Management Plan
SEZ	Special Economic Zone
SGDP	State Gross Domestic Product
SMF	Small and Marginal Farmers
SOP	Standard operating procedures
SPSAU	State Pest Surveillance and Advisory Unit
ULB	Urban Local Bodies
ULV	Ultra Low Volume
UNDP	United Nations Development Programme
UPAAM	Uttar Pradesh Academy of Administration & Management
UPSDMA	UP State Disaster Management Authority
USDA	United States Disaster Administration
WPR	Work Participation Rate

Preface



This State Disaster Management Plan for Locust Attack has been developed on the basis of detailed discussions with the officials at the Directorate of Agriculture, U.P., the secondary sources notably historical records, reports published by FAO and DPPQ, Government of India, recommendations of different specialized agencies in India and elsewhere. Guidelines of NDMA and that of High Power Committee on Disaster Management (HPC) has defined tenor, content, and approach of the report.

The DMP comprehensively covers L0, L1, L2 and L3 situations with reference to the management of Locust Attack should it happen . The mechanisms for real-time alerts, and the strategies that would mitigate / prevent the damage have been put in place.

The comments made by the Principal Secretary, Department of Agriculture U.P. during the presentation of the Draft have been thoroughly studied and incorporated in this final report. His valuable suggestions have enhanced greatly the usefulness of the final document.

We also take this opportunity to thank all those have contributed in developing this plan.



EXECUTIVE SUMMARY

Vulnerability Assessment and Risk Analysis

What are Locusts?

Locusts constitute a serious threat to food security as they can form large and highly mobile swarms capable of migrating over large distances and destroying standing crops over large areas.

Swarms fly during day time, starting about two hours after sunrise and settle about an hour before sunset as convection dries away. Swarms may fly up to nine or ten hours in a day, moving downwind. A swarm moves at slightly less than the wind speed and may easily move 100 km or more in a day. In the absence of wind, locusts fly at about 3-4 m/s.

Migration and Seasonal Distributions

Since swarms are displaced downwind, the seasonal changes in the mean wind flow bring locusts into particular zones during particular seasons. Downwind displacement tends to bring locusts into an area during the season when rain is most likely. Thus in south-east Iran's bordering region with Balochistan (Pakistan) the locusts breed during winter to migrate eastward – towards India and on Indian side i.e. on Rajasthan, Gujarat, Sind (Pak) bordering region the locusts breed in summer and migrate westward. All this is true only in a very general way. Rare and even unprecedented movements continue to occur.

Swarm migrations are generally controlled by warm wind however, there are often other winds that the swarms could have moved with, but apparently do not. This means the direction of migration is not easy to predict. However, the movements of swarms are well documented and do provide some guidance for issuing early warnings by Locust Watch, a constituent of FAO.

History of vulnerability of the State to Locust attacks



The following charts detail locust plagues and upsurges in India. It will be seen that there has been no plague since 1962. *Most of the functionaries in the Plant Protection Division of the State's Agriculture Directorate view a disaster situation from locust plague as a rather remote possibility.*

Locust plague cycles and upsurges in India

Plagues	
Years	Years
1812-1821	1900-1907
1843-1844	1912-1920
1863-1867	1926-1930
1869-1873	1940-1946
1876-1881	1949-1955
1889-1891	1959-1962

Small scale localized locust breeding have also been reported and controlled during the period from 1998, 2002, 2005 and 2007.

Hazard risk assessment and vulnerability mapping

In India, damage to crops caused by locust cycles during 1926-31, on a conservative estimate, was about Rs. 10 crore. During 1940-46 and 1949-55 the damage was estimated at Rs. 2.00 crore each and it was only Rs. 50.00 lakh during the last locust cycle i.e. during 1959-62. Though no locust cycle/plague have been observed after 1962 however, during 1978 and 1993 large scale upsurges were reported. Damage estimated to be Rs. 2.00 lakh in 1978 and Rs. 7.18 lakh in 1993. Since then, reported damages caused by locust upsurges have been largely insignificant.

FAO keeps the areas between Sahara and Indian deserts under constant surveillance and disseminates information and perceived threats at regular interval.

FAO's emergency assistance to countries facing desert locust invasions is coordinated by the Emergency Centre for Locust Operations (ECLLO), based at FAO headquarters in Rome.



Western border regions of India do have locust breeding grounds and to that extent pose a threat to North Indian crops. Typical swarm movements, will threaten Rajasthan Haryana, Punjab, UP and MP. The districts in UP that border on Haryana are particularly vulnerable.

A disaster like situation, however, can arise under following conditions:

1. ECLO becomes dysfunctional (perhaps because donors are unenthusiastic), i.e. it fails / stops to monitor the locust situations in their breeding grounds,
2. War like situation in the breeding area – between Western Sahara and the Indian desert – does not permit the ECLO to carry out regular surveillance operations
3. International tension in Middle east and Pakistan do not allow ECLO to take airborne actions against swarms moving towards the Indian subcontinent
4. Pakistan has breeding grounds where locusts can potentially breed in two seasons (unlike the Indian area which has only one season breeding ground). Lack of communication with Pakistan on locust situation may increase our (Indian territory's) vulnerability.
5. Due to any reason LWO working under DPPQS (described in next section, 4.1) fails to notice phase and morphological changes among the locusts bred in India and this leads to development of local swarms

In any of these contingencies regions on the western border of India will become *vulnerable* to locust swarms. State of UP, however, is about 1000 kms away from the western border and though locust swarms with favourable wind can move even 300 kms a day, in all likelihood UP will have at least 4 to 7 days' warning to prepare itself for fighting swarms.



PREVENTIVE MEASURES

Early Warning and Dissemination Systems

Locust manifestations are monitored by Locust Watch, working under the aegis of FAO. Locust watch issues regular bulletins on locust breeding, phase changes, upsurges and swarm formations and warns the vulnerable nations as soon as possible.

In India Locust Warning Organisation (LWO), Jodhpur (Rajasthan) has been implementing with 100% Central Government funding a Central Sector Scheme, for Locust Control and Research. It started operations in 1939. Its objectives are:

- To monitor locust situation by conducting regular surveys over 2.0 lakh sq. km in the Scheduled Desert Area encompassing the States of Rajasthan and Gujarat
- To organise control operations for preventing locust plague, as and when necessary.

The Directorate of Plant Protection, Quarantine and Storage (DPPQS) functioning under Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (MoA), GoI at Faridabad, is the apex body for locust control in India. A Joint Director of DPPQS heads the LWO. DPPQS issues a fortnightly Locust Situation Bulletin.

As swarm formations and likely movements of swarms are continuously monitored by FAO and information is shared on urgent basis with member nations, any swarm incursions are anticipated well in advance and based on FAO information DPPQS assesses the position and alerts the States likely to be affected. Last such alert was received by UP in 2004. T Clearly the early warning system for locust swarm incursion, a product of years of international co-ordination, may be *considered adequate*.



A disaster situation arising from locust attack has a remote possibility for the State of Uttar Pradesh.

Prevention and Mitigation Measures

As locust swarms come from outside the State the scope of mitigation measures that can be taken in advance is limited to early warning system and alerts. The measures that can be taken in largely form part of response to a situation *and developing* necessary capabilities for undertaking such measures.

Training needs analysis

The investment proposed on training is based mainly on two factors: “low threat perception” on one hand, and “low levels of exposure and expertise” of the existing staff in handling the disaster, should it happen. Given low levels of threat perception, the considered opinion of the concerned government officials is that the formal training be confined to the four Campaign Managers and ten Master Trainers while the other functionaries be *sensitised* on the subject.

RESPONSE

Alert mechanism

DPPQS, Faridabad issues a fortnightly bulletin on locust situations. This bulletin keeps the Directorate of Agriculture at Lucknow regularly updated.

The alert mechanism is considered adequate for the threat.

In case of attacks by swarms of locusts an *L1 situation is rather unlikely*. The situation would be either L2 or L3.

Recommended Control Measures for Locusts Situations

Control may not always be necessary. Control has its own cost. Given the low vulnerability of the state to this threat, controlling locusts will no be cost effective.

L0 ACTIVITIES

L0 Activities consist of



1. Awareness campaign
2. Training & sensitization programmes,
3. Health check up of field staff
4. Infrastructure creation
5. Logistics
6. Contingency planning & Drill
7. Monitoring development and preparedness activities

INFRASTRUCTURE

Camp Headquarters: *Campaign HQ shall be located at Meerut- a divisional HQ.* However, as the campaign manager should be as close to the site(s) of infestation as possible, suitable premises for camp headquarters should be identified in all districts on western borders of the State, namely, Saharanpur, Muzaffarnaagr, Bagpat, Meerut, Ghaziabad, Mathura, Aligarh, and Agra. As campaigns may be carried out during nights, the premises must have provisions for generator sets.

Central Store: Resources should be cached at a central store. Meerut- almost equidistant from Saharanpur and Agra divisions.

Rural Air Strips: If invasion by large swarms does manage to enter UP, the State will have to seek aerial spray. DCA has issued guidelines for construction of airstrips for agricultural spray. However, *construction of such strips is not really warranted in view of the low probability of the threat* but existing airstrips and sites in each Tehsil must be identified where such airstrips can be constructed in short time.

Training & Sensitization Programmes: No team can successfully control locusts unless adequately sensitized and trained. The details of sensitization and training programmes are described in Section 6.2 under “Capacity Building”. Regular sensitization and training is an important L0 activity.

Drill & Contingency Planning: DA, the primary responsible agency for locust control may organise drills at regular intervals to ensure preparedness.



Preparedness measures are described in fuller detail in Chapter 6. Mock drill activities, based on those measures, are detailed in Annexure 8.

L2 RESPONSE

In locust manifestation the response chain will start long before actual arrival of swarms in the State. *UPSDMA, shall declare the level of disaster situation based on the inputs of Agriculture Production Commissioner/ Principal Secretary, Agriculture members of its Executive Committee.*

Primary L2 Functions:

- Pre-identified CM will take command of the situation and employ pre-identified team leaders with trained field workers
- Concerned DM will facilitate the control operations
- Medical Officers will be attached to the sites of control operations to monitor cases of overexposure to insecticides.

Secondary L2 Functions:

- a. Use of mechanical means of control against smaller infestations by local villagers under leadership of Technical Assistants (Plant Protection) Kissan Mitra / Kissan sahayaks
- b. Loss assessment for relief from CRF, if applicable after the threat is over and L0 is declared

Emergency response: *There should not be any emergency response as locusts cannot appear suddenly. The threat gives ample time to take positions.*

State Control Room: Locust control measures will be undertaken by the CM who will choose his campaign headquarters close to the sites of maximum infestations. He will report to the DA who will keep the APC/ Principal nsecretar, Agriculture and through him the UPSDMA posted of the



developments on regular basis. The State Control Room functioning under SDMA will monitor the CM's operations and will provide any strategic inputs / support it deems fit, or sought for by the CM.

Relief Coordination: No relief coordination is to be undertaken during L2 situation. After deactivation of L2 the PPS, SDAO, DAO, CO, SDM and DM will assess if any farmers are eligible for relief under the Guidelines of the Calamity Relief Fund. Relief standards provided in GoI letter no 32-34/2005-NDM-I, GoI, MHA, DM-I Division dated the 27th June 2007, addressed to the Chief Secretaries and Relief Commissioners of all state, are made applicable in the State *vide* letter no GI-134/1-11-2007-46/97 of the Chief Secretary, addressed to all District Magistrates / DCs.

Information centre: DPPOs should manage information centres in all districts affected by the pest.

Media management: DA regularly gives such matters as it considers merit wide dissemination to Director (Information) for onward circulation to media. TV channels should be encouraged to air informative software on locusts, as also on other agricultural issues, which should meet viewer interest if print media is regularly posted of the situation.

Care must be taken not to overstate the threat or the loss of crops as these are price sensitive information that will impact food prices, and also future prices on commodity exchanges. During L1 situation Office of the District Magistrate will give clearance to the Press Briefings. During L2/L3 situation SDMA/ Office of the APC / Principal Secretary, Agriculture, Government of U.P. will give clearance to the Press Briefings.

Recovery: A major infestation may wipe out the capital of small and marginal farmers. In all such cases Commissioner, Institutional Finance should take up the matter with RBI for extended repayment period of crop loans and waiver / reduction of interest rates. *Unless this is done promptly most SMFs will become*



ineligible for loans for next crop, which will delay recovery and may even impact food situation.

Deactivation of L2, back to L0: APC will declare deactivation of L2 after reports of control are verified. If it is found that small bands of locusts are still persisting in some districts, APC may declare L1 situation in those districts after consulting with the concerned DM/DCs.

L3 RESPONSE

Procedure for the activation of plans: APC / Principal Secretary, Agriculture will declare the level on receipts of information about likely arrival of swarms in UP. *Actual arrival will leave no time for control measures.*

Control room upgraded to EOC: The State Control Room functioning under UPSDMA will be upgraded to EOC with the APC / Principal Secretary, Agriculture in charge.

Structure of EOC: The following functionaries will form part of the EOC:

1. APC (in charge)
2. Principal Secretary Agriculture
3. Director Agriculture
4. Principal Secretary Health

Primary Functions L3:

1. CM & DA, in consultation with DPPQS and IMD will chart the positions of swarms with prevailing / expected wind directions and wind velocities to forecast the courses the swarms may take. An outline of forecasting process is given in the Annexure.
2. Based on the expected course(s) of flights DA will inform the EOC of the districts that may face infestation
3. APC / Principal Secretary, Agriculture will seek aircrafts from DCA, GoI
4. APC / Principal Secretary, Agriculture will inform the DM's where aerial operations are contemplated
5. DA will seek technical assistance from DPPQS for aerial spray



6. DA will ensure availability of insecticides
7. DMs will ensure availability of airstrips for aircrafts to operate from in affected areas and availability of fuel for the aircrafts
8. DMs will also ensure availability of medical officers
9. Health directorate / DCMO will ensure adequate antidotes for Malathion poisoning
10. DA will supervise secondary control measures

Secondary Functions L3:

- CM will ensure adequate teams for controlling the bands fleeing the aerial spray target area (the bands will mostly flee in downwind direction)

Functional control desks:

	Desks	Manned by	Functions
1	Aerial spray	Nominee of DA	Assess target area, adequacy
2	Insecticide availability	CM, Additional Director (PP)	Ensure stocking of insecticide
3	Fuel for aircrafts	Nominee of DA	Ensure stocking of fuel
4	Healthcare	Nominee of Directorate of Health	Ensure availability of experienced MO's with anti-dotes
5	Information	Dy Director (Information)	Issue of media releases
6	PPE	Nominee of DA	Ensure availability of personal protective equipment

Airstrips and stocking of fuel and pesticide

There are a number of air strips in districts. If these do not cover the area likely to be infested, additional sites should be inspected and prepared in advance. Care must be taken that the airstrip is approachable by all weather roads and trucks carrying fuel and insecticide can reach it.



Deactivation of L3: SDMA on report of destruction / complete dispersion of swarms will declare deactivation of L3. If bands are still around and districts need State support L2 will continue else L1/L0 will be declared in consultation with concerned DMs, who will receive information from the extension / plant protection structure of Directorate of Agriculture.

STANDARD OPERATING PROCEDURES: FROM RECEIVING “ALERT” TILL THE THREAT RESOLVES

Directorate of Agriculture will have a dedicated cell to deal with all matters related to locusts, including data base management. This Cell will be networked with the national level agencies, particularly Locust Watch Organisation, Jodhpur, DPPQS, Faridabad and IMD. This dedicated cell will be a part of the DM Cell in the Directorate.

Alerts are sounded by DPPQS when any swarms enter or are threatening to enter India. The swarms enter from west side and infest Gujarat, Rajasthan, Haryana and Punjab before they can reach UP.

Alert (swarms headed towards India)

Assess the time it would take for the swarms to reach UP	DA
Assess the likely numbers to reach UP	DA
Suitably alert the districts	DA
Based on the expected swarm size define likely threat level - not to be declared as the threat is yet to take place	DA
Alert the identified campaign manager	DA
Estimate the requirement of critical resources - equipment and insecticides	CM
Check the availability of resources - workability of equipment and insecticides in stores	CM
Ensure availability of equipment	CM
Set in a mechanism for daily gathering of information on swarm movements - may entail liaison with DPPQS, PP of Rajasthan and Gujarat	CM
Check availability of storage facilities in the threatened districts	CM
Identify and alert team leaders for control operations	CM
Review / update the pre-contract agreements for supply of critical resources	DAC
Obtain financial sanctions for purchase of critical resources	DAC



High Alert (swarms enter India)

Depute team leaders to their designated districts	CM
DPPO as convenor member of DLSAU shall activate and alert All Technical Assistants in the District who will activate and alert the Kissan Mitra / Kissan Sahayak / farming community to keep a watchful eye on locust appearance	DPPO
Procure resources	DA
Review identified sites for campaign headquarters in all districts	CM
Make <i>tehsil</i> wise teams	CM
Draw plans for control operations	CM
Intimate DMs concerned and requisition for MO	CM

Declaration of disaster situation (swarms enter UP)

Assess disaster situation and declare level	SDMA – APC/ Pr. Secy, Agriculture
Surveillance for hunting roosting locations of swarms	DPPOs / DLSAU
Informing the ICO of the roosting locations	DPPO/DM
Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform district administration	CM
Traffic control, if required	SP
Inform villages in downwind direction	SDM, BDO
Alert primary health centres / hospitals in the area	DCMO, SDM
Media release	CM, DM

Declaration of L2

Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform District administration	CM



Traffic control, if required	SP
Inform villages in downwind direction	SDM
Alert primary health centres / hospitals in the area	DCMO
Media release	CM, DA , DI

Control operations

Calibrate equipment	TL
Estimate swath width, decide on emission heights and track widths	TL
Non-stop operations	TL and CM
Six hourly reports	TL to CM
Twelve hourly reports	CM to DA
Campaign to continue till even isolated bands are destroyed	CM
Clean, maintain and store equipment	TL and CM
Disposal of empty insecticide containers	TLs, CM
Final report	CM

Declaration of L3

Request to DCA for aircrafts	APC
Request to DPPQS for tech assistance during aerial spray	DA
Intimation to concerned DMs	APC
Identification of suitable airstrips	CM, DM
Procurement of supplies: ATF, insecticides	CM, DA, DM
Ground monitoring	CM, TLs

Declaration of L0

Swarms destroyed	SDMA - APC
Assessment of loss due to locusts	DAO, DPPO, DSO
Recommendations for compensation if warranted	SDM, DM, RC
Sanction of compensation from CRF	RC
Disbursement of compensation	DM

5.8 Physical resources

Resources required for control operations can be broadly classified in three categories: Critical resources, manpower requirement and PPE (personal protection equipment)

Critical Resources

Sprayers



Hand held
Vehicle mounted
Aerial support (L3)

Insecticides
Spare batteries for hand held sprayers
Protective gear for field staff
Diesel for vehicles
First aid kits at each site

Manpower requirement

For each hand held sprayer : Four persons to operate in shifts
For each vehicle : Eight persons to operate in shifts - teams of two -
one must be a driver
To man the stores in shifts : Nine persons - teams of three
Support personnel : Paramedics

**Recommended minimum Personal Protection Equipment (PPE) if
insecticide belongs to WHO Classification II, III or U**

Activity	Required PPE
Moving and loading of ULV insecticides, equipment cleaning (<i>dustable powders</i>)	Boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, apron, face shield (<i>dust mask</i>)
ULV spraying (<i>if dusting</i>)	Closed canvas shoes or boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, face shield (<i>dust mask</i>)
Spray track marking (flagmen)	Closed shoes, cotton coveralls or two-piece work suit, hat
Insecticide transport	Closed shoes or boots, cotton coveralls or two piece work suit, gloves, apron, face shield, dust mask
Medium and large-scale insecticide storage	Boots, cotton coveralls, chemical-proof coveralls, gloves, hat, apron, face shield, dust mask, hard hat, respiratory protective equipment



Gloves and boots should be of PVC. *Natural rubber and butyl gloves are NOT recommended for locust control as they get permeated within 12 minutes.*

PREPAREDNESS MEASURES

Preparations for pre-determined Responses

Preparedness is directly related to plan responses. It denotes that the State is prepared to take the envisaged control measures. Thus, preparedness would entail the activities that would ensure plan responses at appropriate time. Preparedness activities are therefore, noted against plan responses:

	Plan responses	Preparedness measures	Action
1	Assessment of time for swarms to reach State	1. Training in locust behaviour 2. Training in forecasting methods 3. Drill in forecasting swarm movements- based on IMD data for States of Gujarat / Rajasthan	Directorate of Agriculture
2	Assessment of swarm strengths	4. Training in locust behaviour	Directorate of Agriculture
3	Estimating the required critical resources	5. Preparing list of required resources for swarms of varied sizes / behaviour	Identified CMs
4	Ensuring availability of equipment in working condition	6. Half yearly maintenance drill and stock verification	Identified CMs thru concerned DPPOs
5	Daily gathering of info on swarm movements	7. Training with DPPQS	Identified CMs
6	Availability of storage facilities in affected districts	8. Identification of suitable sites – preferably the existing godowns of PP at Tehsil levels	Identified CM through DPPOs
7	Availability of trained team leaders	9. Identification of team leaders 10. Training of team leaders	DA



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8	Alert activation through the extension structure of plant protection	11. One mock drill every year	DA, will involve the DPPOs of target districts and the plant protection extension staff in those districts
9	Procurement of resources	12. Preparing list of approved suppliers 13. Keeping the rate contracts up-dated	DA
10	Operationalising campaign head quarters	14. Part of the once a year mock drill	CM with DPPOs
11	Making Tehsil wise teams	15. Preparing list of required resources for swarms of varied sizes / behaviour	Identified CMs with identified Team Leaders and plant protection extension staff
12	Deciding whether control is required	16. Training in locust biology & behaviour	Identified CMs
13	Drawing plans for control operations	17. Part of the annual control drill	Identified CMs
14	Availability of trained MOs during campaigns	18. Training to MOs for managing Malathion absorption thru skin and lungs	Directorate of Health
15	Equipment calibration	19. Training in control operations with hand held sprayers	Team Leaders and CMs thru DA
16	Campaign progress reporting	20. Part of annual drill	TLs, CMs thru DA
17	Request DCA for aircrafts	21. Keeping the details of appropriate channel ready, with annual up-dating of name and telephone numbers of concerned persons	DA



18	Procurement of ATF	22. Keeping th4e details of appropriate channel ready, with annual updating of names and telephone numbers of concerned persons	DA
19	Identification of suitable sites for airstrips	23. Selecting the sites meeting the guidelines of DCA for airstrips for agricultural aviation	DPPOs / Dy. Director Agriculture; DMs to be kept informed

Capacity building, Sensitization and other proactive measures

The State has no master trainers / trainers to train the field staff in locust control. This gap can be filled with the help of central institutions functioning in the State. DPPQS has been operating Integrated Pest Management Centre (IPMC) in the State at two locations – Gorakhpur and Lucknow. IPMC, being part of DPPQS is competent and adequately equipped to organise sensitization / training programmes on locust control for field staff of Directorate of Agriculture. Services of UPAAM may be commissioned to coordinate and conduct the sensitization programmes proposed in the plan.

Suggested Phases of Sensitization / Training Programmes

	<i>Years:</i>	2009-10	2010-11	2011 on wards
CMs		1	3	
Master Trainers		5	5	
Team Leaders		20	30	Part of regular sensitization programmes
Support staff		100	900	Part of regular sensitization programmes
Field functionaries*	NW Districts		All	Part of regular sensitization programmes
Medical Officers	NW Districts		All	Part of regular sensitization programmes

- *Of the Directorate of Agriculture*

FINANCIAL ARRANGEMENTS



Estimation of required financial resources

Financial resources required for this plan are estimated in two parts – cost of introducing the plan and cost of maintaining the plan – broadly akin to capital cost and operating cost.

One Time (Capital) Expenses

Particulars	Cost	
1 Training of Master Trainers	10.00	At Gujarat / Rajasthan
2 Training of CM (four persons)	30.00	FAO Training
3 Sensitization of Directorate staff	21.00	By UPAAM / MTs
4 Sensitization of TLs	2.31	By Mts/ UPAAM
5 Sensitization of support staff	2.31	By Mts/ UPAAM
6 Premises for Headquarters	36.15	Including cost of land
7 Generator set / switchgear	1.00	Lump sum
8 Acquisition of hand held sprayers	12.00	40 sprayers
9 Acquisition of PPE	1.00	100 sets
	115.78	

Running cost will be largely in maintaining the physical assets and in continued trainings & mock drills:

Running Expenses

1 Annual Sensitization	5.00	Part of regular training for directorate staff
2 Annual drills	6.00	Involving people in the vulnerable districts
3 Maintenance of equipment	1.20	10% of acquisition cost
4 Maintenance of premises	1.02	5% of construction cost
6 Staff* at HQ	1.20	
	14.42	

**HQ premises will be in charge of the DPPO, Meerut. Only a watchman will be posted there; mechanical maintenance will be outsourced to suppliers.*

The financial resources required are to the tune of Rs 115 lacs for the introduction of the Plan and Rs 15 lacs per annum for keeping it operational.

Monitoring mechanisms, MIS

Since the Plan envisages to introduce a completely new set of activities with its own structures, the monitoring of introduction of the Plan will be quite different from monitoring in later years when the Plan processes should have been fully internalised. Accordingly the proposed MIS is divided in two parts – a) for the first two years; b) for subsequent years. The MIS for the first two years will be more frequent and will be focused on creation of physical and



organisational infrastructure. In the subsequent years the focus will be on preparedness.

MIS for the first two years

	Activity to be monitored	Responsibility	Monitoring authority
1	Selection of site for campaign HQ	DM Meerut	Pr Secy Agr
2	Construction of campaign HQ	PWD	Pr Secy Agr
3	Training CMs	Dy Dir PP	Dir Agr
4	Sensitization of TLs		
5	Sensitization MTs	DPPOs of western divisions	Dy Dir PP
6	Sensitization support staff		
7	Acquisition of sprayers		
8	Acquisition of PPEs	Dy Dir PP	Dir Agr
9	Pre contract agreements for Malathion		

MIS for subsequent years

	Subject	Report by	Report to	Frequency
1	Status of HQ	DPPO Meerut	Dy Dir PP	Half year
2	Status of plan updating	Dy Dir PP	Dir Agr	Half yearly
3	Status of Trained Personnel	Dy Dir PP	Dir Agr	Annual

Preface

This State Disaster Management Plan for Locust Attack has been developed on the basis of detailed discussions with the officials at the Directorate of Agriculture, U.P., the secondary sources notably historical records, reports published by FAO and DPPQ, Government of India, recommendations of different specialized agencies in India and elsewhere. Guidelines of NDMA and that of High Power Committee on Disaster Management (HPC) has defined tenor, content, and approach of the report.



The DMP comprehensively covers L0, L1, L2 and L3 situations with reference to the management of Locust Attack should it happen . The mechanisms for real-time alerts, and the strategies that would mitigate / prevent the damage have been put in place.

The comments made by the Principal Secretary, Department of Agriculture U.P. during the presentation of the Draft have been thoroughly studied and incorporated in this final report. His valuable suggestions have enhanced greatly the usefulness of the final document.

We also take this opportunity to thank all those have contributed in developing this plan.



EXECUTIVE SUMMARY

Vulnerability Assessment and Risk Analysis

What are Locusts?

Locusts constitute a serious threat to food security as they can form large and highly mobile swarms capable of migrating over large distances and destroying standing crops over large areas.

Swarms fly during day time, starting about two hours after sunrise and settle about an hour before sunset as convection dries away. Swarms may fly up to nine or ten hours in a day, moving downwind. A swarm moves at slightly less than the wind speed and may easily move 100 km or more in a day. In the absence of wind, locusts fly at about 3-4 m/s.

