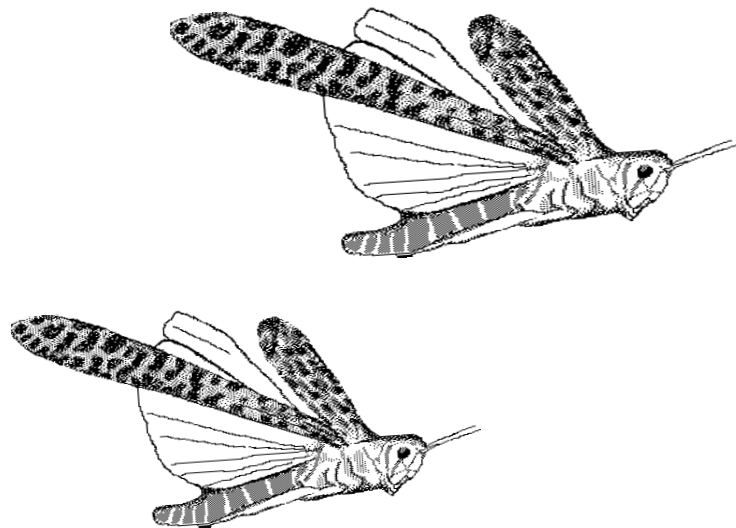


Desert Locust Joint Survey in the Spring Breeding Areas of the I.R. Iran and Pakistan

April-May 2009



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Desert Locust Joint Survey
In the Spring Breeding Areas of Pakistan and I.R. Iran

April-May 2009

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The team cordially acknowledges Mr. Keith Cressman, Senior Locust Forecasting Officer (DLIS/AGPP) and Secretary of the FAO Commission for Controlling the Desert Locust in Southwest Asia (SWAC) at FAO in Rome for his personal efforts as well as the offices of the FAO Representatives in I. R. Iran and Pakistan for their assistance.

The team is extremely grateful to the FAO and its representatives at Islamabad and Tehran for providing additional technical assistance and facilitating the disbursement of general operating expenses and daily subsistence allowances for the survey.

The Joint Survey team also wishes to solicit and thank all of those individuals who assisted in the smooth implementation of the survey.

Summary and Recommendations

1. The 15th consecutive annual joint border Desert Locust survey of the desert areas in the provinces of Sistan/Baluchistan, Hormozgan and Kerman, I. R. Iran and Baluchistan, Pakistan was carried out from 1 April to 4 May 2009. Some 12,680 km were covered of which 5,880 km were in I.R. Iran and 6,800 km in Pakistan.
2. Based on the recommendations of the 14th joint survey, 18 days were spent in Pakistan and 16 days in I. R. Iran. This year, the Iranian team did not enter Pakistan due to disturbances and security reasons. However, the Pakistani team travelled in I. R. Iran.
3. Consequently, the Iranian team did not receive any daily sustainable allowance (DSA) for the Pakistani side. Since the portion of the Joint Survey carried out in Pakistan was supposed to be a national activity conducted only by the Pakistani team, as advised by FAO due to security concerns, Pakistan covered the fuel costs and the FAO Commission for Controlling the Desert Locust in Southwest Asia (SWAC) paid for general operation expenditures and for 75% of the originally intended DSA when the team was in Pakistan, and the full DSA when the Pakistani team was in I. R. Iran.
4. Potential locust breeding areas were surveyed during the period under report in I.R. Iran (Saravan, Khash, Zaboli, Iranshahr, Chabahar, Jask, Kahnuj) and in Pakistan (Nushki, Dalbandin, Kharan, Panjgur, Turbat, Jiwani, Gwadar, Pasni and Uthal).
5. Locust Situation:
 - Pakistan: Neither locust swarms nor any gregarious / solitary breeding was observed from 1-18 April 2009. However, a scattered population of solitary adults at densities of 25-50 adults/ha was seen in the interior of Kharan at Boporek (283313N/651521E) and Totari area (283141N/650844E) on 5 April and at Prome (263847N/631939E) near Panjgur on the 7th.
 - I.R. Iran: No locust swarms nor any gregarious / solitary breeding was observed from 18 April to 1 May 2009. Only insignificant numbers of solitary locust adults were observed in the Memari area (270617N/604211E), Bris (251348N/605604E), Baleshti (270609N/585723E), Khairabad (270421N/603851E), Govadeh (272039N/620046E) and Penik (274411N/585103E) at an average density of 15-25 adults/ha.
6. Habitat:
 - Pakistan: Baluchistan received light to moderate rain in different potential breeding areas since January 2009. Vegetation at most of the places was drying out while at some places it was greening or green. Vegetation densities were different at different places ranging from low to dense. Soil moisture varied from wet to dry.
 - I.R. Iran: light to heavy rain fell during the spring in different potential breeding areas of Sistan/Baluchistan, Hormozgan and Kerman provinces. Soil moisture varied from wet to dry and vegetation was mainly greening or green. Vegetation densities varied from low to dense at different places.
7. The survey results indicate that the Desert Locust situation in both countries is calm. In Pakistan, scattered solitary locusts are likely to remain until vegetation and soil dry out, and there is little possibility of any gregarious locust activity developing. In I.R. Iran, the situation is a slightly different and similar to that in March 2007. The good ecological conditions that are currently present combined with recent rains and relatively cool weather may prolong breeding this year by about one month. Therefore, surveys should continue in the breeding areas to monitor the situation.
8. This year, the team tested a demo version of a new tool, the Joint Survey Database (JSDB). It was found to be of potential use in future surveys and should be finalized.
9. New survey routes, one each in Pakistan and I.R. Iran, are proposed for the next joint survey in 2010.