Migration and Seasonal Distributions

Since swarms are displaced downwind, the seasonal changes in the mean wind flow bring locusts into particular zones during particular seasons. Downwind displacement tends to bring locusts into an area during the season when rain is most likely. Thus in south-east Iran's bordering region with Balochistan (Pakistan) the locusts breed during winter to migrate eastward – towards India and on Indian side i.e. on Rajasthan, Gujarat, Sind (Pak) bordering region the locusts breed in summer and migrate westward. All this is true only in a very general way. Rare and even unprecedented movements continue to occur.

Swarm migrations are generally controlled by warm wind however, there are often other winds that the swarms could have moved with, but apparently do not. This means the direction of migration is not easy to predict. However, the movements of swarms are well documented and do provide some guidance for issuing early warnings by Locust Watch, a constituent of FAO.

History of vulnerability of the State to Locust attacks



The following charts detail locust plagues and upsurges in India. It will be seen that there has been no plague since 1962. *Most of the functionaries in the Plant Protection Division of the State's Agriculture Directorate view a disaster situation from locust plague as a rather remote possibility.*

Locust plague cycles and upsurges in India

Plagues	
Years	Years
1812-1821	1900-1907
1843-1844	1912-1920
1863-1867	1926-1930
1869-1873	1940-1946
1876-1881	1949-1955
1889-1891	1959-1962

Small scale localized locust breeding have also been reported and controlled during the period from 1998, 2002, 2005 and 2007.

Hazard risk assessment and vulnerability mapping

In India, damage to crops caused by locust cycles during 1926-31, on a conservative estimate, was about Rs. 10 crore. During 1940-46 and 1949-55 the damage was estimated at Rs. 2.00 crore each and it was only Rs. 50.00 lakh during the last locust cycle i.e. during 1959-62. Though no locust cycle/plague have been observed after 1962 however, during 1978 and 1993 large scale upsurges were reported. Damage estimated to be Rs. 2.00 lakh in 1978 and Rs. 7.18 lakh in 1993. Since then, reported damages caused by locust upsurges have been largely insignificant.

FAO keeps the areas between Sahara and Indian deserts under constant surveillance and disseminates information and perceived threats at regular interval.

FAO's emergency assistance to countries facing desert locust invasions is coordinated by the Emergency Centre for Locust Operations (ECLLO), based at FAO headquarters in Rome.



Western border regions of India do have locust breeding grounds and to that extent pose a threat to North Indian crops. Typical swarm movements, will threaten Rajasthan Haryana, Punjab, UP and MP. The districts in UP that border on Haryana are particularly vulnerable.

A disaster like situation, however, can arise under following conditions:

6. ECLO becomes dysfunctional (perhaps because donors are unenthusiastic), i.e. it fails / stops to monitor the locust situations in their breeding grounds,
7. War like situation in the breeding area – between Western Sahara and the Indian desert – does not permit the ECLO to carry out regular surveillance operations
8. International tension in Middle east and Pakistan do not allow ECLO to take airborne actions against swarms moving towards the Indian subcontinent
9. Pakistan has breeding grounds where locusts can potentially breed in two seasons (unlike the Indian area which has only one season breeding ground). Lack of communication with Pakistan on locust situation may increase our (Indian territory's) vulnerability.
10. Due to any reason LWO working under DPPQS (described in next section, 4.1) fails to notice phase and morphological changes among the locusts bred in India and this leads to development of local swarms

In any of these contingencies regions on the western border of India will become *vulnerable* to locust swarms. State of UP, however, is about 1000 kms away from the western border and though locust swarms with favourable wind can move even 300 kms a day, in all likelihood UP will have at least 4 to 7 days' warning to prepare itself for fighting swarms.



PREVENTIVE MEASURES

Early Warning and Dissemination Systems

Locust manifestations are monitored by Locust Watch, working under the aegis of FAO. Locust watch issues regular bulletins on locust breeding, phase changes, upsurges and swarm formations and warns the vulnerable nations as soon as possible.

In India Locust Warning Organisation (LWO), Jodhpur (Rajasthan) has been implementing with 100% Central Government funding a Central Sector Scheme, for Locust Control and Research. It started operations in 1939. Its objectives are:

- To monitor locust situation by conducting regular surveys over 2.0 lakh sq. km in the Scheduled Desert Area encompassing the States of Rajasthan and Gujarat
- To organise control operations for preventing locust plague, as and when necessary.

The Directorate of Plant Protection, Quarantine and Storage (DPPQS) functioning under Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (MoA), GoI at Faridabad, is the apex body for locust control in India. A Joint Director of DPPQS heads the LWO. DPPQS issues a fortnightly Locust Situation Bulletin.

As swarm formations and likely movements of swarms are continuously monitored by FAO and information is shared on urgent basis with member nations, any swarm incursions are anticipated well in advance and based on FAO information DPPQS assesses the position and alerts the States likely to be affected. Last such alert was received by UP in 2004. T Clearly the early warning system for locust swarm incursion, a product of years of international co-ordination, may be *considered adequate*.



A disaster situation arising from locust attack has a remote possibility for the State of Uttar Pradesh.

Prevention and Mitigation Measures

As locust swarms come from outside the State the scope of mitigation measures that can be taken in advance is limited to early warning system and alerts. The measures that can be taken in largely form part of response to a situation *and developing* necessary capabilities for undertaking such measures.

Training needs analysis

The investment proposed on training is based mainly on two factors: “low threat perception” on one hand, and “low levels of exposure and expertise” of the existing staff in handling the disaster, should it happen. Given low levels of threat perception, the considered opinion of the concerned government officials is that the formal training be confined to the four Campaign Managers and ten Master Trainers while the other functionaries be *sensitised* on the subject.

RESPONSE

Alert mechanism

DPPQS, Faridabad issues a fortnightly bulletin on locust situations. This bulletin keeps the Directorate of Agriculture at Lucknow regularly updated.

The alert mechanism is considered adequate for the threat.

In case of attacks by swarms of locusts an *L1 situation is rather unlikely*. The situation would be either L2 or L3.

Recommended Control Measures for Locusts Situations

Control may not always be necessary. Control has its own cost. Given the low vulnerability of the state to this threat, controlling locusts will no be cost effective.

L0 ACTIVITIES

L0 Activities consist of



8. Awareness campaign
9. Training & sensitization programmes,
10. Health check up of field staff
11. Infrastructure creation
12. Logistics
13. Contingency planning & Drill
14. Monitoring development and preparedness activities

INFRASTRUCTURE

Camp Headquarters: *Campaign HQ shall be located at Meerut- a divisional HQ.* However, as the campaign manager should be as close to the site(s) of infestation as possible, suitable premises for camp headquarters should be identified in all districts on western borders of the State, namely, Saharanpur, Muzaffarnaagr, Bagpat, Meerut, Ghaziabad, Mathura, Aligarh, and Agra. As campaigns may be carried out during nights, the premises must have provisions for generator sets.

Central Store: Resources should be cached at a central store. Meerut- almost equidistant from Saharanpur and Agra divisions.

Rural Air Strips: If invasion by large swarms does manage to enter UP, the State will have to seek aerial spray. DCA has issued guidelines for construction of airstrips for agricultural spray. However, *construction of such strips is not really warranted in view of the low probability of the threat* but existing airstrips and sites in each Tehsil must be identified where such airstrips can be constructed in short time.

Training & Sensitization Programmes: No team can successfully control locusts unless adequately sensitized and trained. The details of sensitization and training programmes are described in Section 6.2 under “Capacity Building”. Regular sensitization and training is an important L0 activity.

Drill & Contingency Planning: DA, the primary responsible agency for locust control may organise drills at regular intervals to ensure preparedness.



Preparedness measures are described in fuller detail in Chapter 6. Mock drill activities, based on those measures, are detailed in Annexure 8.

L2 RESPONSE

In locust manifestation the response chain will start long before actual arrival of swarms in the State. *UPSDMA, shall declare the level of disaster situation based on the inputs of Agriculture Production Commissioner/ Principal Secretary, Agriculture members of its Executive Committee.*

Primary L2 Functions:

- Pre-identified CM will take command of the situation and employ pre-identified team leaders with trained field workers
- Concerned DM will facilitate the control operations
- Medical Officers will be attached to the sites of control operations to monitor cases of overexposure to insecticides.

Secondary L2 Functions:

- c. Use of mechanical means of control against smaller infestations by local villagers under leadership of Technical Assistants (Plant Protection) Kissan Mitra / Kissan sahayaks
- d. Loss assessment for relief from CRF, if applicable after the threat is over and L0 is declared

Emergency response: *There should not be any emergency response as locusts cannot appear suddenly. The threat gives ample time to take positions.*

State Control Room: Locust control measures will be undertaken by the CM who will choose his campaign headquarters close to the sites of maximum infestations. He will report to the DA who will keep the APC/ Principal nsecretar, Agriculture and through him the UPSDMA posted of the



developments on regular basis. The State Control Room functioning under SDMA will monitor the CM's operations and will provide any strategic inputs / support it deems fit, or sought for by the CM.

Relief Coordination: No relief coordination is to be undertaken during L2 situation. After deactivation of L2 the PPS, SDAO, DAO, CO, SDM and DM will assess if any farmers are eligible for relief under the Guidelines of the Calamity Relief Fund. Relief standards provided in GoI letter no 32-34/2005-NDM-I, GoI, MHA, DM-I Division dated the 27th June 2007, addressed to the Chief Secretaries and Relief Commissioners of all state, are made applicable in the State *vide* letter no GI-134/1-11-2007-46/97 of the Chief Secretary, addressed to all District Magistrates / DCs.

Information centre: DPPOs should manage information centres in all districts affected by the pest.

Media management: DA regularly gives such matters as it considers merit wide dissemination to Director (Information) for onward circulation to media. TV channels should be encouraged to air informative software on locusts, as also on other agricultural issues, which should meet viewer interest if print media is regularly posted of the situation.

Care must be taken not to overstate the threat or the loss of crops as these are price sensitive information that will impact food prices, and also future prices on commodity exchanges. During L1 situation Office of the District Magistrate will give clearance to the Press Briefings. During L2/L3 situation SDMA/ Office of the APC / Principal Secretary, Agriculture, Government of U.P. will give clearance to the Press Briefings.

Recovery: A major infestation may wipe out the capital of small and marginal farmers. In all such cases Commissioner, Institutional Finance should take up the matter with RBI for extended repayment period of crop loans and waiver / reduction of interest rates. *Unless this is done promptly most SMFs will become*



ineligible for loans for next crop, which will delay recovery and may even impact food situation.

Deactivation of L2, back to L0: APC will declare deactivation of L2 after reports of control are verified. If it is found that small bands of locusts are still persisting in some districts, APC may declare L1 situation in those districts after consulting with the concerned DM/DCs.

L3 RESPONSE

Procedure for the activation of plans: APC / Principal Secretary, Agriculture will declare the level on receipts of information about likely arrival of swarms in UP. *Actual arrival will leave no time for control measures.*

Control room upgraded to EOC: The State Control Room functioning under UPSDMA will be upgraded to EOC with the APC / Principal Secretary, Agriculture in charge.

Structure of EOC: The following functionaries will form part of the EOC:

5. APC (in charge)
6. Principal Secretary Agriculture
7. Director Agriculture
8. Principal Secretary Health

Primary Functions L3:

11. CM & DA, in consultation with DPPQS and IMD will chart the positions of swarms with prevailing / expected wind directions and wind velocities to forecast the courses the swarms may take. An outline of forecasting process is given in the Annexure.
12. Based on the expected course(s) of flights DA will inform the EOC of the districts that may face infestation
13. APC / Principal Secretary, Agriculture will seek aircrafts from DCA, GoI
14. APC / Principal Secretary, Agriculture will inform the DM's where aerial operations are contemplated
15. DA will seek technical assistance from DPPQS for aerial spray



16. DA will ensure availability of insecticides
17. DMs will ensure availability of airstrips for aircrafts to operate from in affected areas and availability of fuel for the aircrafts
18. DMs will also ensure availability of medical officers
19. Health directorate / DCMO will ensure adequate antidotes for Malathion poisoning
20. DA will supervise secondary control measures

Secondary Functions L3:

- CM will ensure adequate teams for controlling the bands fleeing the aerial spray target area (the bands will mostly flee in downwind direction)

Functional control desks:

	Desks	Manned by	Functions
1	Aerial spray	Nominee of DA	Assess target area, adequacy
2	Insecticide availability	CM, Additional Director (PP)	Ensure stocking of insecticide
3	Fuel for aircrafts	Nominee of DA	Ensure stocking of fuel
4	Healthcare	Nominee of Directorate of Health	Ensure availability of experienced MO's with anti-dotes
5	Information	Dy Director (Information)	Issue of media releases
6	PPE	Nominee of DA	Ensure availability of personal protective equipment

Airstrips and stocking of fuel and pesticide

There are a number of air strips in districts. If these do not cover the area likely to be infested, additional sites should be inspected and prepared in advance. Care must be taken that the airstrip is approachable by all weather roads and trucks carrying fuel and insecticide can reach it.



Deactivation of L3: SDMA on report of destruction / complete dispersion of swarms will declare deactivation of L3. If bands are still around and districts need State support L2 will continue else L1/L0 will be declared in consultation with concerned DMs, who will receive information from the extension / plant protection structure of Directorate of Agriculture.

STANDARD OPERATING PROCEDURES: FROM RECEIVING “ALERT” TILL THE THREAT RESOLVES

Directorate of Agriculture will have a dedicated cell to deal with all matters related to locusts, including data base management. This Cell will be networked with the national level agencies, particularly Locust Watch Organisation, Jodhpur, DPPQS, Faridabad and IMD. This dedicated cell will be a part of the DM Cell in the Directorate.

Alerts are sounded by DPPQS when any swarms enter or are threatening to enter India. The swarms enter from west side and infest Gujarat, Rajasthan, Haryana and Punjab before they can reach UP.

Alert (swarms headed towards India)

Assess the time it would take for the swarms to reach UP	DA
Assess the likely numbers to reach UP	DA
Suitably alert the districts	DA
Based on the expected swarm size define likely threat level - not to be declared as the threat is yet to take place	DA
Alert the identified campaign manager	DA
Estimate the requirement of critical resources - equipment and insecticides	CM
Check the availability of resources - workability of equipment and insecticides in stores	CM
Ensure availability of equipment	CM
Set in a mechanism for daily gathering of information on swarm movements - may entail liaison with DPPQS, PP of Rajasthan and Gujarat	CM
Check availability of storage facilities in the threatened districts	CM
Identify and alert team leaders for control operations	CM
Review / update the pre-contract agreements for supply of critical resources	DAC
Obtain financial sanctions for purchase of critical resources	DAC



High Alert (swarms enter India)

Depute team leaders to their designated districts	CM
DPPO as convenor member of DLSAU shall activate and alert All Technical Assistants in the District who will activate and alert the Kissan Mitra / Kissan Sahayak / farming community to keep a watchful eye on locust appearance	DPPO
Procure resources	DA
Review identified sites for campaign headquarters in all districts	CM
Make <i>tehsil</i> wise teams	CM
Draw plans for control operations	CM
Intimate DMs concerned and requisition for MO	CM

Declaration of disaster situation (swarms enter UP)

Assess disaster situation and declare level	SDMA – APC/ Pr. Secy, Agriculture
Surveillance for hunting roosting locations of swarms	DPPOs / DLSAU
Informing the ICO of the roosting locations	DPPO/DM
Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform district administration	CM
Traffic control, if required	SP
Inform villages in downwind direction	SDM, BDO
Alert primary health centres / hospitals in the area	DCMO, SDM
Media release	CM, DM

Declaration of L2

Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform District administration	CM



Traffic control, if required	SP
Inform villages in downwind direction	SDM
Alert primary health centres / hospitals in the area	DCMO
Media release	CM, DA , DI

Control operations

Calibrate equipment	TL
Estimate swath width, decide on emission heights and track widths	TL
Non-stop operations	TL and CM
Six hourly reports	TL to CM
Twelve hourly reports	CM to DA
Campaign to continue till even isolated bands are destroyed	CM
Clean, maintain and store equipment	TL and CM
Disposal of empty insecticide containers	TLs, CM
Final report	CM

Declaration of L3

Request to DCA for aircrafts	APC
Request to DPPQS for tech assistance during aerial spray	DA
Intimation to concerned DMs	APC
Identification of suitable airstrips	CM, DM
Procurement of supplies: ATF, insecticides	CM, DA, DM
Ground monitoring	CM, TLs

Declaration of L0

Swarms destroyed	SDMA - APC
Assessment of loss due to locusts	DAO, DPPO, DSO
Recommendations for compensation if warranted	SDM, DM, RC
Sanction of compensation from CRF	RC
Disbursement of compensation	DM

5.8 Physical resources

Resources required for control operations can be broadly classified in three categories: Critical resources, manpower requirement and PPE (personal protection equipment)

Critical Resources

Sprayers



Hand held
Vehicle mounted
Aerial support (L3)

Insecticides
Spare batteries for hand held sprayers
Protective gear for field staff
Diesel for vehicles
First aid kits at each site

Manpower requirement

For each hand held sprayer : Four persons to operate in shifts
For each vehicle : Eight persons to operate in shifts - teams of two -
one must be a driver
To man the stores in shifts : Nine persons - teams of three
Support personnel : Paramedics

**Recommended minimum Personal Protection Equipment (PPE) if
insecticide belongs to WHO Classification II, III or U**

Activity	Required PPE
Moving and loading of ULV insecticides, equipment cleaning (<i>dustable powders</i>)	Boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, apron, face shield (<i>dust mask</i>)
ULV spraying (<i>if dusting</i>)	Closed canvas shoes or boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, face shield (<i>dust mask</i>)
Spray track marking (flagmen)	Closed shoes, cotton coveralls or two-piece work suit, hat
Insecticide transport	Closed shoes or boots, cotton coveralls or two piece work suit, gloves, apron, face shield, dust mask
Medium and large-scale insecticide storage	Boots, cotton coveralls, chemical-proof coveralls, gloves, hat, apron, face shield, dust mask, hard hat, respiratory protective equipment



Gloves and boots should be of PVC. *Natural rubber and butyl gloves are NOT recommended for locust control as they get permeated within 12 minutes.*

PREPAREDNESS MEASURES

Preparations for pre-determined Responses

Preparedness is directly related to plan responses. It denotes that the State is prepared to take the envisaged control measures. Thus, preparedness would entail the activities that would ensure plan responses at appropriate time. Preparedness activities are therefore, noted against plan responses:

	Plan responses	Preparedness measures	Action
1	Assessment of time for swarms to reach State	24. Training in locust behaviour 25. Training in forecasting methods 26. Drill in forecasting swarm movements- based on IMD data for States of Gujarat / Rajasthan	Directorate of Agriculture
2	Assessment of swarm strengths	27. Training in locust behaviour	Directorate of Agriculture
3	Estimating the required critical resources	28. Preparing list of required resources for swarms of varied sizes / behaviour	Identified CMs
4	Ensuring availability of equipment in working condition	29. Half yearly maintenance drill and stock verification	Identified CMs thru concerned DPPOs
5	Daily gathering of info on swarm movements	30. Training with DPPQS	Identified CMs
6	Availability of storage facilities in affected districts	31. Identification of suitable sites – preferably the existing godowns of PP at Tehsil levels	Identified CM through DPPOs
7	Availability of trained team leaders	32. Identification of team leaders 33. Training of team leaders	DA



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Government of Uttar Pradesh

8	Alert activation through the extension structure of plant protection	34. One mock drill every year	DA, will involve the DPPOs of target districts and the plant protection extension staff in those districts
9	Procurement of resources	35. Preparing list of approved suppliers 36. Keeping the rate contracts up-dated	DA
10	Operationalising campaign head quarters	37. Part of the once a year mock drill	CM with DPPOs
11	Making Tehsil wise teams	38. Preparing list of required resources for swarms of varied sizes / behaviour	Identified CMs with identified Team Leaders and plant protection extension staff
12	Deciding whether control is required	39. Training in locust biology & behaviour	Identified CMs
13	Drawing plans for control operations	40. Part of the annual control drill	Identified CMs
14	Availability of trained MOs during campaigns	41. Training to MOs for managing Malathion absorption thru skin and lungs	Directorate of Health
15	Equipment calibration	42. Training in control operations with hand held sprayers	Team Leaders and CMs thru DA
16	Campaign progress reporting	43. Part of annual drill	TLs, CMs thru DA
17	Request DCA for aircrafts	44. Keeping the details of appropriate channel ready, with annual up-dating of name and telephone numbers of concerned persons	DA



18	Procurement of ATF	45. Keeping th4e details of appropriate channel ready, with annual updating of names and telephone numbers of concerned persons	DA
19	Identification of suitable sites for airstrips	46. Selecting the sites meeting the guidelines of DCA for airstrips for agricultural aviation	DPPOs / Dy. Director Agriculture; DMs to be kept informed

Capacity building, Sensitization and other proactive measures

The State has no master trainers / trainers to train the field staff in locust control. This gap can be filled with the help of central institutions functioning in the State. DPPQS has been operating Integrated Pest Management Centre (IPMC) in the State at two locations – Gorakhpur and Lucknow. IPMC, being part of DPPQS is competent and adequately equipped to organise sensitization / training programmes on locust control for field staff of Directorate of Agriculture. Services of UPAAM may be commissioned to coordinate and conduct the sensitization programmes proposed in the plan.

Suggested Phases of Sensitization / Training Programmes

	<i>Years:</i>	2009-10	2010-11	2011 on wards
CMs		1	3	
Master Trainers		5	5	
Team Leaders		20	30	Part of regular sensitization programmes
Support staff		100	900	Part of regular sensitization programmes
Field functionaries*	NW Districts		All	Part of regular sensitization programmes
Medical Officers	NW Districts		All	Part of regular sensitization programmes

- *Of the Directorate of Agriculture*

FINANCIAL ARRANGEMENTS



Estimation of required financial resources

Financial resources required for this plan are estimated in two parts – cost of introducing the plan and cost of maintaining the plan – broadly akin to capital cost and operating cost.

One Time (Capital) Expenses

Particulars	Cost	
1 Training of Master Trainers	10.00	At Gujarat / Rajasthan
2 Training of CM (four persons)	30.00	FAO Training
3 Sensitization of Directorate staff	21.00	By UPAAM / MTs
4 Sensitization of TLs	2.31	By Mts/ UPAAM
5 Sensitization of support staff	2.31	By Mts/ UPAAM
6 Premises for Headquarters	36.15	Including cost of land
7 Generator set / switchgear	1.00	Lump sum
8 Acquisition of hand held sprayers	12.00	40 sprayers
9 Acquisition of PPE	1.00	100 sets
	115.78	

Running cost will be largely in maintaining the physical assets and in continued trainings & mock drills:

Running Expenses

1 Annual Sensitization	5.00	Part of regular training for directorate staff
2 Annual drills	6.00	Involving people in the vulnerable districts
3 Maintenance of equipment	1.20	10% of acquisition cost
4 Maintenance of premises	1.02	5% of construction cost
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	14.42	

**HQ premises will be in charge of the DPPO, Meerut. Only a watchman will be posted there; mechanical maintenance will be outsourced to suppliers.*

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Monitoring mechanisms, MIS

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organisational infrastructure. In the subsequent years the focus will be on preparedness.

MIS for the first two years

	Activity to be monitored	Responsibility	Monitoring authority
1	Selection of site for campaign HQ	DM Meerut	Pr Secy Agr
2	Construction of campaign HQ	PWD	Pr Secy Agr
3	Training CMs	Dy Dir PP	Dir Agr
4	Sensitization of TLs		
5	Sensitization MTs	DPPOs of western divisions	Dy Dir PP
6	Sensitization support staff		
7	Acquisition of sprayers		
8	Acquisition of PPEs	Dy Dir PP	Dir Agr
9	Pre contract agreements for Malathion		

MIS for subsequent years

	Subject	Report by	Report to	Frequency
1	Status of HQ	DPPO Meerut	Dy Dir PP	Half yeary
2	Status of plan updating	Dy Dir PP	Dir Agr	Half yearly
3	Status of Trained Personnel	Dy Dir PP	Dir Agr	Annual



PART I

GENERAL



CHAPTER 1 INTRODUCTION

1.1 Vision Statement

To create a Disaster Management Plan that will provide all information required to understand, prevent and mitigate the threats it covers while complying with the provisions of all Acts, executive orders, guidelines; and will be the most authentic and useful resource for ensuring the state of preparedness to meet those threats and for effectively managing any disaster situation arising from those threats.

1.2 Evolution of This Plan

This Plan has been prepared as a deliverable under UPAAM letter no.... dated The terms of reference require, *inter alia*, the plan to be in line with statutory provisions of the Central and UP State Disaster Management Acts, and also to incorporate the guidelines and executive orders issued by Ministry of Home Affairs GoI, and other instructions on the subject by GoI and GoUP. The mandate also gives specific details of some major issues to be covered under this Plan.

The Plan has evolved around the provisions, directives and objectives of related legislations, executive orders, and international development initiatives. The Plan incorporates the guidelines suggested by the two statutes – Disaster Management Act and Uttar Pradesh Disaster Management Act, Report of the High Powered Committee set up by GoI in 1999, NDMA, and UNDP.

While the objectives of a disaster management plan should remain the same whichever source it may originate from; the stance of a plan and its underlying thematic currents will tend to reflect the concerns of the



originator; and the plans so drawn would acquire different hues reflecting the differences in those concerns. Such differences would not merely consist of variations in details but would. They would go much deeper, in as much as they would espouse different approaches and would assign different importance to various sub-goals.

For developing this Plan as correctly reflecting the current concerns, suggested plan contents and recommended guidelines by different sources were carefully examined. Any such plan is essentially in response to the prevailing needs of the community. It is based on the prevalent socio-economic-political situation in general and the availability of resources in particular. It would, thus, require modifications with changes in those needs or in the societal perspective or in the resource-availability situation. It is, therefore, considered appropriate to clearly articulate those needs and perspectives which form the backdrop of disaster management initiatives undertaken in the country so far. The next few paragraphs provide a brief summary of such initiatives and of the frameworks suggested by the aforesaid Acts / Authorities / Organisation to sketch the setting for this Plan.

In 1999 GoI set up an HPC under the Chairmanship of Shri J.C. Pant to formulate a comprehensive, systematic and holistic approach to disaster management. The HPC emphasized shifting the focus of disaster management from relief centric reactive approach to a proactive approach based on the culture of preparedness, quick response, strategic thinking and prevention. It prepared comprehensive model plans for DM at the national level and provided detailed guidelines for drawing up such plans at state and district levels. It also emphasized vulnerability based planning and graded disasters at three levels: L1, L2 and L3, while denoting L0 as a “no-disaster situation”. It introduced the concept of “Trigger Mechanism” to spontaneously set in motion the process of disaster response.



The disaster management planning received a new orientation with the passage of the Disaster Management Act, 2005. This Act created NDMA and stipulated preparation of a National Plan on Disaster Management in consultation with the State Governments and expert bodies. *It also stipulated that every Ministry and Department of the Government of India should make provisions, in its annual plan budgets, for carrying out activities and programmes set out in the disaster management plans.* It appears that similar stipulation has not been made in the UPSDM Act, which entered the statute-book before the enactment of the Central Act. Further, S40 of the Act stipulates that the DMP of every department of State Government shall lay down, inter alia, “the roles and responsibilities of the department of the State in the event of any threatening disaster situation or disaster and *emergency support function* it is required to perform” as also the “present status of its preparedness to perform such roles or responsibilities or emergency support function”.

In 2006 the Planning Commission, while formulating the Eleventh Five Year Plan (2007-2012) examined the manner in which measures for disaster mitigation, preparedness and capacity building should be enhanced and integrated into the development plans of the Centre and the States and how to ensure that appropriate financial provisions for disaster management are built into the cost estimates.

Meanwhile in 2002, a Disaster Risk Management Programme was taken up in 169 districts in 17 multi-hazard prone States with the assistance from UNDP, USAID and European Union. Under this project, the States were assisted to draw up State, District and Block level disaster risk management plans; village disaster risk management plans in conjunction with the Panchayati Raj Institutions. This programme also helped create disaster management teams at village levels onward, of volunteers trained in preparedness and response functions such as search & rescue, first aid, relief coordination, shelter management etc.