**Desert Locust Joint Survey in the Spring Breeding areas
of Pakistan and I.R. Iran
April-May 2009**

Introduction

This is the fifteenth joint survey conducted in the spring breeding areas of Pakistan and I.R. Iran as recommended by the Nineteenth Session of the FAO Commission for Controlling the Desert Locust in Southwest Asia (SWAC) in 1994. The survey was undertaken by a joint Pakistan / I.R. Iran team at the time of year when locusts are most likely to be present and breeding in both countries. The survey was carried out for a period of 34 days from 1 April to 4 May 2009 for 18 days in Pakistan and 16 days in I.R. Iran (see Appendix 2).

Keeping in mind that hot weather commences first in Baluchistan (Pakistan), the first half of the survey is carried out there while the second half is scheduled in Sistan/Baluchistan, (I.R. Iran). Considering the security situation in Baluchistan (Pakistan) this year, the original survey plan was modified slightly so that only the Pakistani team carried out the survey in their country while both teams undertook the survey jointly in I.R. Iran. As this is an international survey, this practice is very much discouraged except in extraordinary circumstances.

The Joint Survey team consisted of two locust experts each from I.R. Iran and Pakistan. On 18 April, the Pakistani team crossed to Mirjaveh, I.R. Iran at the Taftan border point and surveyed with the Iranian team until 1 May. On the following day, the Locust Unit Heads of both countries met in Zahedan (I.R. Iran) to discuss the results of the survey and to exchange viewpoints for two days.

During the joint survey, a distance of 6,800 km in Pakistan and 5,880 km in I.R. Iran was covered. The survey team made 66 stops in Pakistan and 65 stops in I.R. Iran.

In Pakistan, the team observed populations of solitary adults, at an estimated density of 25-50 adults/ha, in the Kharan Valley in the interior at Boporek (283313N/651521E) and Totari (283141N/650844E), and near Panjgur (263847N/631939E) at Prome. The ecological conditions were favourable for locust breeding due to lush green vegetation and wet soil in both valleys.

In I.R. Iran, solitarious adults at an estimated density of 15-25 adults/ha were seen in the Govadeh area of Souran (272039N/620046E), Memari (270617N/604211E), the Baleshti area (2706 09N 58 57 23E), Khairabad (270421N/603851E) near Iranshahr, Bris area of Chabahar (251348N/605604E) and Penik area of Jaz Murian (274411N/585103E). Vegetation at most of the places was greening or green while, at some places, it was dry and drying. Vegetation density differed in each place, ranging from low to dense.

Methodology

This year, the Iranian team could not visit Pakistan for security reason and the Pakistani team had to undertake the survey alone. Consequently, the Pakistani team crossed the border and entered I.R. Iran on 18 April 2009 and undertook a joint survey with their Iranian counterparts up to 1 May. Pakistan nominated a Maintenance Assistant and I. R. Iran nominated one Expert who was supposed to support the survey and be responsible for photographing the habitats and collecting rainfall data from local stations. Once the Joint Survey team returned to Zahedan on 1 May, they participated in a two-day meeting with the Locust Unit Heads of both countries¹ and compiled the Joint Survey report. The Pakistani team returned back to their country on 4 May 2009 after successfully completing the Joint Survey.

Throughout the Joint Survey, the team travelled as a single team for security, making frequent stops in potential Desert Locust breeding areas. After reaching the survey area, the team split up into two (the Pakistani team leader with the Iranian locust officer; the Iranian team leader with the Pakistani locust officer) to check the area and make observations regarding the locust activity, vegetation, soil type, moisture and the extent of recent rainfall. This information was entered into eLocust2 and instantly sent to DPP, Karachi during the Pakistani portion of the survey and to PPO, Tehran during the Iranian portion of the survey. The data were also saved in the eLocust2 unit. At the same time, all observations were recorded on the *FAO Desert Locust Survey and Control Form* and in the Joint Survey Database (JSDB) (see Appendix 4).

For the first time, a demonstration version of the custom JSDB was prepared and installed on Flybook laptop of the Iranian team. The team tested it during the joint survey by entering the same data that was recorded in eLocust2, and on the standard *FAO Desert Locust Survey and Control Form*. The JSDB connects to a Bluetooth-enabled GPS and shows the team's current position on a map that contains a MODIS vegetation layer and a road layer (see Appendix 7). In this way, the team could navigate to the nearest area that had suitable vegetation and was accessible. It was possible to view each survey stop position on the JSDB map as well as print a hard copy that helped in the preparation of the final report. In addition, a GPS version of a MODIS dynamic greenness map was prepared for the team to use during the Joint Survey. This map is a new remote sensing product currently under evaluation by FAO/DLIS. The team found both tools useful in helping to navigate during the survey and find locust infestations.

Discussion

Most of the locust breeding areas in I. R. Iran received low to heavy rainfall this year, particularly in Nikshahr, Khash, Minab, Kahnuj and Iranshahr areas in March 2009 (see Appendix 5). Vegetation was green and solitary adults were observed at six localities. Light to medium rains fell this year in the winter-spring breeding areas of western Pakistan. Vegetation was greening/green in Nushki and Kharan areas but was either dry or drying out in the northern interior near Dalbandin and towards the coastal areas (see Appendix 6).

The spring breeding areas in both countries can be divided geographically into three parts: Northern, Central and Southern.

¹ From DPP HQ, Karachi: Muhammad Akbar Zardari, Director (Technical) and Muhammad Azam Khan, Deputy Director (Locust); from PPO Tehran: Mehdi Ghaemian, Deputy Director (Public Pest Management)

Northern Baluchistan

The northern part of Baluchistan extends from Mirjaveh in I.R. Iran to Nushki in Pakistan. High elevation sand and rocky plains are present from Zahedan to Nushki. The vegetation from Taftan to Dalbandin was dry but it was greening near Nushki from rains that fell at times from January to March 2009. Soil moisture was dry except in Nushki area. Rain fed and tube well irrigated fields of wheat, cumin and melon were seen in a few places in the Mal area near Nushki.

No solitary or gregarious locust activity was observed in these areas.

Central Baluchistan

The central part of Baluchistan extends from south of Taftan and the Ras Kooh Mountains to the Kech and Mand mountains north of Turbat in Pakistan. This region consists of the Great Sandy Desert, the Kharan Valley and Rakhshan Valley (Panjgur) that extend west to Saravan, Suran, Zaboli valleys in I.R. Iran and continue to Iranshahr and further west to the Jaz Murian Basin east of Kahnuj. Light to medium rainfall was received near Kharan and the Prome Valley near Panjgur, Pakistan where soil moisture was wet and deep, and ecological conditions were favourable for locust breeding due to lush green vegetation.