In addition to these, an all parties National Disaster Management Committee was constituted in 2001 with the PM as its chair in the aftermath of the Gujarat earthquake. The Committee invigorated the political will and various states, notably Orissa and Gujarat, created their SDMAs.

As may be seen, a lot of measures were being taken, suggested under different initiatives by different organizations. This has, occasionally, introduced variant terminologies. For instance UPAAM's work order refers to Crisis Management Groups (CMGs) at District / Block levels but the same body is referred to as Disaster Management Committee (DMC) in the UNDP Project on DRM.

The UNDP Project and NDMA's initiatives led to creation of India Disaster Resource Network (IDRN), a powerful tool for prompt response to disaster situations.

As mentioned earlier the HPC report classified situations based on non-existence or severity of disaster as L0, L1, L2, and L3. Situations may arise in a number of cases where a disaster of unknown severity may appear impending without actually taking place. Examples would be formation of a cyclone heading towards Indian shores, swarms of locusts flying across international boundaries, intelligence reports on simmering civil disorder or communal tension etc. Naturally such information would be quickly shared, at appropriate levels, with the communities likely to be affected giving rise to "alert" situations. Such cases, L0 with "alert", it was found, were so very different from L0 without "alert" that they merited a different category for themselves. As we already have a plethora of nomenclature, without actually naming such situations separately, this Plan emphasizes the *changed* roles of everyone concerned with disaster management when an "alert" is received.



The Plan is focused on the specific deliverables in the work order of UPAAM.

1.3 Themes and Underlying Currents

There are three essential themes running through the Plan: preparedness, development and equity. Preparedness implies a proactive approach, which emphasizes prevention and mitigation rather than reactive responses to an event; development underscores the inverse correlation between human sufferings during disaster and development status of a community; and equity ensures that the weak and helpless sections, which usually suffer worst during any disaster situation, are never lost sight of.

The HPC report defined a disaster as “an occurrence of a severity and magnitude that normally results in deaths, injuries, and property damage, and *that cannot be managed through the routine procedures resources of government*. It usually develops suddenly and unexpectedly and requires immediate, coordinated and effective response by multiple government, voluntary and private sector organizations to meet human needs and speed recovery”. DMA (the Act), on the other hand defines disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be *beyond the coping capacity of the community of the affected area*”. Clearly, a situation becomes a disaster if the community is unable to cope with it in the normal course. Thus, the same situation may be a disaster for one community (of less coping capability) and a *non-disaster situation* for another. Accordingly, this Plan is first aimed at improving the “coping capacity” of the community, which if inadequate may turn even a relatively tame occurrence into a disaster. Thus the measures to be adopted for prevention and mitigation of disasters, that would improve the coping capacity of the society, constitute the first major theme of the Plan



The second theme weaves around the manner in which mitigation measures are to be integrated with development plans and projects of State. It is driven by two concerns; firstly the well established link between higher development level and lesser damage to human lives in disasters; secondly to ensure availability of funds for disaster mitigation activities on a regular basis. The Act defines “mitigation” as “measures aimed at reducing the risk, impact or effects of a disaster or threatening disaster situation”. Obviously resources from Calamity Relief Fund (CRF) are not available for mitigation activities. Though there has been some thinking on Disaster Mitigation Fund (DMF) for sometime, and DMF is a statutory requirement for all States, still there seems to be no unanimity on what should constitute DMF.

One approach is that it may comprise all Plan schemes which qualify as ‘mitigation’ under the Act. Another is that it may consist of a fixed percentage of total plan allocation to be spent only on such mitigation activities that are not covered under any of the existing plan scheme. Planning Commission has suggested that 0.5% of the total plan allocation of each Ministry/ Department be earmarked for NDMF. The third approach, favoured most by cash strapped states is that DMF may only consist of a small token amount to be utilized for unforeseen mitigation measures. This Plan is driven by the realism that disaster management and development must move in tandem else decades of development gains may get lost in a few minutes of disaster. This realization calls for total internalization of DM processes in the planning processes making it the second major theme underlying this Plan.

The third theme of this Plan, “equity”, is borne out of the repeated observations that weaker sections continue to remain more exposed to sufferings from disaster risks than others. The powerless need more support from the community to cope with the hazards of disaster. To ensure that the



special needs of pregnant ladies, lactating mothers, other women, children, aged and disabled are not lost in the flurry of operations the Plan has consciously kept them always in focus. A more effective way of ensuring it is to affirmatively seek their participation during preparedness and mitigation processes as well. As it is not practicable to seek participation of pregnant ladies in mock drills etc the Plan envisages participation of such sections of the community who are more acutely alive to their needs – hospitals, maternity homes, sanitarium and asylum (where existing) staff etc.

Other basic issues underlying the Plan are those raised by NDMA, namely, emphasis on Community Based Disaster Management (CBDM), awareness generation, training needs analysis, knowledge management, development of a state Human Resources (HR) plan, and early warning and forecasting system. As stipulated in the Act, the Plan also sets down standards for relief, rehabilitation etc.

1.4 Objectives of the State Plan

The only plausible objective for a Disaster Management Plan can be to ensure least human sufferings and least damage to properties from disastrous situations, and quickest recovery and reconstruction in post-disaster period.

This Plan sets out a roadmap in line with statutory provisions of the Act, UPSDM Act, also with the guidelines and executive orders issued by MHA, GoI, and other instructions on the subject by GOI and GoUP to achieve the final objective by setting some strategic goals, and identifies intermediate objectives as major milestones. The Plan aims at the following four strategic goals:

1. Professionalising the entire disaster management process
2. Making preparedness, risk reduction / mitigation parts of their normal processes by concerned departments / organizations



3. Strengthening institutional mechanisms to achieve the highest degree of coordination
4. Strengthening emergency response systems by ensuring that responses are prompt and effective
5. Strengthening rehabilitation and recovery structure

The Plan sets out the following intermediate objectives:

1. Identification of risk reduction / mitigation activities for different types of disasters
2. Classification of necessary activities for effective preparedness for different Departments / Organizations
3. Identifying emergency responses for different types of disasters
4. Situation analysis to understand and identify gaps, if any, in
 - a. Resource availability, and
 - b. Institutional mechanisms
5. Creating appropriate structure for seamlessly providing relief and humanitarian assistance
6. Enabling faster recovery through reconstruction and rehabilitation
7. Creating system and infrastructure for effective training and capacity building for risk mitigation, prevention and response
8. Creating heightened awareness among the community-members by education and communication activities



CHAPTER II

OVERVIEW OF THE STATE

Located at the heart of India, Uttar Pradesh is the largest state in terms of population and the fifth largest in terms of area. The state is divided in four economic regions i.e., Western, Central, Bundelkhand and Eastern. Lying largely in the Gangetic plains (except the Bundelkhand region), the economy of the state is based on agriculture. Location in the Gangetic plains and dependency on agriculture give rise to their own potential calamities. A scanty rainy season can lead to near drought conditions with drinking water scarcity; and a heavy rainfall can cause a flurry of floods destroying cultivation, damaging property, disrupting road transportation, water supply, electricity supply systems etc.

The impact of natural calamities is felt more severely by the weaker sections of the society. Immediate relief followed by long term remedial measures is, therefore the main concern of the State Government so that the weaker sections like small and marginal farmers are provided with necessary support to save them from hardships, starvation and unemployment.

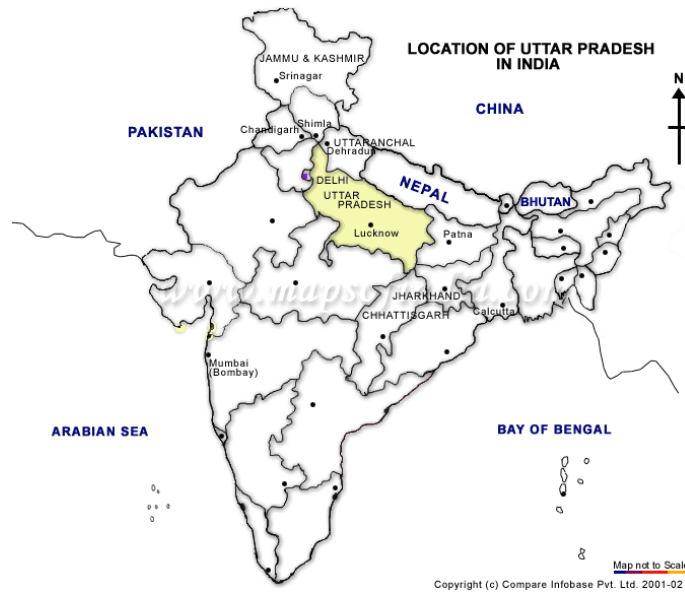
2.1 Topography

Uttar Pradesh is bounded by Nepal and Uttaranchal on the North, Haryana and Rajasthan on the west, Madhya Pradesh and Chhattisgarh on the south and Bihar and Jharkhand on the east. Situated between 23° 52' N and 31° 28' N latitudes and 77° 3' and 84° 39' E longitudes, Uttar Pradesh can be divided into two distinct geographical regions:

- The Gangetic plain in the North, West, Centre and East.
- The Vindhyan hills and plateau in the south



DISASTER MANAGEMENT PLAN-LOCUSTS
Government of Uttar Pradesh

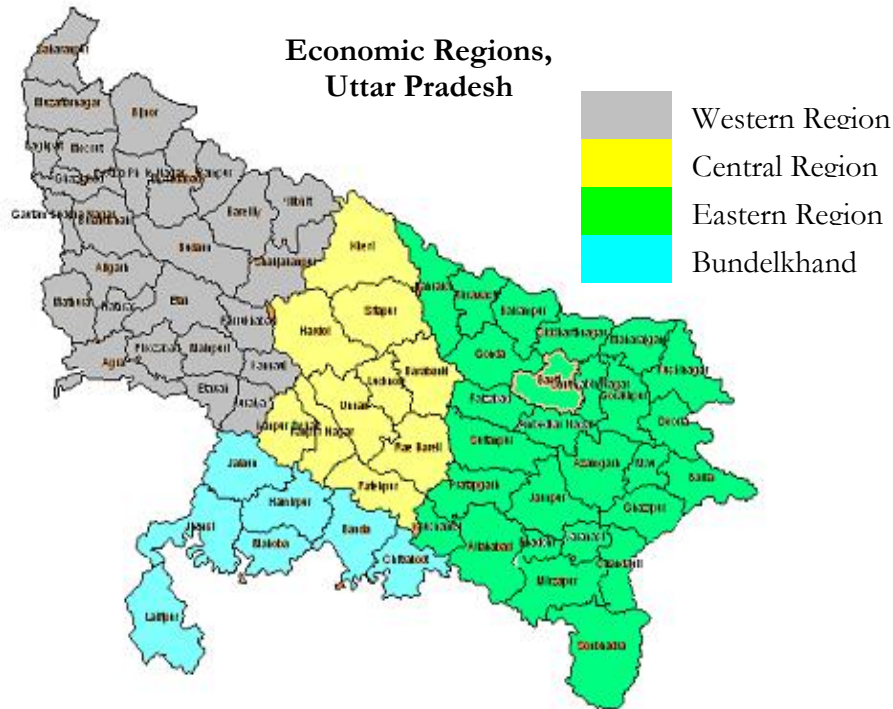


The state has 71 districts, grouped in 17 divisions, again grouped in 4 regions, based on physiographic characteristics and varied social and economic conditions: the Eastern, Central, Western and Bundelkhand regions. The broad characteristics of these regions are;

- Eastern region: Wide alluvial plains with dense rural population (776 persons per sq km), higher proportion of cultivated land.
- Central region: Level riverine plane characterized by fertile alluvial soil, dense population (658 persons per sq km), lower rural density compared to Eastern region.
- Western region: Varies from riverine alluvial plain to generally uniform and level with slight undulations towards south, slopes from north to south or south to east with reference to alignment of major rivers, economically developed and has larger urban centres; population density of 765 persons per sq km.
- Bundelkhand region: Northern part is plain, southern part has gentle undulating surface, due to undulating and rugged surface, Bundelkhand plateau has lower population concentration (280 persons per sq km) compared to other regions.



A map of UP showing the districts in each region is presented below:



2

The state of Uttar Pradesh has an area of 240,928 sq. km. comprising 71 districts 300 tehsils, 809 CD Blocks and 107,452 villages (including forest villages). It may be mentioned that Kanshi Ram Nagar district was created after the 2001 Census from Etah district. As a result, the data for this newly created district is not available independently. The total number of towns in the state is 694 of which 638 are statutory towns and 66 census towns.

2.3 Physical regions

Uttar Pradesh forms a major area of the Northern fertile plain or the Indo-Gangetic plain. As already mentioned The Eastern, Western and Central regions fall under fertile alluvial plains. The Bundelkhand region lies in the Vindhyan plateau. Uttar Pradesh is endowed with natural wealth in the variety of rocks of different ages found in mountain ranges of the Himalayas in the North and Vindhyan ranges in the South. The diversity of



flora and fauna displayed here due to vast area, big and small rivers, varieties of climatic conditions, and different kinds of soils is hard to find elsewhere.

2.4 Climate

The climate of Uttar Pradesh is tropical monsoon in character. The standard temperature varies in the plains from 3-4°C in January to 43-45°C in May and June. Uttar Pradesh mainly experiences three distinct seasons - winter from October to February, summer from March to Mid June and the rainy season from mid June to September. The Himalayan region gets about 100-200cm of rain fall. The rainfall in the plains is heaviest in the east and decreases as one proceeds towards the north-west. Floods are a chronic problem of the state, causing damage to crops, life and property. Flood water during the rainy season becomes a major hindrance for tourists traveling to Uttar Pradesh. There are occasional cloud-bursts adding to the misery of the people. The most severe floods were in 1971, when 51 of the then 54 districts of the state were affected across nearly 52 lakh hectares.

The eastern districts are the most susceptible to floods, the western districts somewhat less and the central region markedly less. The eastern district's proneness to floods is attributed, among other things, to heavy rainfall, low and flat topography, high subsoil water level and the silting of beds which causes river levels to rise. The problem in the western districts is mainly poor drainage caused by the obstruction of roads, railways, canals, new built-up areas etc. There is water logging over large areas. The major flood-prone rivers are the Ganga, Jamuna, Gomati, Ghaghra, Rapti, Sarada and Ramganga. The insufficient drainage capacity of the smaller western rivers Sirsa, Kali and the Aligarh drain is also a cause of floods.

2.5 Temperature and Rainfall

The seasons in Uttar Pradesh can be divided into Summer, Monsoon and Winter. The temperature varies with the change of seasons. Summer season,



which is very hot and dry, continues from March to June. The temperatures during this season rise to 45°C, sometimes 47-48°C. There is low relative humidity of about (20%) and dust laden winds flow throughout the season. Monsoon season runs from June-September. The state receives 85% of average annual rainfall of 990 mm. during the season. The temperature is around 35-42°C on during the season. Winter season starts from October-February. The minimum temperature is around 3-4°C and sometimes goes below -1°C. The maximum temperature remains around 15 °C to 25 °C.



2.6 River systems and Dams

The state has a large network of rivers consisting of Ganga, Yamuna, Ghaghra, Saryu, Ramganga, Sharda, Rapti, Gandak, Gomti etc. These constitute perennial sources of water for the state. However, these rivers also cause serious floods during the months of August and September in most of the districts in the state. The major dams in the state are listed below:



1. **Matatila Dam** is constructed on Betwa River in Lalitpur District
2. **Parichha Dam** is also built on the Betwa River near Parichha town, which is about 25 km from Jhansi. Its reservoir - a placid stretch of water that runs to Notghat Bridge, 34 km away from Jhansi - is ideal for water sports.
3. **Rihand Dam** is built on Rihand River, a tributary of River Sone, at Pipri in Sonbhadra District, near the border of Madhya Pradesh and Uttar Pradesh. It also produces power with its 6 units, each of 50 M.W. Many other seasonal and perennial rivers join the Rihand reservoir such as River Kanchan, Mayar and Azir.
4. **Jamini Dam** is constructed on Jamini River in Lalitpur District.
5. **Rohini Dam** is constructed on Rohini River in Lalitpur District.
6. **Shahzad Dam** is located on the outskirts of Lalitpur. It is built across the Shahzad River, a tributary of the Jamini River. It is a major source for irrigation in Lalitpur District and a major tourist attraction in the region.
7. **Govind Sagar Dam** too is constructed on Shahzad River in Lalitpur District.
8. **Sajnam Dam**, is constructed across the River Sajnam, a tributary of the Jamini near Chandawali in Lalitpur District. It is a major irrigation source and also a tourist attraction.
9. **Sukma-Dukma Dam** is constructed on Betwa River near Jhansi District.
10. **Arjun Dam** is an earthen type dam on Arjun river at Charkhari, about 20 km from Mahoba.



11. **Lakheri Dam**, in Jhansi district, provides irrigation facilities to the villages in the region and is a major source of water in Garautha tehsil.
12. **Maudaha Dam**, situated in Rath tehsil of Hamirpur district, is constructed across the Birma River, a tributary of the Betwa River. Apart from irrigation, Maudaha Dam provides drinking water to the larger parts of the region.
13. **Obra Dam**, situated in the outskirts of Sonbhadra, across the Rihand River, supplies water to the Obra Thermal Power House. The dam also has hydel power generation capacity of 99 MW.
14. **Rajghat Dam**, constructed on the Betwa River at 22 kms from Lalitpur, is a joint venture of the Governments of Madhya Pradesh and Uttar Pradesh.

2.6 Demography

2.6.1 Population

The total population of Uttar Pradesh, as per 2001 Census is 166,197,921 comprising of 87,565,369 males and 78,632,552 females. 79.21 percent resides in the rural areas. The total number of households comes to 25,757,640. The average size of households in the state is 6. The proportion of scheduled caste and scheduled tribe population to the total population in the state comes to 21.1 and 0.1 respectively. The density of the state stands at 690 persons per sq. kms. A map showing density by districts in the state is given below:



Population Density by Districts



2.6.2 Religious Communities

Major religious communities are Hindu, Muslim, Christian, Sikh, Buddhist and Jain. As much as 80.61% are Hindus followed by 18.50% Muslims. The population of other religious communities is negligible. There are 24 districts in the state which have a higher population of Muslims as compared to the state average. The top five such districts are: Rampur (49.14%), Moradabad (45.54%), Bijnor (41.71%), Jyotiba Phule Nagar (39.38%) and Saharanpur (39.11%). Other districts with more than state average of Muslim population are Muzaffarnagar, Balrampur, Bahraich, Bareilly, Meerut, Siddharthnagar, Shrawasti, Baghpat, Sant Kabir Nagar, Ghaziabad, Pilibhit, Barabanki, Budaun, Bulandshahr, Lucknow, Gonda, Sitapur, Kheri and Mau.

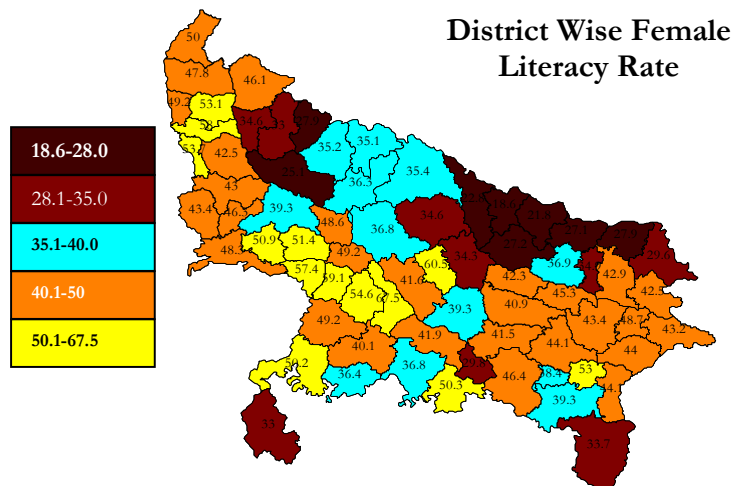
2.6.3 Sex Ratio

It is the number of females per 1000 males in a given area and is indicative of the condition of females in the society. The Indian Census also provides the sex ratio in the age group 0-6 so as to gauge the discrimination between the boy and the girl child. The sex ratio of the state is 898 while that in the age group 0-6 is 916. There is a difference of 18 points in the sex ratio of two age groups. It is obvious that more care is taken in upbringing of male child as compared to female child. The four districts in UP with a female dominated sex ratio are Azamgarh (1020), Jaunpur (1014), Pratapgarh (1004) and Deoria (1002). The lowest sex ratios have been recorded in Shahjahanpur (842), Budaun (842), Gautam Buddha Nagar (841) and Mathura (840).



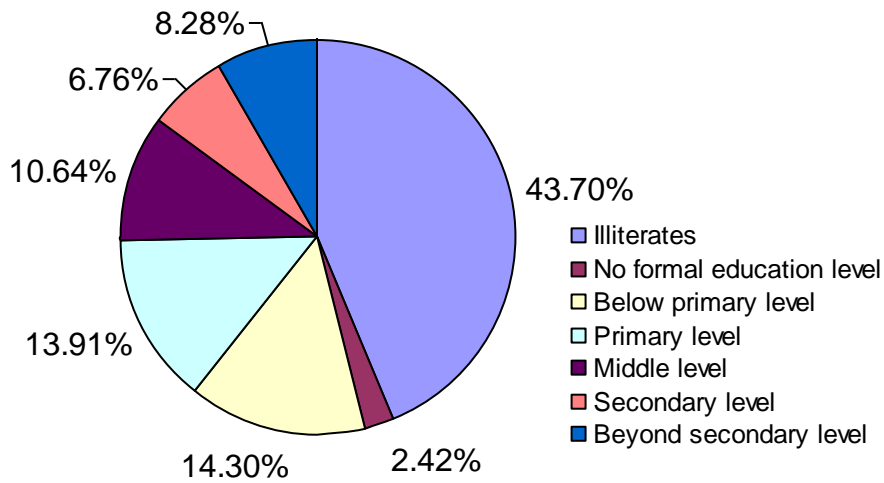
2.6.4 Literacy and Education

The literacy rate of the state is 56.3% which is way below some the other major states like Kerala (90.9), Maharashtra (76.9) and Himachal Pradesh (76.5). Uttar Pradesh ranks 17th in literacy rate among 19 major states. The state has an identical female literacy rank among the major states with 42.20%. Concerning districts, Kanpur Nagar (74.37%), Auraiya (70.50%) and Ghaziabad (69.74%)v have the highest overall literacy rate. The lowest ranked in the list are Bahraich (35.16%), Balrampur (34.60%) and Shrawasti (33.82%). With regard to female literacy, the top three districts are Kanpur Nagar (67.46%), Lucknow (60.47%) and Auraiya (59.13%), While the bottom three are Bahraich (22.78), Balrampur (21.79%) and Shrawasti (18.58%). A map showing female literacy is given below:



2.6.5 Educational Level

4.3% of all literates in the State are without any formal education level. These persons have not achieved any educational level but can read and write with understanding as per the 2001 Census. It means they have not attended any formal school. 25.4% of the literates are educated up to below primary and 24.7% up to primary levels. Thus, over half of the literates have not completed school education beyond primary level. Those achieving middle and Matric / Secondary level of education are 18.9 and 12.0%. It may be seen that 56.3% are literate and of those as many as 85.4 % have either achieved a level below matriculation or none at all. Thus only about 8% of the total population has received education beyond secondary level.



Among the two major religious communities, Hindu appear to be better educated, (only marginally though), than Muslims. The table given below presents full details.

Educational Level in the Two major Religious Communities in UP

Educational Level	All Religions			Hindus			Muslims		
	P	M	F	P	M	F	P	M	F
Literates to total population	56.3	68.8	42.2	58.0	71.2	43.1	47.8	57.3	37.4
Literate with no education	4.3	4.0	4.9	3.7	3.5	4.1	7.7	6.8	9.1
Below primary	25.4	23.1	29.6	24.2	21.9	28.5	32.5	30.2	36.5
Primary	24.7	23.2	27.3	24.1	22.4	27.3	28.1	28.3	27.9
Middle	18.9	20.1	16.8	19.8	20.8	17.8	14.6	16.2	11.8
Matric/Secondary	12.0	13.4	9.5	12.6	14.1	9.9	8.6	9.4	7.2



HS / Inter / Pre-U / SS	7.9	8.6	6.5	8.4	9.2	6.9	4.6	4.8	4.3
Others not equal to Degree	0.2	0.2	0.1	0.2	0.2	0.0	0.2	0.3	0.2
Graduate & above	6.6	7.3	5.1	7.0	7.9	5.4	3.6	4.0	3.0

Among Hindus the proportion of those achieving a level below or equal to Matric or Secondary comes to 84.4 while that of Muslims is as high as 91.5 percent.

2.6.6 Socio-economic profile

Uttar Pradesh (UP), with a population of 16.6 million in 2001 has 16.17% of the country's population living on 240,928 Sq.Kms, which is 7.3 % of the country's area. The population density as per the census of 2001 is 689 per sq. km as against 324 per sq. km for the entire country. Agriculture is the single largest sector of the economy employing 72 % of the labour force and accounts for 46 percent of the state income. Although predominantly an agriculture driven state, with 79 % of the population living in rural areas and agriculture being the main occupation of 78 % of the population, UP is the third poorest in terms of per capita production of food grains as well as in terms of growth rate in the production of food grains. The state is the largest producer of food grain, sugarcane and oil seeds.

Uttar Pradesh ranks low on most of the social development indicator in spite of being the most populous state in the country. The state domestic product increased @ 3% during 1997-2002 against national average of 5.3% during same period. The state's contribution in National Income according to quick estimates for 2002-2003 was 8.3%, placing UP among poorest states in the country.

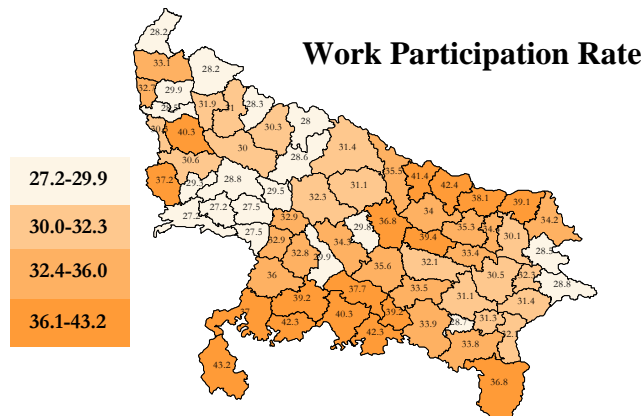
In 1973-74, the number of persons below the poverty line was 53.5 million, which were about 57 percent of the states' population. It was about 16.7 % of the total number of persons living below poverty line in the entire country. The number of persons living below poverty line is 31.15 % in 1999-2000



compared to all India 26.10%. Out of this the poverty ratio in rural areas is 31.22 % and that is the urban areas 30.89 %. It is revealed that though there is a significant declining trend, yet the number of persons living below poverty line in the state remains above 50 millions within a span of 27 years. About 41 million population below poverty line lives in rural area.

2.7 Economic Activity

The work participation rate or WPR (work population rate is arrived at by dividing the number of workers with total population) in the state is 32.5 percent as per the results of 2001 Census. The male WPR is 46.8 percent while that for females is only 16.5. The economy in Uttar Pradesh is basically agricultural. Thus, the proportion of workers engaged in cultivation, whether as cultivators or agricultural labourers, is as high as 65.9%. The proportion of Household Industry workers is 5.6%. Rest 28.5 % is engaged in the category of other workers which includes the secondary and tertiary sectors. A map showing Work Participation Rate by district is presented below:



2.7.1 Agriculture

Uttar Pradesh economy is primarily agrarian in nature. Agriculture contributes about 40 percent to the state gross domestic production as against 25 percent at the national level. This sector engages over 70 percent of the population and 65 percent work force in the state. State has a geographical area 24.2 million hectares and out of this 16.8 million hectares area is actually cultivated. The un-irrigated area is 3.98 million hectare. The



state is geographically located in the most fertile tract of indo-gangetic plains. The state has good soils and water availability through rainfall and river flow.

Uttar Pradesh is largest producer of wheat in the country contributing about 36 percent of the all India production whereas UP is second largest producer of rice, contributing about 15 percent to the national production. The area under these crops is predominantly less than the contribution in terms of production. UP is the second largest pulses producing state in India, contributing to about 45 percent of national production; but its production falls short of what is needed to feed its population. Similarly, in oilseed crops, state is contributing about 18 percent production of rapeseed / mustard. State also contributes about 45 percent sugarcane production in the country. The state is largest producer of potato with about 40 percent of national production while its contribution of mango and guava are about 40 and 46 percent respectively. In all, the state produces about 10 million tonnes of fruits and 17 million tonnes of vegetables.

2.7.2 Industry

Uttar Pradesh ranks fifth in the country both in terms of number of factories and of invested capital. In 2003-04 it had 9,237 factories, comprising 7.2% of total 129,074 factories in India. Growth of industry in UP is not keeping pace with the national growth rate. During 2003-06 UP received only 5 approvals of total 213 industry parks approved in the country.

Uttar Pradesh has 65,538 SSI units i.e., 11.3% of all SSI units in India and ranks fourth in the country in number of SSIs. It has one operational special economic zone at Noida and three approved and under establishment SEZs, one for textiles at Moradabad, and two multi-product SEZs at Bhadohi and Kanpur.



The industrial growth of Uttar Pradesh has been primarily driven by four factors, namely, the traditional skills of local artisans (carpets, brassware, bangles etc), availability of agriculture produce as industrial inputs (sugar, alcohol, other downstream chemicals), its proximity to national capital and huge population and large tracts of agricultural land that offer a big market for many manufactured produce. The first three growth drivers have contributed to concentrated pockets of industrialization.

Terai region has a number of sugar mills and a few chemical units that use molasses as feed. Kanpur / Agra have well developed leather industry, Eastern UP has weaving – textiles and carpets, Moradabad has brassware, Shikohabad has bangles and Khurja has ceramic potteries. Ghaziabad, a district adjoining the national capital has a large number of manufacturing units and newly developed NOIDA has forged ahead in services sector. UP State Industrial Development Corporation (UPIDC) has created a number of industrial states, which have attracted many prestigious industries. UP also has Hindalco, one of the major aluminium manufacturers of the country at Renukoot and an atomic power plant at Narora.

Manufacturing however is the last in contribution to the State Gross Domestic Product. In 2004-05 secondary sector (manufacturing) accounted for 24% of SGDP, primary sector (mostly agriculture) contributed 33% and, tertiary sector comprising transportation, communication, banking, real estate and other services, contributed maximum at 43%. The growth rate of the States SGDP, in line with the trend in national income, had risen from a 1% in 2000-01 to 5.8% in 2002-03. It stood at 4.8% during the year 2004-05. Over the five-year period (2000-05), tertiary sector posted a compounded annual growth rate of 5.5%; secondary sector at 4.4%, and primary sector grew at just 1.8%. Per Capita Income of the state, at 2004-2005 prices, stands at Rs.11477.



2.7.3 Mines

Uttar Pradesh has limestone in Mirzapur and Sonbhadra districts; dolomite in Mirzapur, Sonbhadra and Banda districts, glass-sand in Allahabad Banda and Mau districts; marble in Mirzapur and Sonbhadra districts; bauxite in Banda; non-plastic fireclay in Mirzapur; and Uranium in Lalitpur district. Besides, Barytes and Edalusite are found in the districts of Mirzapur and Sonbhadra. Southern parts of Sonbhadra district also have sizeable coal deposits mined by Northern Coalfields Limited, a public sector company with headquarters in Chhattisgarh. Sand-stone, pebbles, reh, salt punter, morang, sand and other minor minerals are also found in the State.

Mirzapur – Sonbhadra area can be considered as the most significant mining belt of the state.

2.8 Health Infrastructure

Health infrastructure in the State is far from adequate, as would be evident from this table:

Particulars	Required	In place	Shortfall
Sub-Centres (SCs)	26344	20521	5823
Primary Health Centres (PHCs)	4390	3660	730
Community Health Centres (CHCs)	1097	386	711
MPW (Female)/ANM at SCs & PHCs	24181	21900	2281
Health Worker (Male) MPW(M) at SCs	20521	5732	14789
Health Assistant (Female)/LHV at PHCs	3660	2128	1532
Health Assistant (Male) at PHCs	3660	4061	-
Doctor at PHCs	3660	NA	NA
Obstetricians & Gynaecologists at CHCs	386	123	263
Physicians at CHCs	386	123	263
Paediatricians at CHCs	386	13	373
Total specialists at CHCs	1544	413	1131
Radiographers	386	NA	NA

2.9 Transport and communication

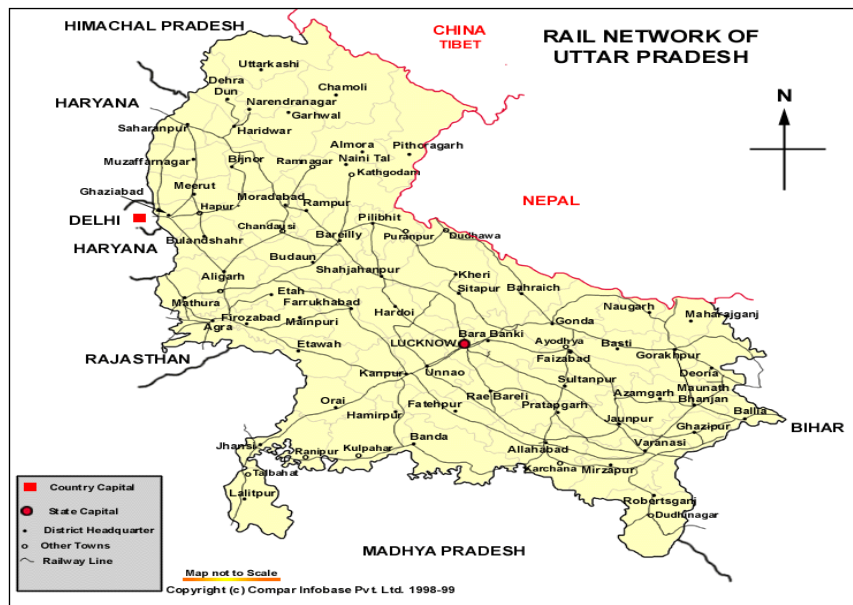


2.9.1 Roads

The state has the largest road network in the country after Maharashtra. There are 31 National Highways (NH), with a total length of 4,942 km (8.5% of total NH length in India). Total road length in the state is 248,481 km (2002), of which 67% (166,659 km) is surfaced and has the largest surfaced urban road network in the country i.e. 50,721 km, as on 2002. Besides total road length of PWD in the state is 118946 km. This includes 3869 km of national highways, 9097 km of state highways, 105980 of other district roads and 72,931 km of rural roads.

2.9.2 Railway

The state has the largest railway network in India with a total length of 8546 kms. Almost all the major as well as small cities in Uttar Pradesh are linked through railways. Cargo carried within the northern and north-eastern zone of the railways is approximately 133 million tonnes. Lucknow is the main junction of the northern network. Other important railway junctions are Agra, Kanpur, Allahabad, Mughalsarai, Jhansi, Moradabad, Varanasi, Tundla, Gorakhpur, Gonda, Faizabad, Bareilly and Sitapur.



2.9.3 Airports



Uttar Pradesh is well connected to Delhi and other cities in India. Uttar Pradesh has various medium and small sized airports that have the facility to operate and host flights. Some of the major cities that are connected through Air-service are Lucknow, Kanpur, Varanasi, Jhansi, Allahabad, Agra, Bareilly, Hindon (Ghaziabad), Gorakhpur, Sarsawa (Saharanpur) and Fursatganj (Raebareli). All these cities have airports, some (notably Lucknow, Varanasi, Agra, Jhansi) host flights from major cities in India. Varanasi and Lucknow have International Airports. Among the domestic airports, Lucknow is the best in terms of connection and infrastructure. The city is well connected to almost all the major destinations in India such as Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Bangalore, Agra, Jaipur, Varanasi and Patna among others.

2.10 Disaster Vulnerability of Uttar Pradesh

The physiographic profile of the state, described in details in this Chapter, bring to fore the following issues regarding its disaster vulnerability and challenges it may face in managing a disaster:

Natural disasters: Among the natural disasters, many are caused by weather factors – floods, storms, tsunami, hurricanes etc. UP, not being a coastal state is not exposed to tsunamis or seasonal hurricanes that form over seas. State is however exposed to the following natural disasters:

- Lying in close proximity to the Himalayan Range exposes UP to earthquake risks
- Dependence on rain fed agriculture over vast areas exposes the state to droughts
- Its riparian system exposes it to floods
- Western agricultural districts of the state are also exposed to locusts

Man made disasters: Population mix, concentration of industries, international borders, dams over rivers – all aggravate the potential threats from man made disasters.



- The population mix of the state gives rise to occasional communal clashes
- Long and porous international border makes it an easy target for anti national elements
- An atomic power plant in the state keeps the risks of a Chernobyl type disaster looming over the horizon
- The number of large and medium sized dams / reservoirs expose UP to the disasters arising from dam-bursts
- Concentration of industries in certain areas (and consequent mobility of population) may assist and promote simmering dissatisfaction among large number of peoples and lead to civil disturbance

The socio economic features of the state – low literacy level in certain districts and huge gaps in health infrastructure pose challenges in managing a disaster situation. It is not improbable that in certain villages of Eastern districts there might not be any person capable of understanding leaflets containing instructions on dealing with a disaster situation. Moreover, low education levels make a population more susceptible to machinations of anti national elements.

Inadequacies in health care system – both of trained persons and infrastructure – make it necessary to move casualties over large distances for proper treatment. This can be a big challenge during floods when roads may get submerged and large tracts get cut off. Concentration of industries and changes in the level of industrialization across the state have impacted the dynamics of labour migration with consequent effects on the social fabric that need to be kept in view while formulating any disaster management plans.

Against this background, three major causes of potential disasters in the state are described briefly.



2.10.1 Earthquakes

An earthquake is a series of vibrations on the earth's surface. It occurs without warning. It can cause grave damage to life and wreck the economy with long lasting adverse effects. Thus years of development gains may be lost in just a few seconds of a high intensity earthquake.

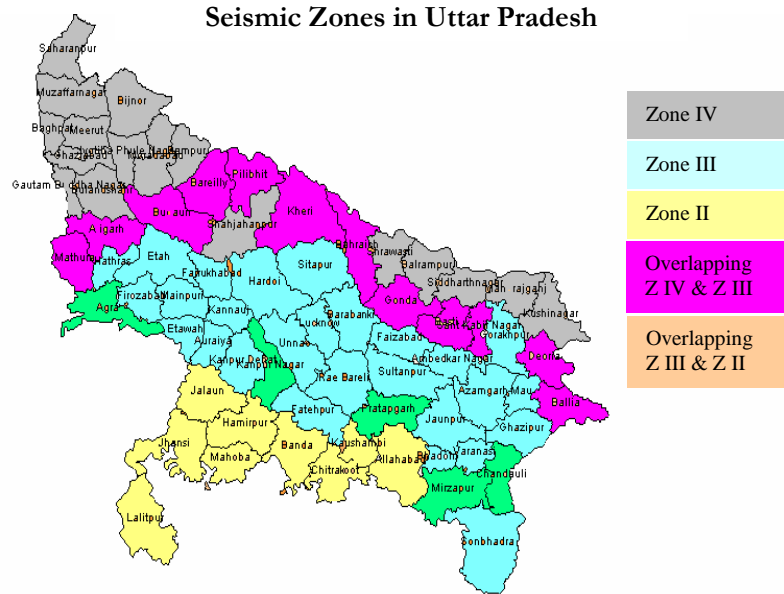
Earthquakes are caused due to the moving plates below the surface of the earth. Major earthquakes often occur around the edges of the moving plates and at other weak places in the crust called *faults*. Based on these faults the whole country is divided into Seismic Zones; Zone V being the highest risk zone. UP does not have any area falling under Zone V. The districts falling under Zones II, III and IV are noted below. The entire Himalayan Region is considered to be vulnerable to high intensity earthquakes

Zone IV : Entire districts of Saharanpur, Muzaffarnagar, Bagpat, Bijnor, Meerut, Ghaziabad, Gautambuddh Nagar, JP Nagar, Rampur, Moradabad, Bulandshar, Shravasti, Balrampur, Siddharthnagar, Maharajganj, Kushinagar, and parts Of Pilibhit, Shajahanpur, Kheri, Baharaich, Gonda, Mathura, Aligarh, Budaun, Bareilly, Basti, Sant Kabir Nagar, Deoria and Ballia.

Zone III: Entire districts of Sonbhadra, Chandauli, Ghazipur, Varanasi, Jaunpur, Azamgarh, Gorakhpur, Sultanpur, Raebareli, Faizabad, Unnao, Lucknow, Barabanki, Sitapur, Hardoi, Kannauj, Mainpuri, Firozabad, Etah, Mahamayanagar, Farukkabad, and parts of Mirzapur, Pratapgarh, Kanpurnagar, Auraiya, Etawah, Agra, Mathura, Aligarh, Badaun, Bareilly, Pilibhit, Kheri, Baharaich, Gonda, Basti, Sant Kabir Nagar, Deoria and Ballia.



Zone II : Entire districts of Lalitpur, Jbansi, Mahoba, Jalaun, Banda, Kausambi, Allahabad and parts of Agra, Etawah, Auraiya, Kanpur Nagar, Fatehpur, Pratapgarh and Mirzapur.

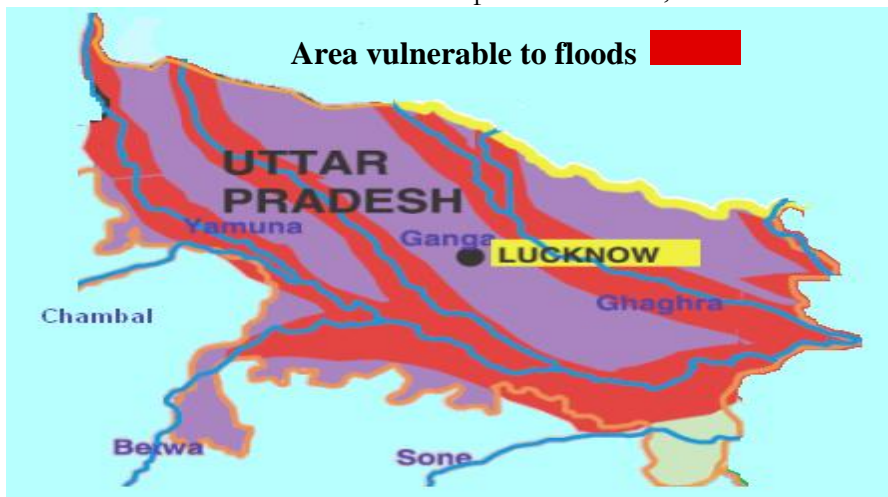


(The overlapping zones showed in the map above indicate that the whole district does not fall into a single zone.)

2.10.2 Flood Prone Areas

Floods are a chronic problem of the state, causing damage to crops, life and property. Flood waters during the rainy season often disrupt transport systems. The most severe floods were in 1971, when 51 of the 54 districts of the state were affected.

The eastern districts are the most susceptible to floods, the western districts



somewhat less and the central region markedly less. The eastern district's proneness to floods is attributed, among other things, to heavy rainfall, low and flat topography, high subsoil water level and the silting of beds which causes river levels to rise. The problem in the western districts is mainly poor drainage caused by the obstruction of roads, railways, canals, new built-up areas etc. There is water logging in the large areas. The major flood-prone rivers are the Ganga, Jamuna, Gomati, Ghaghra, Rapti, Sarda, Gandak and Ramganga.

(Source: NDMA Guidelines)

The Ganga River basin of U.P. experiences normal rainfall in the region from 60 cm to 190 cm of which more than 80% occur during the southwest monsoon. The rainfall increases from west to east and from south to north. Similar is the pattern of floods, the problem increases from west to east and south to north. Out of the 240.93 lakh hectares geographical area of the State about 73.06 lakh hectares is flood prone. As per the Irrigation Department's estimate, only 58.72 lakh can actually be protected. Up to March 2004, only 16.01 lakh hectares has been protected. The eastern districts as well as those situated in the Terai region bordering Nepal are the most affected. Due to floods, an average of 26.89 lakh hectares is affected annually, and the estimated loss to crops, houses and livestock is to the tune of Rs.432 crore annually. Apart from these, loss of human life also occurs.

2.10.3 Drought Prone Areas

Drought is generally considered to be occurring when the principal monsoons fail or are deficient or scanty. Monsoon failure results in crop failure, shortage of drinking water as well as undue hardship to the rural and urban community. Drought is declared for each state or part(s) of a state by the State Government under the Relief Manuals or similar documents of the State Government. Declaration of drought is primarily based on the quantum of rainfall, damage to kharif crops and lesser availability of drinking water and less moisture in the soil. It may be mentioned that there is no universally accepted definition of drought.



The identified drought prone districts of UP are Allahabad, Banda, Hamirpur, Jalaun, Mirzapur and Varanasi, Hathras, Mainpuri, Bareilly, Hardoi, Unnao, Rae Bareli, Farrukhabad, Kannauj, Kanpur Dehat, Fatehpur, Sultanpur, Basti, Sant Kabir Nagar, Kushinagar, Deoria, Mau, Ballia, Jaunpur and Ghazipur.



PART II: DISASTER SPECIFIC

LOCUSTS



Chapter 3

Vulnerability Assessment and Risk Analysis

3.1 What are Locusts?

Locusts have been known to plague agrarian societies since ancient Egyptian civilisation. There are several types of locusts, Desert Locusts (DL), usually found in the arid and semi arid deserts of Africa, Middle East and South West Asia. Locusts do not attack people or animals and there is no evidence that suggests that locusts carry diseases that could harm humans. But they constitute a serious threat to food security as they can form large and highly mobile swarms capable of migrating over large distances and destroying standing crops over large areas.

Locusts are members of the grasshopper family. Unlike grasshoppers they can change their behaviour and physiology, in particular their colour and shape in response to changes in their population density. Adult locusts can form swarms which may contain thousands of millions of individuals and which behave as a unit. Like many insects, locusts do not have wings during their entire life cycle. Unlike common grasshoppers, the non-flying locusts too at times form large groups called “bands”, which are cohesive mass of hoppers that persist and move as units. In general, most grasshoppers do not form bands or true swarms. The following table shows the place of locusts in Animal Kingdom:

CLASS	INSECTA
ORDER	ORTHOPTERA
SUBORDER	CAELIFERA
SUPERFAMILY	ACRIDOIDEA
FAMILY	ACRIDIDAE
SUBFAMILY	CYRTACANTHACRIDINAE
GENUS	Schistocerca
SPECIES	Gregaria



Locusts have two different states called phases: solitary and gregarious. When locusts are present at low densities, the individuals are solitary. As locust numbers increase, they cluster into dense groups and they become gregarious. Behavioural changes can take place rapidly. But in the field, it can take several generations before crowding occurs and solitary individuals behave fully gregariously.

Changes in colour and shape (morphological changes) take more time. It takes one crowded generation to develop the full gregarious colour and takes two or more generations to develop shape. The change in locust colour and shape occurs after the behavioural change. Colour and shape thus indicate how the locusts have been behaving but may not be a reliable guide as to how they will behave in the future. *Therefore, behaviour is the best and most useful phase characteristic to use in locust control work.*

The threat from locusts arises only when they become gregarious. Locusts existing in different habitats, with different conditions of desert, behave differently in each of these settings. In some cases, gregarization may occur when there are only a relatively few locusts; in other cases, it may not occur when there are large numbers of locusts. Phase change is often related to different types and densities of vegetation. The impact of crowding on phase change is also related to the age of locusts. Younger locusts need more crowding for phase change than older locusts.

Life Cycle Of Locusts & Related Parameters

Stages	Egg, hopper, adult	
Durations	Egg	10-65 days
	Hopper	24-95 days (36 days average)
	Adult	2.5-5 months
	Laying-fledgling	10-50 days
	Adult maturation	3 weeks – 9 months (2-4 months average)
	Total	2-6 months
Larval moults	5-6 (Solitarius), 5 (Gregarious)	
Phases	Solitarius, transiens, gregarious	



Affected area | 16 million km² (recession), 29 million km² (invasion)

Eggs hatch into wingless larvae called hoppers. Hoppers shed their skins five or six times, each time growing in size. This process is called moulting and the stage between moults is referred to as an instar. The final moult from the wingless fifth (or sixth) instar hopper to the winged adult is called fledging. It has soft wings that must dry and harden before it can fly. Adults do not moult and therefore do not grow in size but gradually increase in weight. Adults eventually become sexually mature and can copulate and lay eggs.

Approximate density at which phase transformation may occur

	Locusts / m ²	Locusts/ha
Early instar hoppers	5	50000
Late instar hoppers	0.5	5000
Adults	0.025-0.05	250-500

The female locust lays eggs in batches called egg pods. The eggs look like rice grains and are arranged like a miniature hand of bananas. The pod is 3-4 cm long and is so laid that its top is about 5-10 cm below the surface. Pods contain fewer than 80 eggs in the gregarious phase and typically between 90 and 160 in the solitarious phase. Swarms often lay egg pods in dense groups, with tens and even hundreds of pods per square metre. The time between layings in the field is about ten days and on an average a female lays two pods in its life. In optimal temperature and habitat conditions a single female can produce up to 16-20 viable locusts in a single generation.

Eggs are laid when the soil is moist up to ten cm's below surface, which requires rains. Rains produce sufficient vegetation for the hopper to develop when they hatch out. Thus locusts lay eggs only on the borders of desert region where the soil is sandy and they can lay eggs about six inches deep at the same time there is moisture in the soil. In Uttar Pradesh the areas more susceptible to locust attacks are Saharanpur, Muzaffarnagar etc there are no areas where locust lay eggs.



Only a small fraction of the hoppers that emerge survive to fledge. Over 70 percent die as a result of inadequate water reserves, cannibalism and predation by ants. As the hoppers grow, another 10-20 percent may die from cannibalism, parasitism and predation. As hopper numbers increase in certain habitats, their behaviour changes – they get together and become concentrated. During these periods, hoppers start to become attracted by others and form groups. Grouping is an intermediate step in the change between solitary phase hoppers and gregarious phase bands. Presence of groups of hoppers in the field is an important indication that hopper populations are becoming gregarious and bands are likely to form.

Groups are different from what are called “bands”. Groups contain some hoppers that are starting to behave in the same manner but not all do so. Bands consist of all or close to all of the locusts behaving in the same manner. Their appearance is distinctive: hoppers in bands are either black (when young) or yellow with black markings.

Band densities vary according to band behaviour and instar as well as the habitat and the weather. For example, bands are denser on the ground than those roosting on plants which are denser than those marching. Average densities of bands on the ground (for late instar bands) are between 50 and 100 hoppers per m². Individual hopper bands increase in area as the hoppers develop and nearby bands join together, forming much larger bands. In the final instar, however, the bands tend to spread out and become less cohesive. The rate of band movement varies with temperature, vegetation cover and even with the size and coherence of the band. Fourth instar bands usually move from about 200 to 1700 m in a day, moving only during the day and usually only from two to three hours after dawn until about an hour before sunset. However, under exceptionally high temperatures or when the moon is full bands are known to move during nights too.



An adult's wings take ten days to harden sufficiently for sustained flights. Upon reaching an area where rain has recently fallen, immature adults usually start to mature. A mature locust will cause others to mature that is why in swarms they mature together.

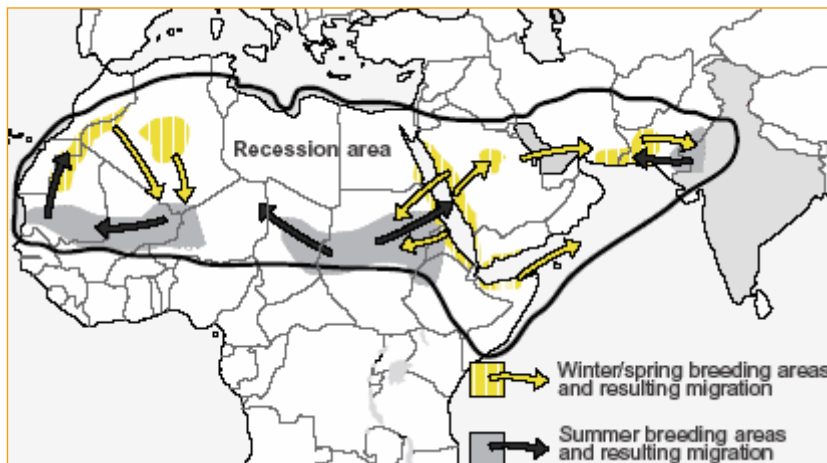
Like hoppers, solitary adults change their behaviour in response to the environment and numbers. At the end of a breeding season during a recession, adult numbers often increase as a result of previous breeding. At the same time, favourable habitats shrink as conditions become dry. This forces the adults to concentrate in those relatively small areas that remain suitable for survival it leads to laying of eggs in the few areas where soil moisture is still available. With increasing population density the adults start to react to each other and form groups. Sighting of groups indicates that the adults are becoming gregarious and may form swarms. The first swarms usually form some tens or even hundreds of kilometres downwind from the main laying area.

Swarms can occur as low-flying sheets (stratiform) or the locusts may pile high in the air (cumuliform), similar to hanging curtains, with the top level as much as 1 500 m above ground. Stratiform swarms are flat, usually tens of metres deep, and often occur during cool, overcast weather or in the late afternoon. Cumuliform swarms are associated with convective updrafts on hot afternoons, especially common during the warmer and drier months of the year. Swarm densities vary considerably; average is generally agreed at about 50 million locusts/km² (50 locusts/m²) whereas the range is 20-150 million/km².

Swarms fly during day time, starting about two hours after sunrise and settle about an hour before sunset as convection dries away. Swarms may fly up to nine or ten hours in a day, moving downwind. A swarm moves at slightly less than the wind speed and may easily move 100 km or more in a day. In the absence of wind, locusts fly at about 3-4 m/s. *These behavioural patterns help in predicting the course a swarm is likely to take.*

I do hope that you will appreciate

Migration and Seasonal Distributions



Since swarms are displaced downwind, the seasonal changes in the mean wind flow bring locusts into particular zones during particular seasons. Downwind displacement tends to bring locusts into an area during the season when rain is most likely. Thus in south-east Iran's bordering region with Balochistan (Pakistan) the locusts breed during winter to migrate eastward – towards India and on Indian side i.e. on Rajasthan, Gujarat, Sind (Pak) bordering region the locusts breed in summer and migrate westward. All this is true only in a very general way. Rare and even unprecedented movements continue to occur.

Swarm migrations are generally controlled by warm wind however, there are often other winds that the swarms could have moved with, but apparently do not. This means the direction of migration is not easy to predict. However, the movements of swarms are well documented and do provide some guidance for issuing early warnings by Locust Watch, a constituent of FAO.

Recessions, Outbreaks, Upsurges and Plagues

Desert Locust plagues occur after a series of events in which locust numbers increase. This starts with the normally calm period of recession, followed by localized outbreaks and upsurges from which a plague may develop and eventually decline, returning to a recession period. During recessions desert locusts are present at low densities in semi-arid or arid areas, away from major agricultural zones, do not cause significant crop damage, and hopper bands and swarms are rare or completely absent. The area within which these populations are confined and move around within is referred to as the *recession area*. It covers about 16 million km² and includes some 30 countries, including India.

The transition from a recession to plague is intermediated by outbreaks and upsurges. An outbreak occurs when there is an increase in locust numbers through concentration, multiplication and grangerisation. It takes place over



several months. An outbreak is often localized. It can lead to the formation of bands and swarms unless it is controlled.