The team found scattered solitary adults, at an estimated density of 25-50 adults/ha, in the Kharan Valley at Boporek (283313N/651521E) and Totari (28 3141N/650844E), and near Panjgur (263847N/631939E) at Prome.

Southern Baluchistan

The southern part of Baluchistan consists of coastal areas that extend from Bandar Abbas, Jask, Chabahar, and Gwater in I.R. Iran and Jiwani, Gwadar, Pasni, Ormara and Uthal in Pakistan. In Pakistan, the area between Pasni to Ormara is famous for locust breeding while areas from Chabahar to Gwater in I.R. Iran are also potential breeding areas for Desert Locust. It was dry and the vegetation was drying on the Pakistani side while, on I.R. Iran side, it was greening and green in the Chabahar area and drying in the Bandar Abbas area.

Conclusion & Recommendations

Desert Locust

The survey results indicate that the Desert Locust situation in both countries is calm.

In Pakistan, scattered solitary locusts are likely to remain until vegetation and soil dry out. In view of the very few locusts present and the relatively poor ecological conditions prevailing in the spring breeding areas of Baluchistan, there is little possibility of any gregarious locust activity developing during the remainder of the spring.

In I.R. Iran, the situation is a slightly different and somewhat similar to that in March 2007. Good ecological conditions prevail in the spring breeding areas where locusts have been present nearly every month during the past two years. Good rains fell this year and the weather has been relatively cool. Consequently, breeding this year may be prolonged by about one month.

Therefore, regular and intensive surveys should be maintained in the breeding areas and continue to at least June or perhaps beyond in order to monitor the situation.

Joint Survey of 2010

Although the situation in Baluchistan, Pakistan is unstable, the team hopes that it will improve and return to normal so that both countries can undertake the regular Joint Survey in 2010 as in the years prior to 2009.

The team suggests improving the organization and implementation of future Joint Surveys:

1. Training at regional level should be organized and assisted by FAO for staff of plant protection organization of both countries to meet any emergency and to become familiar with locust survey and control methods and on the use of GPS, eLocust2, laptop computer and other equipment provided by FAO.
2. Regular national surveys of winter/spring breeding areas of southern Baluchistan should be carried out in both countries from at least 1 February to 31 May every year to check the activity and movement of locusts from across the Persian Gulf.
3. At least one of the two locust experts from each country should be the nationally designated locust information officer. This person would be useful because he knows the latest situation, data recording, reporting, computers, GPS, eLocust2, new technologies and preparing the final report.
4. At least one of the four drivers should be a mechanic who will also be responsible for emergency repair of vehicles during the survey. He should be well equipped with the necessary tool kit and emergency spare parts.
5. FAO is requested to provide walkie-talkies of high range for making better communications during the survey.
6. The route of Bandar Abbas to Kahnuj should be slightly modified to include Ghale Ganj and Sowlan (see Appendix 8).
7. Three overnights should be continued in Kharan (Pakistan) in order to survey the vast and deep desert of Kharan, Naru, Shamsi and Ormage.
8. Pakistan should arrange, manage and improve guesthouse accommodations and the Locust Officer in-Charge of the respective outposts in Pakistan should coordinate and help the survey team. The arrangements were inadequate this year.
9. Keeping in the view of the tough desert job and the high inflation rate, the DSA may be enhanced by 50%.
10. The survey should be continued in the coming years to assess the locust situation and any possible migration from across the Persian Gulf.
11. It is recommended that whenever locust control operations occur in either country, the locust officers of DPP and PPO should be invited to participate in order to gain more experience. This activity should be sponsored by FAO.
12. In partial fulfilment of recommendations 1 (f) and (i) of the 26th session of SWAC (see page 3 of final report), Mr. Ghaemian (I.R. Iran) produced custom maps for both laptop and GPS that showed area names of Sistan/Baluchistan, Hormozgan and Kerman provinces. These maps were not prepared for Pakistan because (a) the Iranian team did not enter Pakistan this year and (b) a digital map was not available for Pakistan. The Joint Survey team used the maps during the portion of the survey in I.R. Iran. As they were very useful in locating suitable breeding habitats, it is recommended that the same maps be produced for the Pakistani side and used next year.