The early stages of an outbreak are often unobserved. Next stage, upsurge is a result of successful breeding over a number of generations by an initially small population. With successive generations, the proportion of the total population in bands and swarms increases until few scattered locusts remain. Several outbreaks that occur at the same time followed by two or more generations of transient-to-gregarious breeding can lead to an upsurge. Upsurge is dependent upon a series of substantial and widespread rains of which at least the earliest rains occur in the *normally arid recession area*. As the upsurge develops, there will be migration taking adults from one breeding area to the next one in the chain. Many upsurges die out without leading to a major plague. This may be because of failure of the rains or migration of adults to an area in which they die shortly upon arrival without laying, or control operations. In upsurges that lead to plagues, the sequence of movements has often been different. What is important is that plagues do not suddenly develop overnight. It takes several months of good breeding conditions and increased locust activity before a localized outbreak develops in one or more countries. If not controlled and favourable conditions continue, this can lead to a regional upsurge that may extend to other regions and eventually cause a plague. In many cases, outbreaks or upsurges do not lead to major plagues because of successful control operations, poor rainfall or adult migration to unfavourable areas.

Plagues are periods of one or more years with widespread and heavy locust infestations, the majority of which occur as bands or swarms. A plague can occur when favourable breeding conditions are present and control operations fail to stop local outbreaks from developing into an upsurge that cannot be contained. A major plague exists when two or more regions are affected simultaneously. Plagues are separated by recession periods during



which bands and swarms are rare or completely absent, and most of the locusts are present at low densities. There have been six major plagues of Desert Locusts in the 1900s. Plagues usually decline as a result of a combination of natural factors and human intervention. One natural cause is failure of the rains in an area where successful breeding usually occurs. Human intervention through control operations also plays a significant role in bringing plagues to an end.



3.2 History of vulnerability of the State to Locust attacks

The following charts detail locust plagues and upsurges in India. It will be seen that there has been no plague since 1962. Though, upsurges are far more common. Sporadic upsurges have been witnessed almost continuously but the last upsurge with heavy swam incursions took place in 1997. This raises the question about the perceived threat from locusts to the State of UP. *Most of the functionaries in the Plant Protection Division of the State's Agriculture Directorate view a disaster situation from locust plague as a rather remote possibility.*

Locust plague cycles and upsurges in India

Plagues	
Years	Years
1812-1821	1900-1907
1843-1844	1912-1920
1863-1867	1926-1930
1869-1873	1940-1946
1876-1881	1949-1955
1889-1891	1959-1962

Upsurges	
Year	No. of swarms incursion
1964	004
1968	167
1970	002
1973	006
1974	006
1975	019
1976	002
1978	020
1983	026
1986	003
1989	015
1993	172
1997	004

Small scale localized locust breeding have also been reported and controlled during the period from 1998, 2002, 2005 and 2007.



3.3 Hazard risk assessment and vulnerability mapping

Hazard risk is product of two probabilities: possibility of loss in case of the occurrence of the hazardous event and the probability of the occurrence of the event itself. The former, the expected loss in case of plagues, is indeed extremely large. An adult Desert Locust can consume roughly its own weight in fresh food per day that is about two grams every day. A very small sized swarm (of about one square kilometre) can destroy over 100 tonnes of crop *daily*. During plagues, locusts can potentially damage the livelihood of a tenth of the world's population. Plagues occur sporadically with no regular time gaps.

In India, damage to crops caused by locust cycles during 1926-31, on a conservative estimate, was about Rs. 10 crore. During 1940-46 and 1949-55 the damage was estimated at Rs. 2.00 crore each and it was only Rs. 50.00 lakh during the last locust cycle i.e. during 1959-62. Though no locust cycle/ plague have been observed after 1962 however, during 1978 and 1993 large scale upsurges were reported. Damage estimated to be Rs. 2.00 lakh in 1978 and Rs. 7.18 lakh in 1993. Since then, reported damages caused by locust upsurges have been largely insignificant.

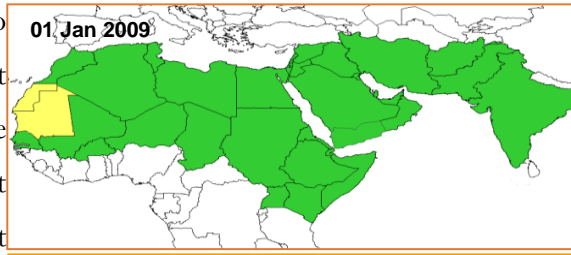
The reduction in damages is a testimony to the benefits of preparedness, a result of the several National and Regional organizations established to prevent plague under the overall coordination of the Food and Agriculture Organization. Considering the widely spread locations of their breeding grounds and the mechanisms of changes in their behaviour and morphology, locust prevention programme essentially entails a very high degree of coordination among the various national and international agencies engaged in locust control. It can not have any short term or medium term measures.



Prevention of locust menace is achieved only through dedicated agencies working full time on long term basis. FAO keeps the areas between Sahara and Indian deserts under constant surveillance and disseminates information and perceived threats at regular interval. For instance during 2009 the developments on the locust front as relayed by FAO can be seen with the four panels on this page. 2009 started with a moderate to high risk situation in Mauritania and Western Sahara. It was likely that adults will move into northern Mauritania and Western Sahara and breed in areas that had received unusually heavy rains in September. However, in three months the situation returned to CALM level. Due to poor rains this winter, locust populations declined to low levels that did not threaten crops. The “CALM” did not last long. Within a month the Central Region was put under CAUTION. The risk level increased because of the threats posed by the development of outbreaks in Yemen and Northern Somalia. By 12 June 2009 the CAUTION level expanded to cover other countries including South West Asia. The risk to India is from the swarms in North Somalia.



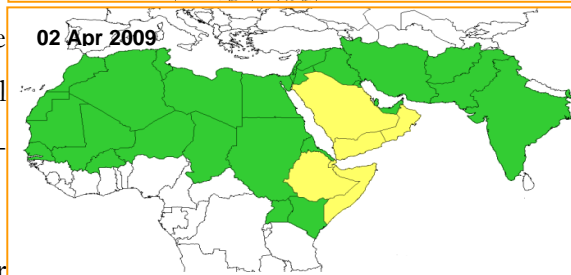
FAO's emergency assistance to countries facing desert locust invasions is coordinated by the Emergency Centre for Locust Operations (ECLCO), based at



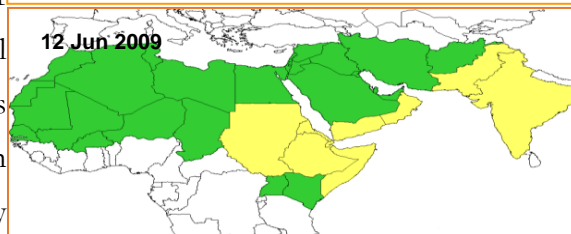
FAO headquarters in Rome. Technical experts at ECLCO strengthen the capacity of national authorities to manage locust control campaigns.



ECLCO continually monitors the locust situation and is the focal point for assistance to locust-affected countries.



ECLCO maintains a regular dialogue with the international donor community. Priorities for assistance are based on information provided daily by



National Locust Control Units and Plant Protection Services, supplemented by reports from FAO's country representatives and advice from FAO consultants in the field.

ECLCO develops and implements locust control projects using donor funds, providing inputs including pesticides, equipment, environmental monitoring and technical advice. ECLCO also monitors bilateral assistance to affected countries, seeking to coordinating inputs and avoiding duplication of effort.

As long as the ECLCO is functional with sufficient funds from the donor countries to tackle the locusts at the origin itself, regions located away from those breeding grounds have little



real threats. ECLO often charters aircrafts in Saharan Africa to spray insecticides on swarms while in air.

Western border regions of India do have locust breeding grounds and to that extent pose a threat to North Indian crops. Typical swarm movements, will threaten Rajasthan Haryana, Punjab, Up and MP. The districts in UP that border on Haryana are particularly vulnerable.

A disaster like situation, however, can arise under following conditions:

ECLO becomes dysfunctional (perhaps because donors are unenthusiastic), i.e. it fails / stops to monitor the locust situations in their breeding grounds,

1. War like situation in the breeding area – between Western Sahara and the Indian desert – does not permit the ECLO to carry out regular surveillance operations
2. International tension in Middle east and Pakistan do not allow ECLO to take airborne actions against swarms moving towards the Indian subcontinent
3. Pakistan has breeding grounds where locusts can potentially breed in two seasons (unlike the Indian area which has only one season breeding ground). Lack of communication with Pakistan on locust situation may increase our (Indian territory's) vulnerability.
4. Due to any reason LWO working under DPPQS (described in next section, 4.1) fails to notice phase and morphological changes among the locusts bred in India and this leads to development of local swarms



In any of these contingencies regions on the western border of India will become *highly vulnerable* to locust swarms. State of UP, however, is about 1000 kms away from the western border and though locust swarms with favourable wind can move even 300 kms a day, in all likelihood UP will have at least 4 to 7 days' warning to prepare itself for fighting swarms.

Finally, locust breeding is a function of weather conditions. And weather conditions are severely changing because of the ongoing global warming. This process of global warming is only about three decades old and its understanding is still far from perfect. How it will impact the rainfall patterns in coming decades is far from clear. India has locust breeding grounds that can become a significant threat if weather conditions turn favourable (for breeding of locusts). Neighbouring Pakistan has areas where locusts can breed in two seasons, against only one in India. Under such conditions the risk of locust infestation must be recognised as a potential threat to national food security.



Chapter 4: Preventive Measures

4.1 Early Warning and Dissemination Systems

Locust manifestations are monitored by Locust Watch, working under the aegis of FAO. Locust watch issues regular bulletins on locust breeding, phase changes, upsurges and swarm formations and warns the vulnerable nations as soon as possible.

About two years back in July 2007, a locust warning issued by the FAO had asked India and Pakistan to take immediate steps to safeguard their crops. FAO had warned of two swarms of desert locusts heading towards the Indian sub-continent - one from Somalia and the other from Oman and Yemen. The swarms were reportedly likely to reach the continent in two or three days after the warning. FAO had put India and Pakistan on a high alert to take the necessary precautions to ensure intensive monitoring of the summer breeding areas. Around this time, locusts had been sighted in the Kutch region of Gujarat.

In India Locust Warning Organisation (LWO), Jodhpur (Rajasthan) has been implementing with 100% Central Government funding a Central Sector Scheme, for Locust Control and Research. It started operations in 1939. Its objectives are:

1. To monitor locust situation by conducting regular surveys over 2.0 lakh sq. km in the Scheduled Desert Area encompassing the States of Rajasthan and Gujarat
2. To organise control operations for preventing locust plague, as and when necessary

Major functions of LWO are:



1. Locust surveillance and monitoring through 5 circle offices and 23 outposts
2. Organise control operations against local build ups of locust population and invading locust swarms
3. Issues of fortnightly locust situation bulletins
4. Organise Indo-Pak Border Meetings and maintain wireless contact between Jodhpur and Karachi during June to November
5. Coordinate with locust prone countries and FAO as part of International Commitment
6. Participate in International Meetings on Locusts
7. Conduct field research on locust behaviour, biology and control
8. Explore use of satellite data for locust surveillance and forecasting

The Directorate of Plant Protection, Quarantine and Storage (DPPQS) functioning under Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (MoA), GoI at Faridabad, is the apex body for locust control in India. A Joint Director of DPPQS heads the LWO.

DPPQS issues a fortnightly Locust Situation Bulletin. The bulletin has typically four sections: forecasts, weather summary, locust position in India and international locust positions. Locust breeding is closely correlated with climatic factors. The bulletin details meteorological observations from different stations in Western Rajasthan and Kutch regions - natural breeding grounds of locusts in India.

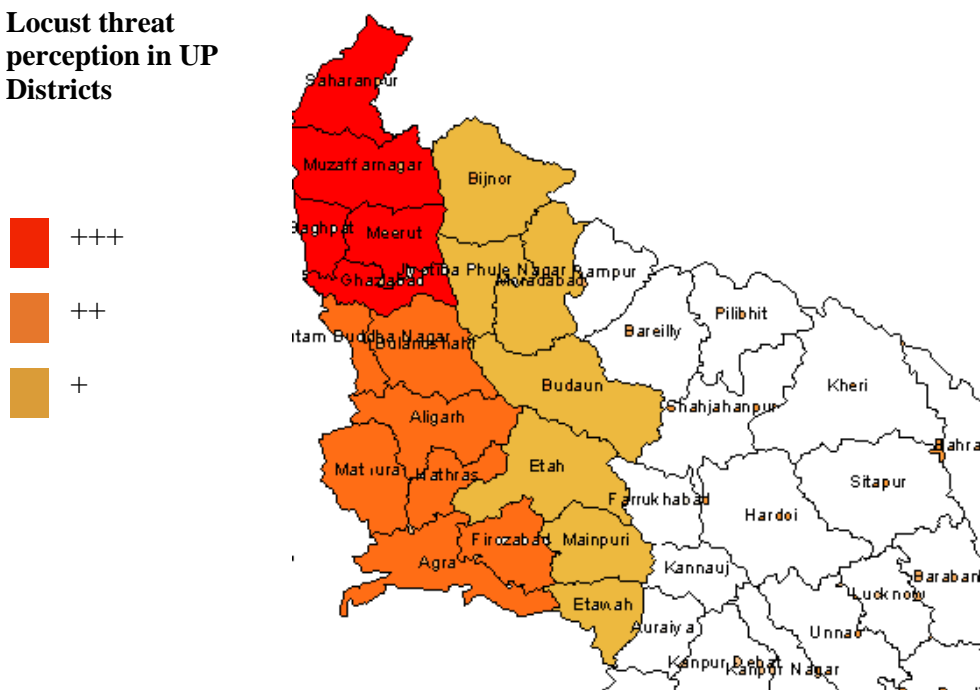
As swarm formations and likely movements of swarms are continuously monitored by FAO and information is shared on urgent basis with member nations, any swarm incursions are anticipated well in advance and based on FAO information DPPQS assesses the position and alerts the States likely to be affected. Last such alert was received by UP in 2004. This alert was issued to States of Gujarat, Rajasthan, Haryana, Punjab, MP and UP. On receipt of the alert the Directorate of Agriculture, UP had procured additional



quantities of pesticides and prepared itself for the menace. The swarms, however, never reached Indian sub-continent. Clearly the early warning system for locust swarm incursion, a product of years of international co-ordination, may be *considered adequate*.

A disaster situation arising from locust attack has a remote possibility for the State of Uttar Pradesh. However, different regions of the State do not have the same vulnerability to locust attacks. The regions closer to Haryana / Punjab viz. Meerut, Moradabad and Saharanpur Divisions are more vulnerable. Though there are no breeding grounds for locusts in UP the areas bordering on the arid zones (Agra Division) may provide conducive climates for locust breeding, with favourable rains, *if a swarm can reach there*.

Locust threat perception in UP Districts



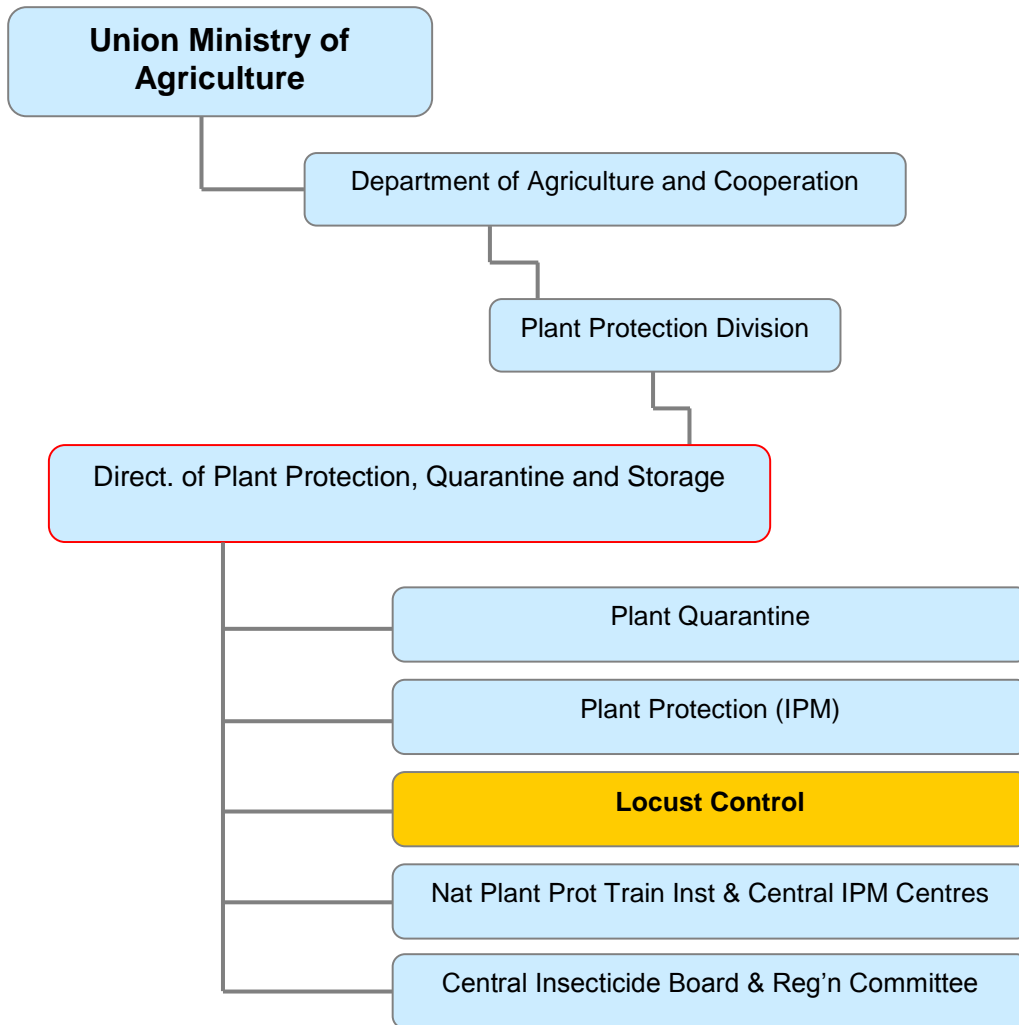
In past there have been erroneous reports of locusts being spotted in that area. For instance in August 2008 locusts were reported in Agra and it was felt that a large number of villages in Achnera, Fatehpur Sikri, Kheragarh, Shamshabad regions were threatened by locusts. State Government had deputed a team of scientists and plant protection experts who concluded that



the infestation was not of locusts but an insect of another type had been eating away crops. Farmers were asked to spray chemicals to control the spread of pests.



National Institutional Structure for Pest Control



4.2 Prevention and Mitigation Measures

Prevention activities are those that need to be undertaken to *reduce or eliminate the occurrence of a hazardous event*. Mitigation measures, on the other hand, *eliminate or significantly reduce the damages* that can be caused by a potential hazardous event. As locust swarms come from outside the State and their movements depend on weather factors such as rains and wind, there is little that can be done by way of prevention measures against arrival of locust swarms in UP.

The scope of mitigation measures that can be taken in advance is also limited. There can be two types of mitigation measures while engaging with locust situations. As locusts destroy crops by settling on farms, measures can be adopted so that they do not settle, alternatively they are effectively eliminated while settled / in air. Such measures cannot be taken in advance and thus form part of response to a situation and are accordingly described in Chapter 5 on *Response*. Necessary capabilities for undertaking such measures are described in Chapter 6 on *Preparedness*.

Perhaps the only measure that can be undertaken to reduce the likely loss to farmers (not damage to crops, though) is to buy insurance against damage caused by locusts. Crop insurance will help in stabilization of farmers' income. But, agricultural insurance is a very involved issue. GoI has been concerned with viable agricultural insurance for a long time and a crop insurance scheme linking institutional credit (crop loan based on area approach) was implemented from kharif 1985 on all-India level. The scheme covered all natural risks excluding nuclear and war risks; it thus covered pests and diseases and by extensions locusts as well.

In 1999 GoI launched a new crop insurance scheme called Rashtriya Krishi Bima Yojana (RKBY) under the National Agricultural Insurance Scheme (NAIS). Participation in RKBY was compulsory for farmers growing *notified*



crops and availing crop loans from formal credit Institutions. NAIS specifically covered “Pests / Diseases” and therefore damage from locusts.

Effectiveness of multi peril crop insurance has been low. This insurance can only be provided by government agencies due to unpredictable weather risk and co-variate risk of crop damage / failure over a large area. Crop insurance is cumbersome to administer and prone to losses. Claims ratios have been around 500 per cent. Insurance companies may feel that crop insurance is a liability – there is a feeling that it is not a profitable proposition at all. Estimating crop loss due to an unexpected weather event is difficult so also estimation of potential yield and actual yield. Unfortunately because of these factors the focus is shifting to weather insurance – which, naturally, *does not cover locusts*. In India, ICICI Lombard pioneered weather insurance as a risk mitigation tool. Clearly this insurance does not offer protection against locust attack.

In USA, USDA’s Farm Service Agency manages Non-insured Crop Disaster Assistance Program and provides financial assistance to producers of non-insurable crops when low yields, loss of inventory occur due to natural disasters. Multiple Peril Crop Insurance (MPCI) policies are available for most insured crops.

Widely across the globe, agricultural insurance schemes are being subsidized. The experience of USA and Brazil shows that increasing premium rates (to commercially viable levels) causes severe drop in the participation leading to discontinuation of the programme.

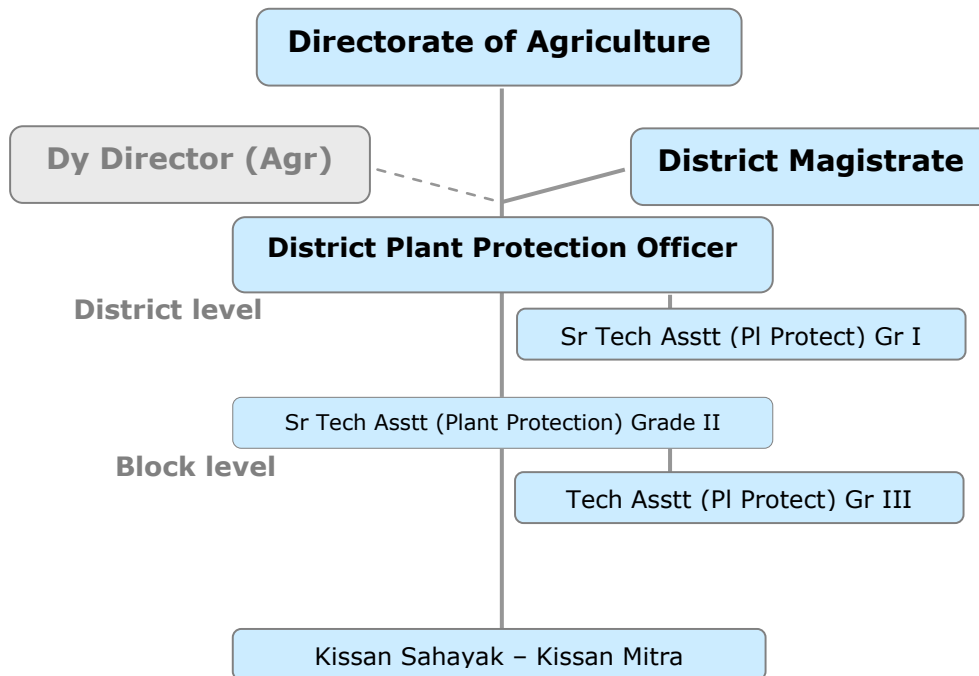
State of Kerala has a 100% State sponsored crop insurance scheme covering a number of perils for some major crops. The scheme has been in operations since 1995 and is scheduled to end in 2010. The financial outlay for the scheme is miniscule (Rs 100 lakhs) and details of its working, challenges it faces etc are not available.



Finally, any crop insurance is seen from food security angle as well, necessitating a wider coverage and “pure-play” locust coverage may not be forthcoming soon.

4.3 Training needs analysis

Locust control at State level is part of the responsibilities of the Directorate of Agriculture, functioning under the Agriculture Department of the Government of UP. The Directorate has a Joint Director in charge of, among other things, plant protection. At the Directorate level Plant Protection has an Additional Director and also an Assistant Director. In each revenue Division the Directorate is present through a Deputy Director Agriculture. Plant protection, however, is really looked after by District Plant Protection Officer posted in each of the revenue Districts. The institutional set up for plant protection, through which locust control is / will be carried out, is as under:



Panchayat level *place*, is considered adequate. Kissan Sahayak / Mitra operate at panchayat level and play a crucial role in surveillance. They conduct their own roving surveys and also educate farmers on surveillance.



Though the set up is considered adequate, *hardly any person seems to have had any direct experience of locusts*. Field level staff, it would appear, is not exposed to locust situations at all. (This explains the need of sending a team of scientists from Lucknow to Agra in 2008 to check whether the new types of insects seen there were locusts.) Directorate has regular training programmes on plant protection measures, pesticide use, side effects of pesticides etc but since no locusts have actually been observed for a number of decades, locust control has not formed part of the training schedule in recent years. This leads to the conclusion that there are *serious knowledge gaps calling for extensive trainings*. (Training has been discussed in Chapter 6 on Capacity Building.)

The choice insecticide for locusts is Malathion (95%). Malathion poisoning is common. In fact being one of the more easily available poisonous materials it is often used in suicide attempts and doctors are well exposed to treatment of Malathion poisoning. Two issues make the poisoning case in fighting locusts different from the more common cases: a) Concentration of Malathion is very high compared to what is used for other purposes; and b) In suicide attempts Malathion is ingested orally and is susceptible to being pumped out. In fighting locusts it is ingested through lungs and gets absorbed directly in blood. Health directorate may hold a symposium on treatment of such cases for refreshing the knowledge base of medical officers.

The investment proposed on training based on “low threat perception” on one hand, and “low levels of exposure and expertise” of the staff in handling the disaster, may it happen. Given low levels of threat perception, the considered opinion of the concerned government officials is that the formal training be confined to the four Campaign Managers and ten Master Trainers while the other functionaries be sensitised on the subject. Section 6.2 under “Capacity Building” deals with the matter at length.



CHAPTER 5

RESPONSE



Chapter 5: Response

5.1 Alert mechanism

DPPQS, Faridabad issues a fortnightly bulletin on locust situations. This bulletin keeps the Directorate of Agriculture at Lucknow regularly updated. In case of developments, usually far beyond the boundaries of India that may have implications for Indian crops, DPPQS issues an “alert”. The last such alert was received at Lucknow in Dec 2004.

On receipt of the alert Directorate had procured additional quantities of insecticides. (Normally the Directorate has sufficient quantities of insecticide for crop protection purposes. This additional quantity was purchased to fight locusts that may decide to settle on not agricultural fields but on wilderness and destroy the vegetation.)

The alert mechanism is considered adequate for the threat.

5.2 Criteria for level definition

Level definition has two issues:

- a. It is a function of severity of damage / expected damage; and
- b. The need for direct involvement of central / state government departments

Damage from locust swarms can be estimated rather easily. Key issues are number of locusts in the swarms. This number depends on the area of the swarm and the density of locusts per square kilometre of the swarm area. Both parameters are amenable to fair estimation. A locust can devour grains etc equal to its own weight every day. Thus the likely daily damage to crops can be easily estimated.



Swarm densities vary considerably. The generally accepted figure for an average medium-density settled swarm is about 50 million locusts/km² or 50 locusts/m² whereas the range is 20-150 million/km². *Thus a swarm of 1 square kilometre can devour about 100 tones of crop everyday.* Since swarms while flying generally spread out and occupy about three times as much area as while roosting, if the reports say that a swarm is flying covering 30 square kilometres a fair estimate of daily damage can be made with the following general relationships:

Damage to crops in tonnes/day = Number of locusts in the swarms x 2/1000,000

Number of locusts in the swarms = Roosting area x 50 million

Roosting area = Flying area / 3

Since the swarm area varies from a few square kilometres to over 100 square kilometres, it is safe to assume that the damage from a swarm would be *very high*.

Further, a locust swarm cannot be effectively fought with the usual resources available at district level. This is because, often the best response to a locust attack is aerial spray i.e. attacking the swarms while still flying. This calls for specialised aircrafts (and appropriate insecticides) which is usually not available at district / State level.

Thus in case of attacks by swarms of locusts an *L1 situation is rather unlikely*. The situation would be either L2 or L3. In case swarms enter India and are engaged before they come near State boundaries (a most likely scenario if swarms do enter India) it is not unlikely that small groups of locusts do enter the State and aerial spray may not be the most efficient way of engaging such small concentrations and we will have L1 stage where a district should be able



to effectively respond to a potential threat entirely on its own resources. The following chart would help in level-defining:

	Locust situation warning	Likely daily damage to crops	Level
1	Larger swarms with flying area over 10 square kilometres headed for UP	Over 350 tonnes per day	L3
2	Smaller swarms with flying areas up to 10 square kilometres headed for UP	Up to 350 tonnes per day	L2
3	No proper swarms but smaller groups are heading towards UP	Can vary from a few to a few hundred tonnes per day	L1



5.3 Recommended Control Measures for Locusts Situations

5.3.1 Control may not always be necessary. The reason is control has its own cost. If this cost is more than the benefits from controlling locusts then perhaps control is best avoided. Though no hard and fast rules can be prescribed on when to control locusts; it is decision based on the age, phase and maturity of the locusts, as well as on their number and density, and other factors such as closeness to vulnerable crops and likelihood of breeding. It is usually very wasteful to control solitary and other low-density locusts scattered over a large area – almost all the insecticide miss the locusts. It may be more sensible to wait to see if they group together and form better targets after a few days or if they die when conditions become unfavourable. Often control decisions are based on threshold numbers of locusts per hectare but these may need to be modified according to the specific situation. The decision may also be influenced by ecological or environmental considerations.

5.3.2 If control is necessary, factors influencing the methods:

- a. Size of infestation: If the targets are small and few in number, they can be controlled using low speed, simple methods. However, if the infestation is heavy and widespread, the method must be able to cover larger area quickly.
- b. Stage of locusts: If they are adults, a quick response and fast method is required to prevent them from migrating to other areas, especially if they are sexually mature.
- c. Location: If bands or swarms are close to crops, there obviously exists a greater need for a quick response, fast method.
- d. Resources available for control: If the most appropriate equipment or materials are not available control must be carried out with whatever is available



5.3.3 Methods of Locust Control

Locust control is usually managed by four methods:

a. Mechanical: Mechanical methods may prevent some crop damage if the locust infestation is light, but have little effect on the overall population and can fail to protect crops when there are many locusts continuously invading the fields.

b. Baiting: Baiting involves mixing insecticide dust with a carrier such as maize meal and scattering the mixture among or in the path of the locusts. It was popular till the 1950s but has been used very little in recent years. This method involves a lot of work in preparing, transporting and applying large quantities of bait. There may also be a risk to livestock that might eat the bait. It also carries the risk that livestock may consume bait.

c. Dusting: Dusting involves mixing pesticide dust with powdered chalk or talc and scattering on the locusts. It can be carried out without specialist application equipment but many countries have given up dusting because of the large quantities of product to be transported and applied, and to the fact that control is sometimes poor, especially with later instar hoppers and adults. There is also a health risk of operators inhaling the dust.

d. Spraying: Spraying is the most commonly used method for locust control. It involves using a sprayer to break liquid pesticide into droplets, which are then distributed over the target area. The method of choice is Ultra low volume (ULV) spraying. This technique use much smaller volumes of spray liquid, called ultra low volume (ULV) spraying. In order to spread such small volumes over the target, the liquid must be broken up into small droplets light enough to be carried easily by the wind. ULV spraying requires special sprayers. These sprayers can be operated hand held, mounted on a vehicle or mounted on a truck. The characteristics of different platforms for sprayers, as published by FAO are as under:



Characteristics of Different Sprayer Platform

Performance factor	Portable	Vehicle	Aircraft
Work rate (Full coverage spraying)	Slow 15 ha/day	Fast 100 ha/day	Fast 5000 ha/day
Speed of response	Fast	fast	Can be slow
Spray in hills	Yes	No	Yes
Spray on soft sand / clay	Yes	No	Yes
Spray single bands	Yes	Yes	Not efficiently
Spray settled swarm	Difficult	Difficult	Yes
Spray flying swarms	No	No	Yes
Easy monitoring	Yes	Usually yes	No, difficult
Involve community	Possible	Possible	No
Appropriate target size	Up to 10 ha	Up to 100 ha	Over 25 ha

For large swarms the choice platform is aircraft. However, aircraft cannot be used to spray single bands efficiently. *Since it is more likely that the State would face low infestations, it should be self sufficient in hand held sprayers.*

Aerial spraying with helicopters is almost the same as with fixed-wing aircrafts. Helicopters do have some advantages. They can fly more slowly, are more manoeuvrable so they can turn back to check on suspected targets and can land without an airstrip which makes survey and mortality assessments much easier. They can also spray more safely than fixed-wing aircraft in narrow valleys. However, they are much more expensive to operate and usually slower for spraying. They should be used only when the extra expense is considered worthwhile.

More often, as the infestations are expected to be low, hand held sprayers would need to be used. Selection considerations are as under:

Type	Vehicle - Passive	Vehicle - Airblast	Vehicle - Airblast
Make	MKII ULVA Mast	Micronair AU8110	Micronair AU0110



Pesticide efficiency			
Droplet size	Good	Average	Good
Spectrum width	Excellent	Poor	Average
Flow rate	Excellent	Excellent	Excellent
Calibration ease	Good	Good	Good
Sustainability			
Filling/spraying/cleaning	Good	Poor	Average
Durability/maintenance	Average	Poor	Poor
Socio economic			
Safety	Good	Average	Average
Cost	Acceptable	Costly	Acceptable
Work rate	Average	Good	Average
Overall	Good	Average	Average

For safe and effective use of the insecticide several important factors must be considered:

- Droplet size (depends on the atomizer)
- Droplet spectrum (depends on the atomizer)
- Work rate (depends on the sprayer platform and flow rate)
- Operator safety (depends on various design features)
- Ease of use (depends on various design features)
- Reliability (depends on construction materials and design)

Droplet size: Droplet size depends on the atomizer i.e. the components of the sprayer that makes the droplets. Atomizer is of critical importance as the droplets must be of the right size to be effective. The volume of a droplet increases 8 times if its diameter is doubled and as large droplets fall on the ground faster they are very wasteful. The ideal droplet diameter for locust control is thought to be between 50 and 100 μm , one micron (μm) is one thousandth of a millimetre.

Droplet spectrum: No sprayer actually produces droplets of a certain size, instead every sprayer produces a range of droplet sizes. This range is called



droplet spectrum. A narrow droplet spectrum contains droplets of approximately the same size and is best for ULV spraying. Droplet spectra are usually described using the values of volume median diameter (VMD) and number median diameter (NMD). The ratio (R) of VMD and NMD values gives a rough measure of the width of the droplet spectrum – the nearer it is to 1, the more similar the droplet sizes, the larger it is, the greater the range of droplet sizes. It is thought that the VMD from ULV locust sprayers should be between 50 and 100 μm and that the NMD should not be less than half the VMD, i.e. R is less than 2. Another way of describing a good droplet spectrum for ULV locust control is to say that it should have at least 80 percent of the spray volume in the size range 50-100 μm .

Work rate: Work rate refers to the area that can be covered per unit of time – usually per day. Work rate of hand held sprayers is about 15 hectares per day but those of vehicle mounted and aerial sprayers are in the range of 100 hectares and 5000 hectares per day.

5.3.4 Choice of Insecticide

Issues in deciding on insecticides are:

- Efficacy – determines the quantity of active ingredient needed
- Safety –toxicity to mammals (humans, livestock) and to birds and fish
- Specificity – ideally should be toxic only to locusts, but most are toxic to many other types of arthropod they are called broad spectrum compounds
- Persistence – how long it remains biologically active in the field; longer it remains active, the more effective it is but it may cause a greater environmental impact
- Route of entry – whether contact or stomach action product - flying swarms need a contact action product
- Speed of action – if crops are infested - faster the product, the less crop damage



- Shelf life – the longer the better
- Availability – must be available as ULV formulations in large quantities at short notice
- Cost – cheaper products will greatly reduce control costs

Locust control is largely carried out with conventional chemical insecticides. They work either by direct contact action (droplets land on the locusts) or by secondary contact action (locusts touch the droplets on the vegetation) or by stomach action (locusts eat the sprayed vegetation). The insecticides are usually neurotoxic, i.e. they kill the locust by interfering with its nervous system. However, there are some newer chemical and biological products which offer advantages such as lower environmental impact, lower operator hazard and greater logistical efficiency, e.g. large areas can be treated in a short time. There are three commonly used types of active ingredient – the toxic part of insecticides.

Organochlorines: BHC, DDT, dieldrin and endrin are examples. They are generally broad spectrum, are persistent in the environment and can build up in the bodies of animals and thus are hazardous to the environment and to mammals. Use of most organochlorine pesticides is not recommended for pest management (including locusts).

Organophosphates and carbamates: Currently the most widely used type of locust insecticides, e.g. fenitrothion, malathion, chlorpyrifos and bendiocarb. Malathion ULV is currently used for locust control in India. Fenitrothion ULV was also in use till 2007 when it became a banned insecticide. These insecticides are quite fast acting (two to eight hrs), relatively non-persistent and broad spectrum compounds. Fenitrothion is *moderately* hazardous to mammals (WHO Class II), whereas Malathion is considered *slightly* hazardous (WHO Class III).



Synthetic pyrethroids: Examples are deltamethrin, lambda-cyhalothrin and esfenvalerate. They are fast-acting (knockdown within minutes), have varying levels of persistence and are broad spectrum – most are in WHO class III, slightly hazardous.

Naturally occurring products such as the extract from the **neem** tree are potentially useful as insecticides. Mortality is slower and usually lower than with conventional insecticides. The mixture of active ingredients in locally produced neem extract is very complex and varies from batch to batch, and *it would be difficult to produce sufficient quantities to combat a large-scale locust infestation at short notice.* (This issue has been dealt with in Chapter 7 on Mainstreaming DM Concerns into Development Plans.)

5.3.5 Calibration

Calibration is the measurement and adjustment of various parts of the sprayer to get the correct amount of insecticide, in the right size spray droplets, to the right place. Without calibration spraying may be ineffective or insecticide may be wasted. For efficient result three factors need to be calibrated: Droplet size, Emission height and recommended dose of insecticide.

The height at which the cloud of spray droplets is emitted will influence where the wind carries the drops, so if height is adjustable, it must be set so that insecticide is well distributed over the target area. If the wind is very strong the height should be reduced. Depending on the wind speed, emission height for handheld sprayers should be 0.5-2.0 m, for vehicle-mounted sprayers 2.0-3.5 m (although most are not adjustable) and for aircraft 5-10 m. Vehicle mounted air-blast sprayers can be angled up or down to alter the effective emission height (up to around 8 m).

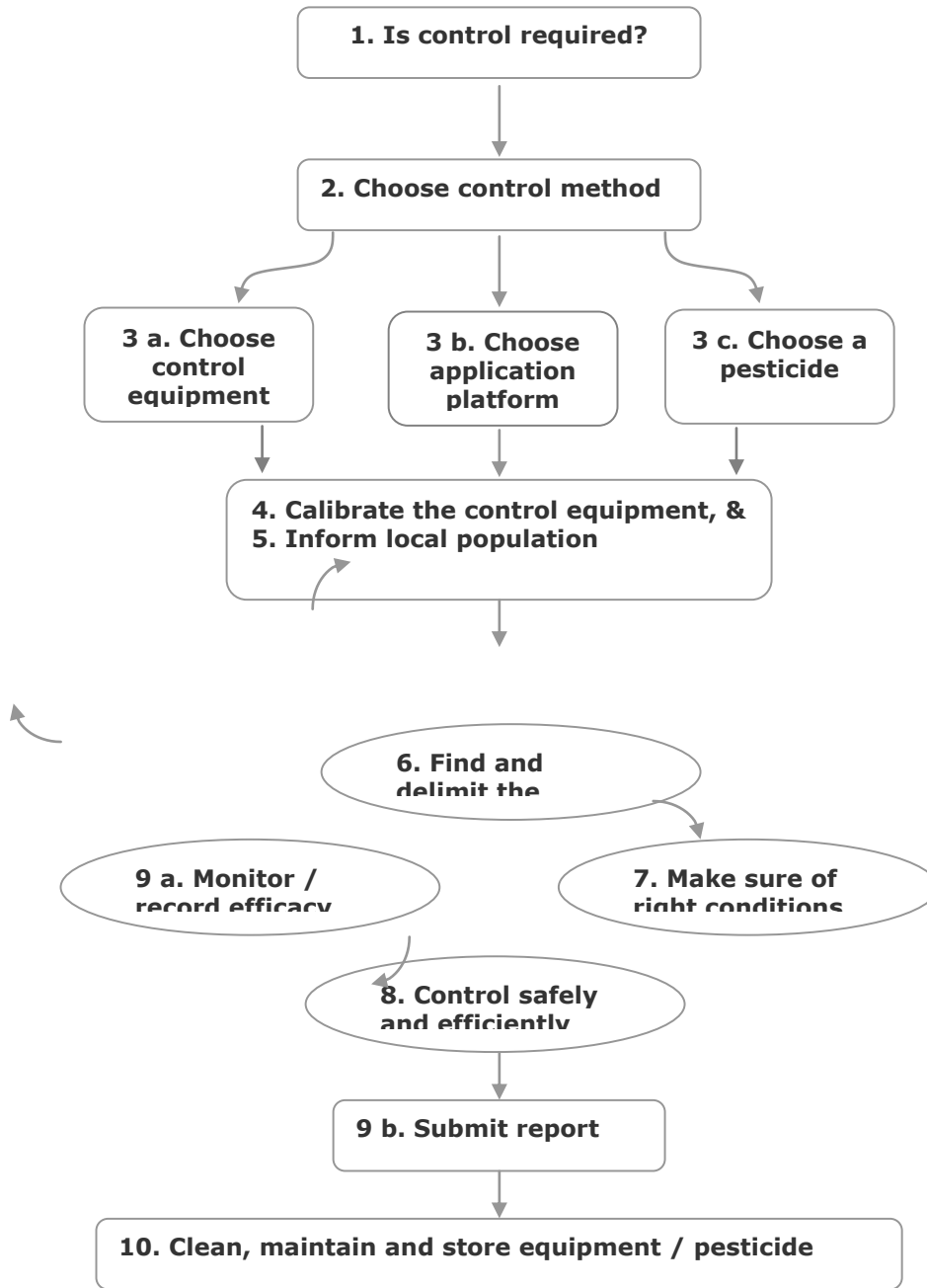
The distance over which most of the spray is deposited is called swath. Swath width for any sprayer is not an exact measure as it depends on droplet size



and wind conditions. Swath gets wider with smaller droplet size, higher emission and higher wind speed. Spraying is done in a way that swaths are over lapped so that the spray deposit is as uniform as possible. Thus wider swaths mean more separated spray tracks and this improves the work rate.



Summary of Locust Control Process



5.4 L0 Activities

L0 Activities consist of

1. Awareness campaign
2. Training & sensitization programmes,
3. Health check up of field staff
4. Infrastructure creation
5. Logistics
6. Contingency planning & Drill
7. Monitoring development and preparedness activities

5.4.1 Awareness Campaign: As locusts have not infested the State for decades the general awareness of locusts is rather low. For a successful field campaign against locusts it is essential that everyone concerned with locust infestation knows and understands locusts, their special biological features that separate them from other grasshoppers and their habits. Awareness programme should cover:

- All staff / extension staff of Agriculture Department
- Farming communities of Moradabad, Meerut, Saharanpur and Agra Divisions
- School teachers and students
- Home guards, whose services may be required in control operations

Awareness programme may entail:

- Addressing meetings of staff and farmers
- Distribution of pamphlets with pictures and habits of locusts
- Organising quiz / competitions in rural schools
- Demonstration of equipments
- Wall paintings / posters etc

Care should be taken that the awareness programme does not give rise to a sense of impending doom among its target audience.



5.4.2 Logistic planning: The critical resources for controlling locust infestations are men, sprayers (hand held, vehicle mounted, air borne), insecticides and protective gear. Other (non-critical) resources are batteries, generator set, first aid kits etc. Locusts roost only during nights and fly off within two hours of sunrise. Thus the infestation can be controlled at grounds only during nights. If infestation is confined to patches of few hectares (less than 15) spread widely hand held sprayers would be as effective as vehicle mounted and cheaper too. If the infestation is spread over several square kilometres, aerial spray is the only answer. Vehicle mounted sprayers are useful for swarms that cover some 15 to 100 hectares.

By way of abundant precaution the Directorate may choose to hold vehicle mounted sprayers in inventory but it is felt *this precaution will be largely superfluous*. Swarms of the size of 100 acres or so are *extremely unlikely* to enter UP. If they do, it will mean utter destruction of crops in Haryana and Punjab.

Logistic planning should, therefore, focus on the following:

- a. Identification of men/ women to be engaged in control campaign
 - At least four persons should be identified for advanced training to act as Campaign Managers. Control operations will normally require only one CM, other persons would be *fall back*. The CM will be overall in charge of control operations. The CM's role is akin to a project manager's role in a project. CM should be able to visualise all contingencies and keep his team prepared. CM should be technically sound at the same time full of initiative and resourcefulness. He / she must have the gravita to command instinctive obedience in field situations. *Choosing a leader first and then making him / her technically sound is, perhaps, a better course than choosing a technically sound person and bestowing powers and responsibilities of leadership on him / her*. The CM should be equally at home in



issuing instructions to the team members, winning support of the local administration, in obtaining latest information from DPPQS organs in Faridabad or Jodhpur and in articulating correctly the ground position and probabilities to the APC at Control Room.

Directorate of Agriculture will identify suitable persons from amongst its officers and arrange for their training through DPPQS. Directorate will also maintain full records of their training and contact details in its dedicated cell. These persons must be available to *immediately* when needed.

- At least fifty persons should be identified for training to act as Team Leaders. (Normally not more than 20/30 TLs should be required.) These can be selected from Technical Assistants Grade III posted in western divisions. The DPPOs of the western division districts shall identify suitable persons and arrange for their trainings through the Directorate of Agriculture. TLS would be trained by Master Trainers trained at Gujarat / Rajasthan where actual operations take place. Director PP will maintain a list of Master Trainers and will schedule the training programmes of TLs identified by DPPOs.

Full details of the trained TLs, including their medical histories, will be maintained at the offices of the DPPOs and at the dedicated cell at the Directorate of Agriculture.

- At least 1000 men and women should be identified to be trained in using hand held sprayers during night conditions. All these persons should preferably hail from the vulnerable districts, namely, Saharanpur, Muzaffarnagar, Bagpat, Meerut, Ghaziabad, Mathurs, Aligarh, and Agra. These can be selected from amongst the Kissan Sahayak / Kissan Mitras working in villages in western



divisions. (Infestation can take place anywhere, but in all likelihood infestations should be confined to these districts in western divisions). Trained persons in every Tehsil of these districts will ensure familiarity with the terrain and timely availability of personnel for undertaking control operations.

These persons shall be identified by the Technical Officers (Grades I / II / III) in consultation with the DPPOs. Their training shall be scheduled by the Dy Director PP.

Full details of the trained campaign workers, including their medical histories, will be maintained at the dedicated cell at the Directorate of Agriculture.

b. Arrangements for prompt procurement of ULV formulation of Malathion

- Malathion is regularly procured by DA, but for locust control ULV formulation (95%+ active ingredient) is needed. Contact details of three manufacturers of ULV formulation of Malathion are given in Annexure II) Disaster Management in India: Status Report, released by MHA in Aug 2004, notes in paragraph 4.10 that States have been advised to *finalize pre-contract agreement for all disaster relief items so as to avoid delays in procuring relief items after disaster situations*. Malathion, though not strictly as relief item, is a critical resource for fighting locust infestations and such arrangement must be in place with reputed manufacturers.

c. Adequate availability of protective gear for field staff

- Malathion can get rapidly absorbed through skin or lungs. Though only slightly harmful (WHO Classification III) it can even cause death. As ULV formulations are highly concentrated, the field staff engaged in control measures – i.e. those operating sprayers and those handling the stores, filling the sprayer tanks etc –



should use not only protective gloves and masks, but full body protective gear.

- d. Identification of persons to be developed into Master Trainers
 - The role and need of Master Trainers are described in Section 5.5.5.b below.
- e. Maintenance of hand held ULV sprayers at a central storage point
- f. Availability of generator sets with adequate fuel
- g. Arrangement for prompt procurement of spare batteries, torches, first aid kits etc

5.4.3 Health check up of field staff: Malathion, for that matter all organo-phosphorus and carbamate groups of insecticides affect mammals. (Wilful ingestion of Malathion is often reported in suicide attempts.) These pesticides inhibit an enzyme called cholinesterase. Without an adequate level of cholinesterase the body accumulates acetylcholine, which may lead to muscular paralysis and ultimately death by respiratory depression. During control operations, it is possible that some workers may get over exposed to the pesticides. Monitoring of cholinesterase levels helps in identifying such workers while the exposure is still at sub-clinical levels.

During L0 periods, a record should be made of baseline cholinesterase level of each worker and such workers who already have low cholinesterase levels should not be inducted in control campaign. (As cholinesterase levels vary from person to person, what would be naturally low, and therefore *acceptable* as opposed to low due to malfunction of liver or some other organ and therefore *not acceptable*, should be decided by the medical officer examining the field workers. The MO will take a view on this matter by applying clinical sense and taking into account other findings.) This record of baseline levels should be correctly maintained as it would help later on, during campaigns, in



identifying the exposure intensities and taking off such workers who may get over exposed but show no clinical symptoms.

The enzyme cholinesterase, without getting too technical, it can be said is found in two forms – one in red blood cells and the other in serum. The enzyme in serum is called pseudo-cholinesterase. The test for level of cholinesterase in RBC is quite involved whereas that for pseudo-cholinesterase in serum is often a part of liver function test and is performed at a number of laboratories. The level as given by serum pseudo-cholinesterase test is adequate for the purpose at hand and whenever this document refers to cholinesterase test, serum pseudo-cholinesterase test is implied.

5.4.4 Infrastructure creation: Physical, long-term infrastructure facilities required for control operations are: campaign headquarters, storage facilities for critical and other resources, rural airstrips *in extremely rare cases*.

5.4.4.a Camp Headquarters: *Campaign HQ shall be located at Meerut- a divisional HQ.* However, as the campaign manager should be as close to the site(s) of infestation as possible, suitable premises for camp headquarters should be identified in all districts on western borders of the State, namely, Saharanpur, Muzaffarnagr, Bagpat, Meerut, Ghaziabad, Mathura, Aligarh, and Agra. As campaigns may be carried out during nights, the premises must have provisions for generator sets.

5.4.4.b Central Store: In view of the low probability of the occurrence of the threat, stocking sufficient number of hand held sprayers in all districts may not be cost efficient. Instead the resources should be cached at a central store. Meerut, almost equidistant from Saharanpur and Agra divisions, seems a suitable site for such a central store.



5.4.4.c Rural Air Strips: If invasion by large swarms does manage to enter UP, the State will have to seek aerial spray. Aircrafts for this purpose are provided by Department of Civil Aviation Department, GoI. DPPQS has on certain occasions hired aircrafts from DCA. Aerial spraying is carried out at low speed and low heights – 15 meters or so (unless obstructed by trees or other many centres, more strips may be required to cover the agricultural fields. DCA has issued guidelines for construction of airstrips for agricultural spray. *Construction of such strips is not really warranted in view of the low probability of the threat* but sites in each Tehsil must be identified where such airstrips can be constructed in short time. The site of the strips must have good road connectivity as the aircrafts will need to be refuelled and refilled with insecticides.

5.4.5 Training & Sensitization Programmes: No team can successfully control locusts unless adequately sensitized and trained. The details of sensitization and training programmes are described in Section 6.2 under “Capacity Building”. Regular sensitization and training is an important L0 activity.

5.4.6 Drill & Contingency Planning: DA, the primary responsible agency for locust control may organise drills at regular intervals to ensure preparedness. Preparedness measures are described in fuller detail in Chapter 6. Mock drill activities, based on those measures, are detailed in Annexure 8.

DA may also have suitable contingent plans ready for various contingencies – such as both CMs being unable to manage control campaigns, locust infestation coinciding with elections in the State, locusts infest an area where mass unrest has been simmering for some time etc. Indeed, contingencies can be many and varied; and recording all possible contingencies and



preparing for them may be an unending task with little benefits. But DA may judiciously decide on what contingencies need to be planned for and act accordingly.

5.4.7 Monitoring Developments and Preparedness: Many of the activities enumerated above are one off in the sense that they need to be done once for a long time; for instance identification of CMs, TLs etc. Many others are on going in nature – training programmes, maintenance of equipment etc. DA may monitor the developments regarding these activities to ensure that they are undertaken earnestly in the right spirit.



5.5 L2 Response

In locust manifestation the response chain will start long before actual arrival of swarms in the State. The SOPs for locust control operations are tabulated in the next Section. DA, who will be in constant touch with DPPQS, will ensure that the Campaign Manager is kept in a state of readiness to immediately takeover the command of the situation. DA will also keep the Principal Secretary Agriculture and the APC posted of the developments regularly.

UPSDMA, shall declare the level of disaster situation based on the inputs of Agriculture Production Commissioner/ Principal Secretary, Agriculture members of its Executive Committee.

Primary L2 Functions:

1. Pre-identified CM will take command of the situation and employ pre-identified team leaders with trained field workers
2. Concerned DM will facilitate the control operations
3. Medical Officers will be attached to the sites of control operations to monitor cases of overexposure to insecticides.

Secondary L2 Functions:

15. Use of mechanical means of control against smaller infestations by local villagers under leadership of Technical Assistants (Plant Protection) Kissan Mitra / Kissan sahayaks
16. Loss assessment for relief from CRF, if applicable after the threat is over and L0 is declared

Emergency response: *There should not be any emergency response as locusts cannot appear suddenly. The threat gives ample time to take positions.*



State Control Room: Locust control measures will be undertaken by the CM who will choose his campaign headquarters close to the sites of maximum infestations. He will report to the DA who will keep the APC and through him the UPSDMA posted of the developments on regular basis. The State Control Room functioning under SDMA will monitor the CM's operations and will provide any strategic inputs / support it deems fit, or sought for by the CM. Normally in L2 situations there should not be any need for such inputs / support. The need, however, may arise if locust infestation coincides with some other threat or some other event that may demand administration's attention, for instance elections or festivals etc.

Relief Coordination: No relief coordination is to be undertaken during L2 situation. After deactivation of L2 the PPS, SDAO, DAO, CO, SDM and DM will assess if any farmers are eligible for relief under the Guidelines of the Calamity Relief Fund. Relief standards provided in GoI letter no 32-34/2005-NDM-I, GoI, MHA, DM-I Division dated the 27th June 2007, addressed to the Chief Secretaries and Relief Commissioners of all state, are made applicable in the State *vide* letter no GI-134/1-11-2007-46/97 of the Chief Secretary, addressed to all District Magistrates / DCs. The powers to sanction relief amounts, as mentioned in the Chief Secretary's letter are as under:

Amount	Sanctioning Officer
Up to Rs 5000	Circle Officer
Rs 5000 to Rs 7500	Sub Divisional Officer
Over Rs 7500	DM / DC

The Guidelines lay the following relief standards for locust situations:

Gratuitous relief can be provided for families in dire need of immediate sustenance after a calamity at the rate of Rs 20 per adult and Rs 15 per child, (inclusive of supplementary nutrition as per ICDS norms). In locust situation the maximum period for which the relief can be provided is up to 60 days, in case of a sever attack up to 90 days.