APPENDICES

Appendix 1. List of participants

	Name	Title	City
I.R. Iran			
<i>Team Leader</i>	Ali Babali Fashki	PPO expert	Tehran PPO
<i>Locust Officer</i>	Javad Ravandeh	PPO expert	Chabahar
<i>Environmental Asst.</i>	Arash Rostami Por	Director asst.	Minab
<i>Drivers</i>			
	Eshagh Darzi		Tehran
	Muhammad Gholami		Bandar Abbas
	Ahmad Rodbari		Jiroft and Kahnuj
	Abdol Karim Hagh Talab		Konarak
Pakistan			
<i>Team Leader</i>	Nazar Hussain Malik	Entomologist	Multan
<i>Locust Officer</i>	Ghulam Qadir Lund	Asst. Entomologist	Mirpurkhas
<i>Maintenance Asst.</i>	Nasarullah	Maintenance	Karachi
<i>Drivers</i>			
	Muhammad Saleem		Multan
	Abdul Karim		Quetta
	Muhammad Iqbal		Karachi
	Muhammad Zaman		Karachi

Appendix 2. Itinerary

Date	Route	km	Overnight
1 Apr	Quetta, Nushki	300	Nushki
2 Apr	Nushki, Dalbandin, Chagai Hills, Nushki	553	Nushki
3 Apr	Nushki, Kharan, Kharan area (Naru)	152	Kharan
4 Apr	Kharan area	225	Kharan
5 Apr	Kharan area (Shamsi)	335	Kharan
6 Apr	Kharan, Basima, Nag, Panjgur	140	Panjgur
7 Apr	Panjgur, Prome, Panjgur	280	Panjgur
8 Apr	Panjgur, Hoshab, Turbat	285	Turbat
9 Apr	Turbat, Solaika, Turbat	298	Turbat
10 Apr	Turbat, Suntsar, Jiwani	98	Jiwani
11 Apr	Jiwani, Gwadar	189	Gwadar
12 Apr	Gwadar, Kulanch, Pasni	454	Pasni
13 Apr	Pasni area	350	Pasni
14 Apr	Pasni, Ormara, Uthal	347	Uthal
15 Apr	Uthal, Quetta	335	Quetta
16 Apr	<i>Report Day – prepare 1st half survey results</i>	0	Quetta
17 Apr	Quetta, Nushki, Taftan	700	Taftan
18 Apr	Cross Taftan (Pakistan) to Mirjaveh (I.R. Iran); <i>send 1st half survey results</i>	200	Zahedan
19 Apr	Zahedan, Khash, Gosht, Saravan	465	Saravan
20 Apr	Saravan, Souran, Zaboli, Iranshahr	490	Iranshahr
21 Apr	Iranshahr, Jolgeh Chah Hashem, Iranshahr	676	Iranshahr
22 Apr	Iranshahr, Espakeh, Nikshahr, Chabahar	480	Chabahar
23 Apr	Chabahar, Beris, Sham, Govater, Chabahar	240	Chabahar
24 Apr	Chabahar, Vashnam, Dashtiari, Chabahar	320	Chabahar
25 Apr	Chabahar, Zar Abad, Jask, Jask area	457	Jask
26 Apr	Jask, Minab, Bandar Abbas	480	Bandar Abbas
27 Apr	<i>Report Day – prepare 2nd half survey results</i>	0	Bandar Abbas
28 Apr	Bandar Abbas, Kahnuj, Ghale Ganj, Sowlan, Kahnuj	572	Kahnuj
29 Apr	East Jaz Murian, Kahnuj	430	Kahnuj
30 Apr	Kahnuj, Zeh Kalout, Dalgan, Bampour, Sardegal, Iranshahr	550	Iranshahr
1 May	Iranshahr, Zahedan; <i>send 2nd half survey results</i>	320	
2 May	Locust Heads / JS team meeting	0	Zahedan
3 May	Locust Heads / JS team meeting	0	Zahedan
4 May	Zahedan, Mirjaveh; Pakistani team cross the border	200	