If the situation persists beyond 90 days the State level Committee shall decide the further period for which relief can be provided from CRF on month to month basis, coterminous with the actual period of prevailing situation.

Additionally, assistance supplementary nutrition can be provided at the rate of Rs 2 per person per day for a maximum period of 60 days. If the situation persists, this period can be extended up to 90 days with approval of State Level Committee if the relief is to be granted from CRF and as per the assessment of Central Team for assistance to be provided under NCCF.

Gratuitous relief should only be given to those who have no food reserve and who have no other immediate means of support. For quicker reference, the gratuitous relief provisions are tabulated:

Gratuitous Relief	Max no of days	Extendable up to	Extending authority	Beyond 90 days
Adult	20	60	Sanctioning authority	SLC, on month to month basis
Child	15	60		
Supple. Nutrition				
Adult	2	60	SLC if from CRF;	No provision
Child	2	60	CT if from NCCF	

Information centre: DPPOs should manage information centres in all districts affected by the pest. During or after control operations stray locusts may disperse to nearby fields and it may not be practical to send locust control teams to all such as low concentration areas, DPPO, TA (PP) etc should inform the farmers on effective handling of locusts in the fields.

Media management: DA regularly gives such matters as it considers merit wide dissemination to Director (Information) for onward circulation to media. Occasionally radio reporters are invited to visit field and radio features



on agriculture are frequently broadcasted. A locust attack, being a relatively rare phenomenon should attract significant media interest. To make full use of this opportunity, right from the receipt of the first alert, regular communiqués should be issued to press. TV channels should be encouraged to air informative software on locusts, as also on other agricultural issues, which should meet viewer interest if print media is regularly posted of the situation.

Care must be taken not to overstate the threat or the loss of crops as these are price sensitive information that will impact food prices, and also future prices on commodity exchanges. During L1 situation Office of the District Magistrate will give clearance to the Press Briefings. During L2/L3 situation SDMA/ Office of the APC / Principal Secretary, Agriculture, Government of U.P. will give clearance to the Press Briefings.

Recovery: A major infestation may wipe out the capital of small and marginal farmers. In all such cases Commissioner, Institutional Finance should take up the matter with RBI for extended repayment period of crop loans and waiver / reduction of interest rates. *Unless this is done promptly most SMFs will become ineligible for loans for next crop, which will delay recovery and may even impact food situation.*

Deactivation of L2, back to L0: APC will declare deactivation of L2 after reports of control are verified. If it is found that small bands of locusts are still persisting in some districts, APC may declare L1 situation in those districts after consulting with the concerned DM/DCs.



5.6 L3 Response

Procedure for the activation of plans: APC / Principal Secretary, Agriculture will declare the level on receipts of information about likely arrival of swarms in UP. *Actual arrival will leave no time for control measures.*

Control room upgraded to EOC: The State Control Room functioning under UPSDMA will be upgraded to EOC with the APC / Principal Secretary, Agriculture in charge.

Structure of EOC: The following functionaries will form part of the EOC:

47. APC (in charge)
48. Principal Secretary Agriculture
49. Director Agriculture
50. Principal Secretary Health

Primary Functions L3:

1. CM & DA, in consultation with DPPQS and IMD will chart the positions of swarms with prevailing / expected wind directions and wind velocities to forecast the courses the swarms may take. An outline of forecasting process is given in the Annexure.
2. Based on the expected course(s) of flights DA will inform the EOC of the districts that may face infestation
3. APC / Principal Secretary, Agriculture will seek aircrafts from DCA, GoI
4. APC / Principal Secretary, Agriculture will inform the DM's where aerial operations are contemplated
5. DA will seek technical assistance from DPPQS for aerial spray
6. DA will ensure availability of insecticides



7. DMs will ensure availability of airstrips for aircrafts to operate from in affected areas and availability of fuel for the aircrafts
8. DMs will also ensure availability of medical officers
9. Health directorate / DCMO will ensure adequate antidotes for Malathion poisoning
10. DA will supervise secondary control measures

Secondary Functions L3:

9. CM will ensure adequate teams for controlling the bands fleeing the aerial spray target area (the bands will mostly flee in downwind direction)

Functional control desks:

	Desks	Manned by	Functions
1	Aerial spray	Nominee of DA	Assess target area, adequacy
2	Insecticide availability	CM, Additional Director (PP)	Ensure stocking of insecticide
3	Fuel for aircrafts	Nominee of DA	Ensure stocking of fuel
4	Healthcare	Nominee of Directorate of Health	Ensure availability of experienced MO's with anti-dotes
5	Information	Dy Director (Information)	Issue of media releases
6	PPE	Nominee of DA	Ensure availability of personal protective equipment

Airstrips and stocking of fuel and pesticide

There are a number of air strips in districts. If these do not cover the area likely to be infested, additional sites should be inspected and prepared in



advance. Care must be taken that the airstrip is approachable by all weather roads and trucks carrying fuel and insecticide can reach it.

Airfields must have secure buildings to store fuel and insecticides. As redistribution of fuel / insecticides will entail loss of time and money, the stocks should be centrally stored and dispatches should be made after the control site is identified.

Different aircrafts have different fuel consumption. As the aircrafts will be obtained from DPPQS / DCA, fuel requirement must be ascertained at the time of seeking assistance for aerial operations. But for the purposes of advanced planning, it is reasonable to consider fuel needs based on 100 litres for each hour of flying. The maximum radius of operation for a light spray aircraft with 4 to 5 hours endurance is about 200 km. Ideally the airstrip should not be over 100 km away from the control site. A reasonable advanced supply to a field base would be 2 000 litres of pesticide and 2 000 litres of fuel. This would be enough to allow two light aircraft to operate for about two days. CM should ensure higher stock of insecticides at campaign headquarters to be distributed as need arises.

Steady supply of fuel can be ensured with Indian Oil who have depots for ATF at Agra and Delhi.

Deactivation of L3: SDMA on report of destruction / complete dispersion of swarms will declare deactivation of L3. If bands are still around and districts need State support L2 will continue else L1/L0 will be declared in consultation with concerned DMs, who will receive information from the extension / plant protection structure of Directorate of Agriculture.



5.7 Standard Operating Procedures: from receiving “Alert” till the threat resolves

Directorate of Agriculture will have a dedicated cell to deal with all matters related to locusts, including data base management. This Cell will be networked with the national level agencies, particularly Locust Watch Organisation, Jodhpur, DPPQS, Faridabad and IMD. This dedicated cell will be a part of the DM Cell in the Directorate.

Alerts are sounded by DPPQS when any swarms enter or are threatening to enter India. The swarms enter from west side and infest Gujarat, Rajasthan, Haryana and Punjab before they can reach UP.

Alert (swarms headed towards India)

Assess the time it would take for the swarms to reach UP	DA
Assess the likely numbers to reach UP	DA
Suitably alert the districts	DA
Based on the expected swarm size define likely threat level - not to be declared as the threat is yet to take place	DA
Alert the identified campaign manager	DA
Estimate the requirement of critical resources - equipment and insecticides	CM
Check the availability of resources - workability of equipment and insecticides in stores	CM
Ensure availability of equipment	CM
Set in a mechanism for daily gathering of information on swarm movements - may entail liaison with DPPQS, PP of Rajasthan and Gujarat	CM
Check availability of storage facilities in the threatened districts	CM
Identify and alert team leaders for control operations	CM
Review / update the pre-contract agreements for supply of critical resources	DAC
Obtain financial sanctions for purchase of critical resources	DAC

High Alert (swarms enter India)

Depute team leaders to their designated districts	CM
DPPO as convenor member of DLSAU shall activate and alert All Technical Assistants in the District who will activate and alert the Kissan Mitra / Kissan Sahayak /	DPPO



farming community to keep a watchful eye on locust appearance	
Procure resources	DA
Review identified sites for campaign headquarters in all districts	CM
Make <i>tehsil</i> wise teams	CM
Draw plans for control operations	CM
Intimate DMs concerned and requisition for MO	CM

Declaration of disaster situation (swarms enter UP)

Assess disaster situation and declare level	SDMA – APC/ Pr. Secy, Agriculture
Surveillance for hunting roosting locations of swarms	DPPOs / DLSAU
Informing the ICO of the roosting locations	DPPO/DM
Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform district administration	CM
Traffic control, if required	SP
Inform villages in downwind direction	SDM, BDO
Alert primary health centres / hospitals in the area	DCMO, SDM
Media release	CM, DM

Declaration of L2

Operationalise campaign headquarters	CM
Identify roosting sites	DPPPO, CM
Mobilize equipment from stores to target areas	CM
Deputation of MOs to control operation sites	DCMO, DM
Decide if control is necessary	CM, DPPO
Collect meteorological information	CM
Information dissemination	CM
Inform District administration	CM
Traffic control, if required	SP
Inform villages in downwind direction	SDM
Alert primary health centres / hospitals in the area	DCMO
Media release	CM, DA , DI



Control operations

Calibrate equipment	TL
Estimate swath width, decide on emission heights and track widths	TL
Non-stop operations	TL and CM
Six hourly reports	TL to CM
Twelve hourly reports	CM to DA
Campaign to continue till even isolated bands are destroyed	CM
Clean, maintain and store equipment	TL and CM
Disposal of empty insecticide containers	TLs, CM
Final report	CM

Declaration of L3

Request to DCA for aircrafts	APC
Request to DPPQS for tech assistance during aerial spray	DA
Intimation to concerned DMs	APC
Identification of suitable airstrips	CM, DM
Procurement of supplies: ATF, insecticides	CM, DA, DM
Ground monitoring	CM, TLs

Declaration of L0

Swarms destroyed	SDMA - APC
Assessment of loss due to locusts	DAO, DPPO, DSO
Recommendations for compensation if warranted	SDM, DM, RC
Sanction of compensation from CRF	RC
Disbursement of compensation	DM

5.8 Physical resources

Resources required for control operations can be broadly classified in three categories: Critical resources, manpower requirement and PPE (personal protection equipment)

Critical Resources

Sprayers

- Hand held
- Vehicle mounted
- Aerial support (L3)

Insecticides



Spare batteries for hand held sprayers
Protective gear for field staff
Diesel for vehicles
First aid kits at each site

Manpower requirement

For each hand held sprayer : Four persons to operate in shifts
For each vehicle : Eight persons to operate in shifts - teams of two -
one must be a driver
To man the stores in shifts : Nine persons - teams of three
Support personnel : Paramedics

Recommended minimum Personal Protection Equipment (PPE) if insecticide belongs to WHO Classification II, III or U

Activity	Required PPE
Moving and loading of ULV insecticides, equipment cleaning (<i>dustable powders</i>)	Boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, apron, face shield (<i>dust mask</i>)
ULV spraying (<i>if dusting</i>)	Closed canvas shoes or boots; cotton coveralls or two-piece work suit, gloves, (hard)-hat, face shield (<i>dust mask</i>)
Spray track marking (flagmen)	Closed shoes, cotton coveralls or two-piece work suit, hat
Insecticide transport	Closed shoes or boots, cotton coveralls or two piece work suit, gloves, apron, face shield, dust mask
Medium and large-scale insecticide storage	Boots, cotton coveralls, chemical-proof coveralls, gloves, hat, apron, face shield, dust mask, hard hat, respiratory protective equipment

Gloves and boots should be of PVC. ***Natural rubber and butyl gloves are NOT recommended for locust control as they get permeated within 12 minutes.***



CHAPTER – 6

PREPAREDNESS MEASURES



Chapter 6: Preparedness Measures

6.1 Preparations for pre-determined Responses

Preparedness is directly related to plan responses. It denotes that the State is prepared to take the envisaged control measures. Thus, preparedness would entail the activities that would ensure plan responses at appropriate time. Preparedness activities are therefore, noted against plan responses:

	Plan responses	Preparedness measures	Action
1	Assessment of time for swarms to reach State	<ul style="list-style-type: none"> ▪ Training in locust behaviour ▪ Training in fore-casting methods ▪ Drill in forecasting swarm movements- based on IMD data for States of Gujarat / Rajasthan 	Directorate of Agriculture
2	Assessment of swarm strengths	<ul style="list-style-type: none"> ▪ Training in locust behaviour 	Directorate of Agriculture
3	Estimating the required critical resources	<ul style="list-style-type: none"> ▪ Preparing list of required resources for swarms of varied sizes / behaviour 	Identified CMs
4	Ensuring availability of equipment in working condition	<ul style="list-style-type: none"> ▪ Half yearly maintenance drill and stock verification 	Identified CMs thru concerned DPPOs
5	Daily gathering of info on swarm movements	<ul style="list-style-type: none"> ▪ Training with DPPQS 	Identified CMs
6	Availability of storage facilities in affected districts	<ul style="list-style-type: none"> ▪ Identification of suitable sites – preferably the existing godowns of PP at Tehsil levels 	Identified CM through DPPOs
7	Availability of trained team leaders	<ul style="list-style-type: none"> ▪ Identification of team leaders ▪ Training of team leaders 	DA



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8	Alert activation through the extension structure of plant protection	<ul style="list-style-type: none"> ▪ One mock drill every year 	DA, will involve the DPOs of target districts and the plant protection extension staff in those districts
9	Procurement of resources	<ul style="list-style-type: none"> ▪ Preparing list of approved suppliers ▪ Keeping the rate contracts up-dated 	DA
10	Operationalising campaign head quarters	<ul style="list-style-type: none"> ▪ Part of the once a year mock drill 	CM with DPPOs
11	Making Tehsil wise teams	<ul style="list-style-type: none"> ▪ Preparing list of required resources for swarms of varied sizes / behaviour 	Identified CMs with identified Team Leaders and plant protection extension staff
12	Deciding whether control is required	<ul style="list-style-type: none"> ▪ Training in locust biology & behaviour 	Identified CMs
13	Drawing plans for control operations	<ul style="list-style-type: none"> ▪ Part of the annual control drill 	Identified CMs
14	Availability of trained MOs during campaigns	<ul style="list-style-type: none"> ▪ Training to MOs for managing Malathion absorption thru skin and lungs 	Directorate of Health
15	Equipment calibration	<ul style="list-style-type: none"> ▪ Training in control operations with hand held sprayers 	Team Leaders and CMs thru DA
16	Campaign progress reporting	<ul style="list-style-type: none"> ▪ Part of annual drill 	TLs, CMs thru DA
17	Request DCA for aircrafts	<ul style="list-style-type: none"> ▪ Keeping the details of appropriate channel ready, with annual up-dating of name and telephone numbers of concerned persons 	DA



18	Procurement of ATF	▪ Keeping the details of appropriate channel ready, with annual updating of names and telephone numbers of concerned persons	DA
19	Identification of suitable sites for airstrips	▪ Selecting the sites meeting the guidelines of DCA for airstrips for agricultural aviation	DPPOs / Dy. Director Agriculture; DMs to be kept informed



6.2 Capacity building, Sensitization and other proactive measures

The State has no master trainers / trainers to train the field staff in locust control. This gap can be filled with the help of central institutions functioning in the State. DPPQS has been operating Integrated Pest Management Centre (IPMC) in the State at two locations – Gorakhpur and Lucknow. IPMC, being part of DPPQS is competent and adequately equipped to organise sensitization / training programmes on locust control for field staff of Directorate of Agriculture. Services of UPAAM may be commissioned to coordinate and conduct the sensitization programmes proposed in the plan.

To bring forth the desired level of awareness a series of sensitization programmes are needed with faculty support from IPMC (or LWO). The sensitization / training programme can be planned in three phases:

- a. In the first phase all field staff of Agriculture Directorate working in Meerut, Saharanpur, Moradabad and Agra Division should be sensitized in identification and control of locusts at their various life stages / phases
- b. As the Directorate staff is liable to be transferred all over Uttar Pradesh, in the second stage of the sensitization drive, *all* DPPO's and Technical Assistants of the State will need to be sensitized in locust control
- c. Finally, locust control sensitization should be made a part of the training schedules of the Directorate and refresher courses on locusts should be included in the existing training programme

Despite low level of “vulnerability and threat levels, it is suggested that for successful campaign against locusts the atleast four Campaign Managers and ten Master Trainers be adequately trained, should there be a locust attack. Sensitization and Training programmes also offer opportunities for mock drill



that are also critically important for maintaining the state of preparedness. Six levels of sensitization and training programmes are envisaged:

1. **Training for Campaign Managers:** The CM's role requires complete perspective of operations. The persons identified for CM's role must be exposed to actual locust control operations as often carried out on the western borders of the country. If possible CM should be deputed to any training programmes conducted by FAO. FAO's trainings are announced to DPPQS and a request may be made to DPPQS for training the persons identified for CM' role. FAO trainings are expensive and the cost will be wasted if the person trained gets transferred to to some other department / state. It is therefore desirable that CM should be identified from amongst Agriculture Department functionaries, whose services should be available to the Department for some time.
2. **Training for Master Trainers:** For adequate level of preparedness a large number of people will need training. This can be done more efficiently by creating a pool of Master Trainers in the State. At least ten persons should be trained as Master Trainers, who can then go on to train others. These Master Trainers should be sent for training in locust control to the programmes conducted by Rajasthan and Gujarat Governments. The Master Trainers will be identified by the DPPOs in consultation with the Dy Director PP from amongst Technical Assistants Grade I.
3. **Sensitization for Team Leaders:** TLs will manage teams of sprayers, with role similar to that of an overseer. They will be trained/ sensitized by master trainers in the state. Key inputs for their sensitization / trainings are given in Annexure V.
4. **Sensitization for Field Staff:** Field Staff will work strictly under the supervision of TLs. They need to be trained in filling insecticides in the



sprayers, operating the sprayers and finally cleaning the equipment. They will be sensitized in recognising symptoms of over exposure to Malathion – either in themselves or in co-workers. They will be sensitized by Master Trainers.

5. **Sensitization for Support Staff:** Support staff needs to be sensitized in maintenance of equipment, filling of sprayers and in recognising exposure symptoms. They will be sensitized by master trainers.

6. **Sensitization for Medical Officers:** It is important to have MOs present at the site of control operations to manage any case of acute poisoning by Malathion. Though most of the MOs in the State will have some experience of treating persons who have orally ingested Malathion, the exposure at control operations sites are unlikely to be that due to oral ingestion. Thus the standard procedure of inducing vomiting may not be very effective. *It is recommended that Health Directorate may look into circulating standard procedures for treating people whose bodies have absorbed ULV Malathion (95%+ concentration) through skin or lungs. MOs being deputed to control operation sites should be aware of such procedures and be adequately equipped for them.*

Suggested Phases of Sensitization / Training Programmes

	Years:	2009-10	2010-11	2011 on wards
CMs		1	3	
Master Trainers		5	5	
Team Leaders		20	30	Part of regular sensitization programmes
Support staff		100	900	Part of regular sensitization programmes
Field functionaries*	NW Districts		All	Part of regular sensitization programmes
Medical Officers	NW Districts		All	Part of regular sensitization programmes

** Of the Directorate of Agriculture*



6.3 Use of Media

6.3.1 Key issues

An effective communication scheme complete with media plan is an essential part of preparedness measures. Unless there is an already structured media plan, information dissemination at the time of operation may get haphazard, *because the sites of operations will get identified just before sunset when the locusts have settled for the night.*

Key issues of the media plan would be:

- Advising the local community of the control measures in their area
- Traffic control if the roosting area is along some arterial road
- Alert to villages in downwind direction from the operation sites
- Information on medical preparedness, on nominated / designated hospitals, doctors / paramedics etc to cover emergency health management, the need of which may arise due to accidental over exposure to Malathion in downwind area

A good media plan should also enhance

- Community knowledge base: because of topical interest in locusts, it would be a good time to educate the community on locust biology, behaviour and control
- Awareness level: by following up with interviews of agriculture scientists / entomologists from Agriculture Universities in print and electronic media

The communiqués would be released by the Director (Information) but the materials must be kept ready at Directorate of Agriculture with only the last minute details to be filled in. This exercise is covered under the SOPs in Section 5.7 of the Plan.



6.3.1 SOPs for Media releases

A copy of the typical medial release is given in the next section. It will need to be filled by the CM and vetted by the District Magistrate. Dissemination will take place at two levels; local, and State capital.

A release vetted by the District Magistrate will be sent to DA who will pass it on to DDI for release to TV and Radio the same evening.

DPPO and Panchayat level extension staff of Agriculture Department shall ensure that the affected areas are alerted. The SP will ensure diversion of traffic if required.

6.3.3 Draft Media Release

Locust control measures are being carried out in ***** village(s) under ***** Gram Panchayat, ***** PS, ***** Tehsil, ***** District. The control site runs along ***** road at *** to *** kilometres. Operations shall start at **** on **** and are scheduled for **** days.

People of nearby villages, namely, ***** (those lying in downwind direction) should take precautionary measures against airborne insecticide droplets. Masks of cotton clothes will provide sufficient protection. If the following symptoms persist, people should visit the nearest PHC / hospitals at *****.

Symptoms of Insecticide Poisoning

- Irritated or tearing eyes with blurred vision
- Headache, muscle twitching, tremor, muscle weakness, paralysis
- Runny nose, abnormal breathing
- Nausea, vomiting, abdominal pain, diarrhoea



Chapter 7

Financial Arrangements

7.1 Assessment of required financial resources

Financial resources required for this plan are estimated in two parts – cost of introducing the plan and cost of maintaining the plan – broadly akin to capital cost and operating cost. Although, unlike any physical sector plan, capital cost will not give rise to *physical assets* of commensurate value. The assets generated will be (in addition to physical assets such as sprayers) in the form of enhanced capability of the State to understand locust behaviour and to fight the menace.

One Time (Capital) Expenses

Particulars	Cost	
1 Training of Master Trainers	10.00	At Gujarat / Rajasthan
2 Training of CM (four persons)	30.00	FAO Training
3 Sensitization of Directorate staff	21.00	By UPAAM / MTs
4 Sensitization of TLs	2.31	By Mts/ UPAAM
5 Sensitization of support staff	2.31	By Mts/ UPAAM
6 Premises for Headquarters	36.15	Including cost of land
7 Generator set / switchgear	1.00	Lump sum
8 Acquisition of hand held sprayers	12.00	40 sprayers
9 Acquisition of PPE	1.00	100 sets
	115.78	

Running cost will be largely in maintaining the physical assets and in continued trainings & mock drills:

Running Expenses

1 Annual Sensitization	5.00	Part of regular training for directorate staff
2 Annual drills	6.00	Involving people in the vulnerable districts
3 Maintenance of equipment	1.20	10% of acquisition cost
4 Maintenance of premises	1.02	5% of construction cost
6 Staff* at HQ	1.20	
	14.42	

**HQ premises will be in charge of the DPPO, Meerut. Only a watchman will be posted there; mechanical maintenance will be outsourced to suppliers.*

The financial resources required are to the tune of Rs 115 lacs for the introduction of the Plan and Rs 15 lacs per annum for keeping it operational.



7.2 Funding Arrangement

The Disaster Management Act defines mitigation as “measures aimed at reducing the risk, impact or effects of a disaster or threatening disaster situation”. As all the costs detailed above are for purposes that meet the definition of *mitigation* in the Act, these costs are, therefore, eligible for funding from Disaster Mitigation Fund. Planning Commission has suggested that 0.5% of the total plan allocation of each Ministry/Department be earmarked for National Disaster Mitigation Fund. The position of DMF for states is not yet crystallised. Till such time that State creates a DMF the funds for meeting the introduction cost and maintenance costs will need to be budgeted in the Agriculture Directorate’s annual cost estimates.

7.3 Funding for campaigns against locust infestation

The cost of a campaign against locust infestation will depend on the size of the infestation and will vary very widely. An L3 situation, though unlikely, will call for chartering aircrafts and the cost may well go into crores.



PART III

CROSS-CUTTING ISSUES



Chapter 8

Mainstreaming Disaster Management Concerns into Developmental Plans / Programmes

This generally includes creation or maintenance of economic and social infrastructure like irrigation, power, drinking water, sanitation, roads, buildings, schools and hospitals, housing, heritage monuments etc that can be of use in disaster management operations. Typically, elements of impact assessment, risk reduction, and the “do no harm” approach need to be built into the developmental plans while building in DM concerns into such plans.

Locust control does not require permanent infrastructure that can be included in development plans. Because of rather low threat of massive swarm incursion in UP requiring aerial operations, creation of rural airstrips is not really called for; instead flat fields of adequate size may be identified that can be converted into airstrips for control operations at short notice. In most cases there will be an existing airfield within a radius of 100 km from the control site. Such airfields can be used for the spray aircrafts.

There is an allied issue which may be considered for inclusion in development plans of the districts. In Section 5.3.4 a reference was made to naturally occurring insecticide - the extract from **Neem** seeds. It was noted that it would be difficult to produce sufficient quantities to combat a large-scale locust infestation at short notice. While research scientists are quite bullish on neem extracts, the scientists in the field are not. The general belief is neem extract is good for lab but not for the field because we can hardly ever get enough neem extract to fight a major infestation of locusts, more over being a natural extract, the concentration of the active ingredient (and hence efficacy of the insecticide) will vary from batch to batch.



However, neem extract is effective, at least for fighting minor infestations, and it has no harmful effect on mammals. It is, therefore, suggested that the forestry programmes / social forestry programmes of the target districts may consider encouraging plantation of neem trees. Western states of Rajasthan, Gujarat have high number of neem trees, Neem can survive dry spells and also provides cool shade during hot months. Extracts, affecting the eating habits of insects, are obtained from neem seeds. Neem extract has ready market in India and abroad. The process is simple (the State has scores of such units engaged in extracting essential oils from mentha / lemongrass etc) and collection of neem seeds can become a useful seasonal activity for BPL people. With vigorous and sustained drive to plant neem trees in two decades or so State can look forward to manage minor infestation without any chemical pesticide.

Encouraging Neem plantation may not be easy though. In Saharanpur and nearby areas, which are more susceptible to locust attacks than most other districts, it will have to compete with eucalyptus and poplar which are grown extensively as raw material for paper industry. Moreover, because of its relatively late fruition, Neem trees will take longer to become economically remunerative. State Forest Department considers Neem a good “row tree”, to be planted along the roads. The growth has not been as expected because people often take away twigs from young trees for brushing teeth.

Nevertheless, Neem oil and Neem oilcake are regularly sold and have ready markets. These products also have good export markets. With encouragement from District Administration, it should be possible to have large tracts under Neem. This issue deserves to be incorporated in the district plans of western districts.



Chapter 9 Partnership with other stakeholders

The largest stakeholder in any exercise controlling locust infestations is the farming community. Farmers would also (often) be among the first to notice locusts. Further, support manpower for control operations would usually be drawn from the rural communities. It is therefore extremely important to win full support of the local farming communities to the locust management plan.

Many other organisations will have major roles to play in control operations and recovery efforts, such as, the academic institutions, scientific and technical organisations, armed forces (for possible logistic supports) NGOs etc. For smooth and efficient control operations, strong working relations need to be developed and maintained with the following organisations / institutions:

- Communities
- Academic institutions
- Scientific and technical organizations
- NGOs
- Public sector units
- Private sector organizations

Disaster, it must be noted, is a collective problem, which requires a collective approach involving government, private sector, humanitarian agencies, NGOs and of course the local communities. As in any other disaster, even in locust manifestations, poor people suffer most. It may appear contradictory as the poor are landless and damage from locust attacks are estimated in terms of loss of crops – i.e. the estimated losses only measure the losses to land owners. Poor suffer from secondary effect: major loss of crops implies loss of livelihoods for all those who entirely depend on providing services to farm owners. Thus the economic impact of a locust attack may be high for land owners *in rupee terms* but it usually is much greater for poor in terms of *percentage fall in earnings*, leading to starvations.



The only way the poor can be helped lies in community preparedness and education about risk reduction. It is here that private sector corporates, finance institutions and banks need to rise to the challenges presented by disasters. This cannot be ensured without making them partners in preparedness and recovery processes. Seeking donations from these organisations is not the way out. What is required is to seize the business opportunities that arise from any calamity and invite the private sector to exploit those opportunities while bearing a fraction of the cost of recovery.

Loss of standing crops mean huge losses not only for farmers but also shrunk markets for fertiliser and insecticides manufacturers, poor prospects of loan recovery for banks, underutilisation of warehousing capacities, loss of raw materials for agro-based industries – sugar mills, flour mills etc and finally loss of markets for all manufacturers who cater to the rural markets – from soaps to tractors. *All these organisations have substantial stakes in successful control operations against locusts and in faster recovery.*

Donations are important for immediate relief but cash has a tendency to get frittered away on unproductive uses. Disaster managers need to come up with innovative schemes to achieve timely relief and quick recovery. Such schemes will depend on the local agronomy and may differ from district to district. For example if the damage takes place in early stage of crops, farmers may go for re-cropping or for an alternate crop. Here the stakeholders are land-owning/tilling farmers, landless agricultural labour, fertilizer and insecticide dealers / manufacturers, banks and financial institutions, traders & warehouse owners, rice millers & exporters, etc. and finally the State. Agriculture universities, research institutions etc will be the resource centres. Second / alternate crop will meet the recovery needs by providing employment for agricultural labour and reducing the burden (of total loss) for farmers. It will also enable the farmers for timely operations of the next crop.



Chapter 10

Review and Updating

10.1 Probabilistic scenario-building

Models giving probabilistic scenarios are built based on available data. The major steps involved in this exercise are identifying the complete set of exogenous variables that impact the model's output parameters, understanding the relationship between the exogenous variable and output parameters, collection of historical data of exogenous variables, understanding the distribution of those variables to see if they fit in standard statistical distributions. Finally running the model hundreds of thousand times to get the *expected* exogenous variables based on random inputs in statistical distributions and calculate the output parameters based on the expected values of the exogenous variables so derived.

Such a model for predicting locust infestation is not quite possible. The exogenous variables so far as UP (or even India) is concerned are: rainfall in breeding areas, rain fall and food availability on swarm paths, wind direction etc and no reliable model can be prepared with these variables. Moreover as stated earlier though swarm movements are well documented still it is extremely difficult to predict swarm movements with any certainty. In absence of any distribution pattern on swarm incursions probabilistic models will be of little use.

A simple model of likely damage has been provided earlier.

10.2 Schedule for mock drills / exercises

Mock drills must be conducted at least once a year in all districts of western divisions. Activities of a drill are described in Annexure VI.

10.3 Schedule for Updating the Plan

The plan needs to be updated regularly and its updation should be part of the key performance areas of a middle level functionary in Plant Protection Division of the Directorate of Agriculture. Updation points are detailed in Annexure VII.



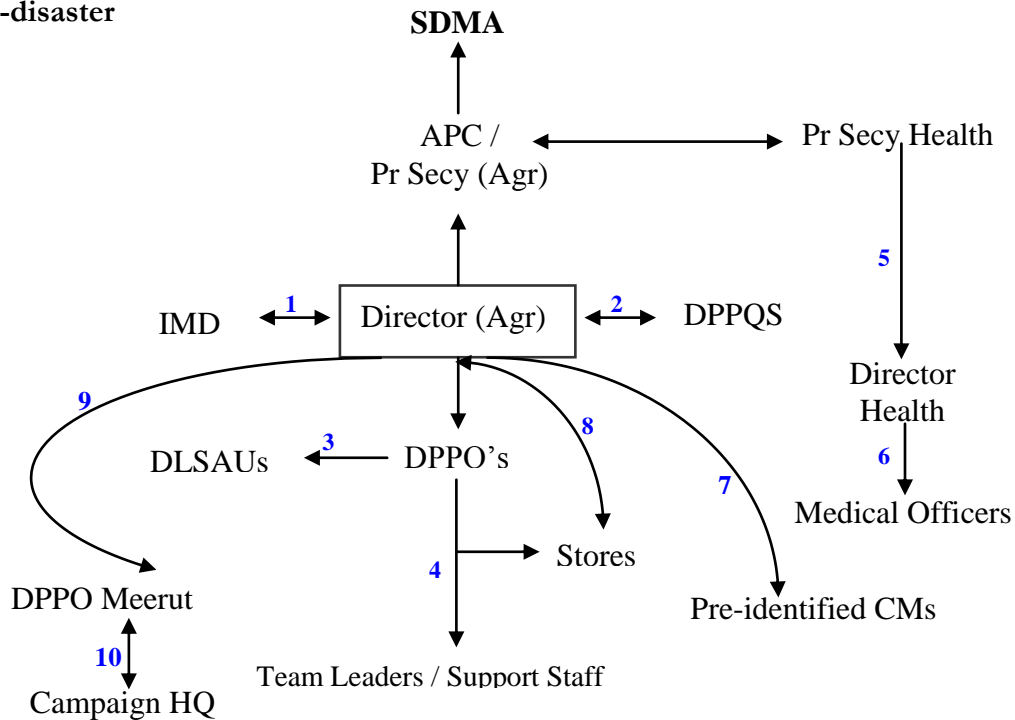
Chapter 11 Coordination and Implementation

11.1 Gridlock of Incident Command Office

Locust control operations will be undertaken by a specialist leader, namely the Campaign Manager. Thus, the CM will be the Incident Commander. State will have four persons adequately trained to take on the role of the CM. On declaration of L2 situation, one such person, depending on his / her availability shall be ordered by the SDMA to assume the role of the CM.

11.2 State Wide Activity Flow

Pre-disaster



L0 Situation

1 & 2	DA to maintain regular contact with Directorate of Plant Protection , Quarantine & Storage (DPPQS) and with Indian Meteorological Deptt (IMD)
3	DPPOs as convenor members of District Level Surveillance Advisory Units (DLSAU) to keep the Units active
4	DPPOs to keep track of all pre-identified and trained TLs and support staff in their districts
5 & 6	Director Health to ensure adequate training of medical officers for managing Malathion (ULV) ingestion by lungs

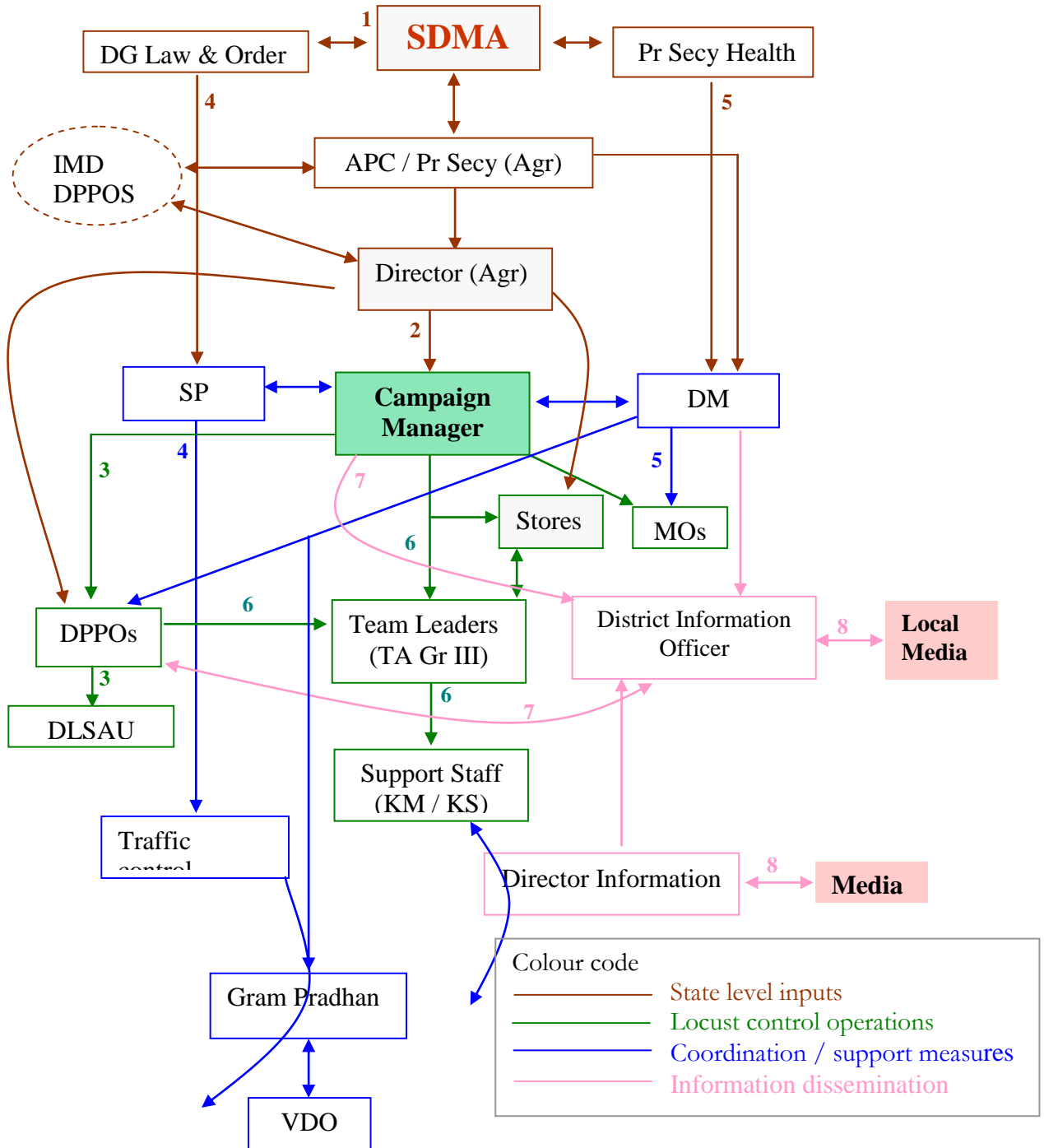


DISASTER MANAGEMENT PLAN-LOCUSTS
Government of Uttar Pradesh

7	DA to keep track of the identified CMs to ensure their availability at shortest notice
8	DA to assess the availability of required physical resources and of working condition of equipment
9 & 10	DA to ensure (through DPPO, Meerut) that the Campaign Head Quarters can become operational immediately



During disaster: L2 Situation

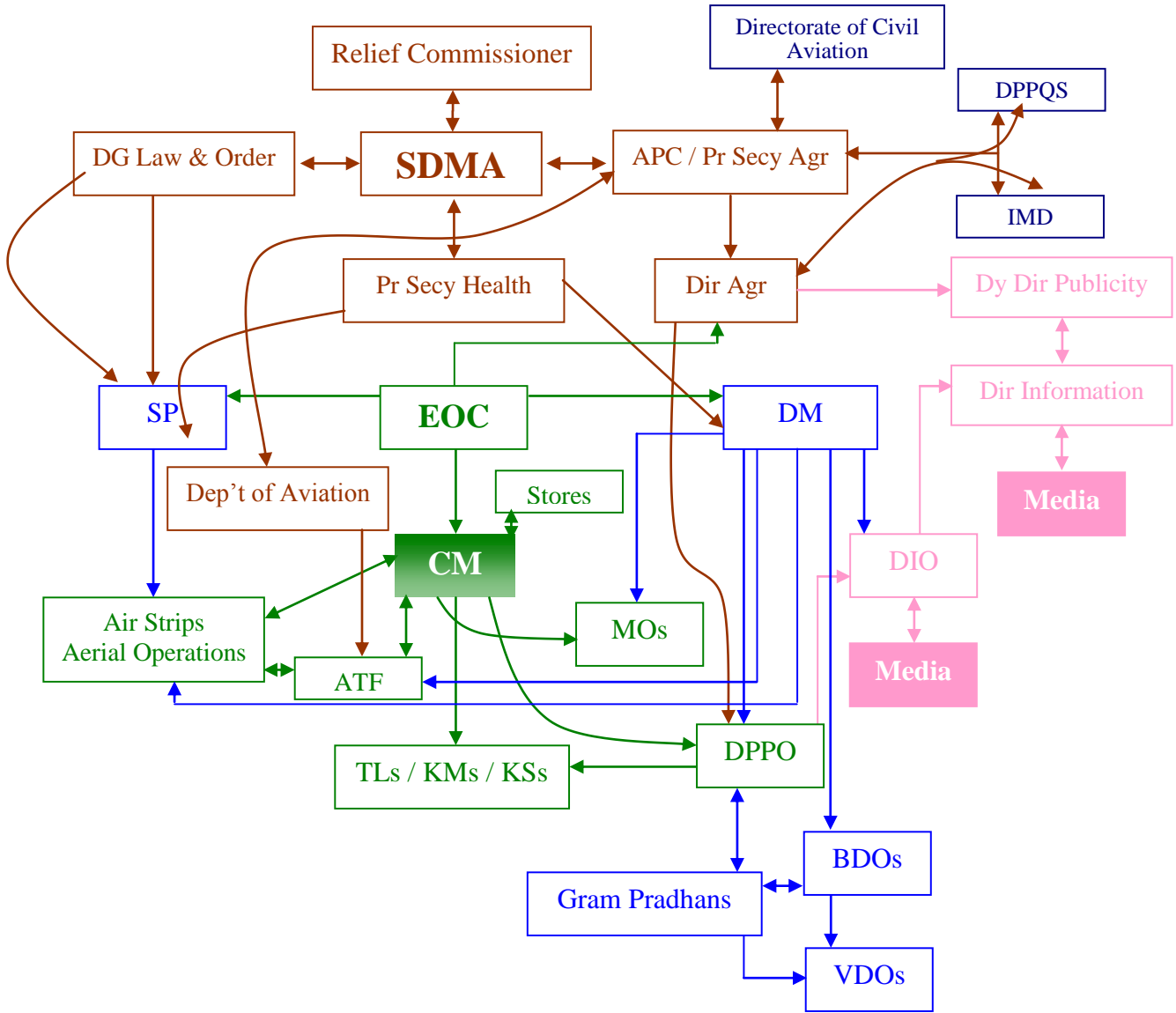


- 1 | L2 declared by SDMA
- 2 | CM ordered to take over charge
- 3 | CM mobilises DPPOs, and through him DLSAUs for surveillance
- 4 | SDMA through DG (L&O) supervises traffic control and other such issues
- 5 | SDMA through Pr Secy Health supervises availability of MOs at operation sites



- 6 | CM with DPPO(s) puts together the campaign team and the TLs
- 7 | DPPO and CM keep the DIO posted of developments
- 8 | DIO and DI disseminate information through media briefs at district and state levels

During disaster: L3 Situation

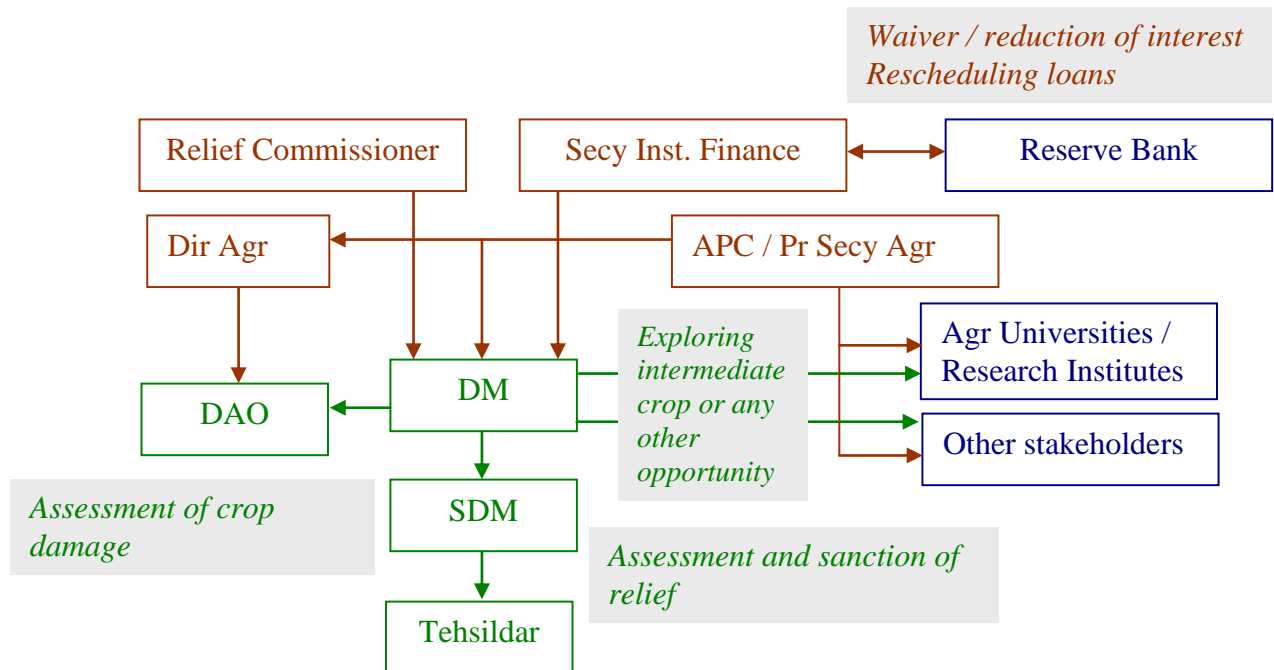


Colour code

- State level inputs
- Locust control operations
- Coordination / support measures
- Information dissemination



Post disaster



11.3 Quality and outcome indicators

The quality and outcome of the plan can be tested only in the event of an infestation. However, drills reveal the level of preparedness. Mock Drills, as described in Annexure VI, will give an opportunity to test how successfully the processes of the Plan will have been internalized. The key preparedness parameters are:

- Time taken by the CM for taking position
- Time taken by the TLs to report
- Time taken for movement of sprayers and PPE from HQ to the sites
- Time taken by MOs to report
- Time taken in loading calibrating the equipment, deciding on swath widths, and track widths
- Work rate achieved with plain water in sprayers
- Working conditions of sprayers, generator sets, PPE, communication equipment
- Reporting frequency (and quality)



11.4 Monitoring mechanisms, MIS

Since the Plan envisages to introduce a completely new set of activities with its own structures, the monitoring of introduction of the Plan will be quite different from monitoring in later years when the Plan processes should have been fully internalised. Accordingly the proposed MIS is divided in two parts – a) for the first two years; b) for subsequent years. The MIS for the first two years will be more frequent and will be focused on creation of physical and organisational infrastructure. In the subsequent years the focus will be on preparedness.

11.4.1 MIS for the first two years

	Activity to be monitored	Responsibility	Monitoring authority
1	Selection of site for campaign HQ	DM Meerut	Pr Secy Agr
2	Construction of campaign HQ	PWD	Pr Secy Agr
3	Training CMs	Dy Dir PP	Dir Agr
4	Sensitization of TLs		
5	Sensitization MTs	DPPOs of western divisions	Dy Dir PP
6	Sensitization support staff		
7	Acquisition of sprayers		
8	Acquisition of PPEs	Dy Dir PP	Dir Agr
9	Pre contract agreements for Malathion		

Frequency of the reports is not being suggested. This can be worked out after schedule for the activities are finalised. Care should be taken to ensure that reports are received while there is still time for corrective measures if an activity is seen to be behind schedule. For example if an activity is to be completed by Dec 2009, status reports must be obtained in Oct and Nov to take corrective measures if needed.

In each case the person responsible for the activity shall report to the monitoring authority the following:

- a. Status of the activity



- b. What was to be achieved by this date
- c. What has actually been achieved
- d. The reasons for delay
- e. Corrective measures required to keep the project on schedule

11.4.2 MIS for subsequent years

	Subject	Report by	Report to	Frequency
1	Status of HQ	DPPO Meerut	Dy Dir PP	Half yearly
2	Status of plan updating	Dy Dir PP	Dir Agr	Half yearly
3	Status of Trained Personnel	Dy Dir PP	Dir Agr	Annual

Status of HQ

1. Number of sprayers:
2. Condition of sprayers:
 - a. Excellent:
 - b. Good:
 - c. Needing repairs:
3. Last visit by AMC contractor:
 - a. Number of PPEs:
 - b. Condition of PPEs:
4. Working:
5. Needing replacement:
6. Certificate that the general upkeep of premises is satisfactory; if not reasons thereof and date by when it would be satisfactory.

Status of Plan Updating

21. Certificate that the following have been updated:
 - a. Emergency contact numbers
 - b. Contact details of Malathion ULV suppliers
 - c. AMCs for sprayers



- d. Relief standards (as per latest GoI / GoUP instructions)
- 22. Any changes in long term vulnerability of State in view of changed weather pattern as observed by FAO / LWO
 - a. Will the changed vulnerability demand more TLs / campaign workers?
- 23. Any changes suggested in fighting locust infestations by FAO / DPPQS

Status of Trained Personnel

- 1. Number of trained CMs available
- 2. If less than 4, schedule for training the shortfall number
- 3. Number of trained MTs available
- 4. If less than 10, schedule for training the shortfall number
- 5. Number of trained TLs
- 6. If less than 50, schedule for training the shortfall number
- 7. Training programmes held on locusts



8. Annexures to the Plan

- I. Damage/need assessment format
- II. Contact details of three manufacturers of Malathion ULV
- III. Emergency telephone directory
- IV. List of training/technical institutions
- V. Key inputs for training for Team Leaders
- VI. Detailed activities for mock drills
- VII Points for updating the Plan



Annexure I

Damage / Need Assessment Form

Name of holder:		
Father's name:		
Village:		
Gram Panchayat:		
Description of holding:	Circle No:	
	Mauza:	
	Khata:	
	Khesra:	
	Area:	
Irrigation	Irrigated	Non irrigated
Standing crop:		
Standard crop value:		
Extent of damage: (% loss)		
Lost value:		
Available food reserve	YES	NO
If NO food reserve:		
Number of dependants	Adults:	Minors:
Eligible gratuitous relief per day:		
Recommended no of days:		
Eligible gratuitous relief:		

Signature / LTI of Holder:

Signature of Surveyor:
(Name and designation)

Signature of Gram Pradhan:

SANCTIONED / RECOMMENDED

SANCTIONED / RECOMMENDED

TEHSILDAR

SDM

SANCTIONED



INTEGRATEDMANAGEMENT GROUP, LUCKNOW

DM

Annexure II

Contact details of Malathion ULV manufacturers

	Name of firms	Addresses
1	Shivalik Rasayan Ltd	Corporate office 1506,Chiranjiv Tower,43, Nehru Place, Tel: (+91-11) 26221811,26418182. Fax: (91-11) 26213081 Regd. Office & factory :: Kolhupani, P.O. Chandanwari, Dehra Dun 248007 Tel: (+91-135) 2773429,27772038
2	Hindustan Insecticides Ltd.	Crop Office 6, SCOPE Complex ,7, Lodhi Road New Delhi 110003 Sales: Regional Sales Manager 1, Shopping Complex , Karampura , New Delhi -110015 hilnor@nde.vsnl.net 091-11-25938757, 25464921
3	Janki International (Suppliers)	206/C-10 Lokdhara, Kalyan (East) Mumbai, 421 306 India Tel: +91 251 2351562 Fax: +91 251 2351562



Annexure III



Key inputs of Sensitization programmes for Team Leaders

Suggested duration: 4 days

1. Introduction to locusts' biology and behaviour (one day)

- a. Locust phases: solitarius & gregarious
- b. Life cycle of locusts: eggs, hoppers, adult – maturation
- c. Locust behaviour: Solitary, groups, swarms
- d. Locust infestations: recessions, outbreaks, upsurges, plagues and declines

2. Control operation (two days)

- a. Necessity of control and control methods: Cost benefit analysis, Mechanical, Baiting, Spraying
- b. Spraying: Water-based spraying, Ultra low volume (ULV) spraying, ULV sprayers, Droplet size, Droplet spectrum
- c. Spreading ULV spray evenly over the target: Swath width, Track spacing
- d. Calibration: Droplet size, Emission height, Recommended dose of insecticide
- e. Achieving the recommended dose: Calculating the required volume application rate (VAR), Calculating sprayer settings for required VAR., deciding track spacing, speed and flow rate
- f. Sprayer strategies: Spraying single hopper bands, Spraying blocks of hopper bands,
- g. Barrier spraying to control hopper bands, Spraying settled swarms, Spraying flying swarms
- h. Finding and delimiting the target: Finding individual targets – bands and swarms, Delimiting and marking individual targets – bands and swarms, Delimiting a block of bands or a scattered swarm
- i. Weather conditions for spraying: When to spray, When not to spray, Wind, Sunshine, Rain
- j. Monitoring operations: Spray monitoring, How to assess locust mortality, Measuring approximate size of the target, Measuring average density of locusts in the target. Calculations for field mortality assessments,



k. Cleaning, storing and disposing of spray materials: Sprayers, Insecticide storage, Disposal of pesticide containers

3. Safety and environmental precautions (one day)

- a. Sources of risk: Toxicity, magnitude of exposure, duration of exposure
- b. Personal protective equipment (PPE): Use and maintenance of PPE
- c. Logistics: Insecticide transport, insecticide and fuel storage,
- d. Fire risk
- e. Handling insecticides: Mixing insecticides, loading insecticides,
- f. Spraying: minimizing exposure of control staff, bystanders, livestock and non-target areas .
- g. Poisoning: Signs and symptoms of poisoning, first aid, treatment
- h. Cleaning up: Empty containers, Contaminated PPE, spills, remaining insecticides
- i. Spray monitoring: Efficacy assessment



Annexure VI

Mock Drills

Schedule: Two drills during the year – one during Rabi and the other during Kharif crops

Coverage: Drills will first cover the five north western districts, namely, Saharanpur, Muzaffarnagar, Baghpat, Meerut and Ghaziabad. Later drills will cover districts of GB Nagar, Bulandshahr, Aligarh, Mathura, Hathras, Agra and Firozabad will be covered one time during the year.

Outcome indicators:

Time taken by the CM for taking position

Time taken by the TLs to report

Time taken for movement of sprayers and PPE from HQ to the sites

Time taken by MOs to report

Time taken in loading calibrating the equipment, deciding on swath widths, and track widths

Work rate achieved with plain water in sprayers

Working conditions of sprayers, generator sets, PPE, communication equipment

Reporting frequency (and quality)

Drill planning:

Such a drill must be planned in advance with minute details. Director PP will prepare scenario based on swarm strength and distance from state borders. The scenarios will have details of swarm landing sites and swarm behavior. The swarm behaviour will be based on realistic assumptions of their feeding habits and movements. Full details of the scenario shall NOT be divulged, instead only such developments shall be revealed at each stage as would become known in a real life situation.



The alert for the Drill shall be declared by the SDMA / APC. Declaration by SDMA will underscore the importance of the drill and will motivate all the Government functionaries to participate in the drill in right earnest.

Other Issues

- L2 activities will be enacted with senior level inputs to check on the coordination *from top to the campaign worker level.*
- The drill should be aimed at testing all L2 activities – control operations, support and coordination as well as information dissemination.
- Media may be invited to witness the preparedness.



Annexure VII

Points for Updating the Plan

1. Telephone numbers and other contact coordinates of the following persons need to be checked and updated every quarter:
 - a. Trained campaign managers,
 - b. Trained team leaders,
 - c. Functionaries of the Department / Directorate of Agriculture and
 - d. Functionaries of the State Control Room
 - e. DPPQS, Faridabad
 - f. LWO, Jodhpur
 - g. Directorate of Civil Aviation, GoI

2. Contact details of the following need to be updated every six months:
 - h. Malathion ULV suppliers,
 - i. Suppliers of sprayers and of PPE

3. Changes in Relief Standards will need to be made as and when warranted by GoI / GoUP directives

4. Any changes in long term vulnerability of State in view of changed weather pattern as observed by FAO / LWO will be needed to be incorporated with particular attention to:
 - j. Will the changed vulnerability make other districts more vulnerable than they are today? If so, the vulnerability map will need to be redrawn.
 - k. Will the changed vulnerability demand more TLs / campaign workers? If so, adequate number of personnel should be trained and costs thereof be estimated to be incorporated in the Plan.

5. If FAO / DPPQS suggest any changes in fighting locust infestations, such changes may have far reaching impact on the Plan- must be studied in detail to be incorporated