Total distance covered in I.R. Iran	5 880 km
Total distance covered in Pakistan	6 800 km
Total distance covered in JS 2009	12 680 km
Total area surveyed in I.R. Iran	7 730 ha
Total area surveyed in Pakistan	7 530 ha
Total area surveyed in JS 2009	15 260 ha
Total stops visited in I.R. Iran	65
Total stops visited in Pakistan	66
Total stops visited in JS 2009	131

Appendix 3. FAO Desert Locust Survey and Control Form

Please send to FAO HQs by fax: +39-06-57055271 or by email: eclo@fao.org (indicate appropriate information as required)

1 SURVEY STOP	1	2	3	4	5	6
1-1 Date						
1-2 Name						
1-3 Latitude (N)						
1-4 Longitude (E or W)						
2 ECOLOGY						
2-1 Area of survey (ha)						
2-2 Habitat (wadi, plains, dunes, crops)						
2-3 Date of last rain						
2-4 Rain amount (mm, low, moderate, high)	L M H ?	L M H ?	L M H ?	L M H ?	L M H ?	L M H ?
2-5 Vegetation (dry, greening, green, drying)						
2-6 Vegetation density (low, medium, dense)	L M D	L M D	L M D	L M D	L M D	L M D
2-7 Soil moisture (wet / dry)	W D	W D	W D	W D	W D	W D
3 LOCUSTS						
3-1 Present or absent	P A	P A	P A	P A	P A	P A
3-2 Area infested (ha)						
4 HOPPERS						
4-1 Hopper stages (H 1 2 3 4 5 6 F)	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F
4-2 Appearance (solitary, transient, gregarious)	S T G	S T G	S T G	S T G	S T G	S T G
4-3 Behaviour (Isolated, scattered, group)	I S G	I S G	I S G	I S G	I S G	I S G
4-4 Hopper density (/site./m ² , low, medium, high)						
5 BANDS						
5-1 Band stage (H 1 2 3 4 5 F)	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F
5-2 Band density (/site./m ² , low, medium, high)						
5-3 Band sizes (m ² or ha)						
5-4 Number of bands						
6 ADULTS						
6-1 Maturity (immature, mature)	I M	I M	I M	I M	I M	I M
6-2 Appearance (solitary, transients, gregarious)	S T G	S T G	S T G	S T G	S T G	S T G
6-3 Behaviour (isolated, scattered, groups)	I S G	I S G	I S G	I S G	I S G	I S G
6-4 Adult density (/transect, /ha, L, M, H)						
6-5 Breeding (copulating, laying)	C L	C L	C L	C L	C L	C L
7 SWARMS						
7-1 Maturity (immature, mature)	I M	I M	I M	I M	I M	I M
7-2 Swarm density (/m ² , low, medium, high)						
7-3 Swarm size (km ² , hectare)						
7-4 Number of swarms						
7-5 Breeding (copulating, laying)	C L	C L	C L	C L	C L	C L
7-6 Flying (direction, time passing)						
7-7 Flying height (low, medium, high)	L M H	L M H	L M H	L M H	L M H	L M H
8 CONTROL						
8-1 Pesticide name and formulation						
8-2 Application rate (l/ha, kg/ha)						
8-3 Quantity (litres, kilograms)						
8-4 Area treated (ha)						
8-5 Ground or air	G A	G A	G A	G A	G A	G A
8-6 Estimated % of killing						
9 COMMENTS						

Was GPS used to determine locations? Yes No Is a brief interpretation or analysis of the results included? Yes No

Country: _____ Locust Officer: _____ dated _____

Cleared by: _____ dated _____

Appendix 4a. Desert Locust Survey Results (Pakistan)

SURVEY STOP	1	2	3	4	5
date	01/04/2009	01/04/2009	01/04/2009	02/04/2009	02/04/2009
time	16:17:00	16:28:00	16:48:00	12:10:00	12:38:00
name					
Longitude (N)	065°56'28.00"E	065°53'48.00"E	065°29'38.00"E	065°56'28.00"E	065°08'09.00"E
Latitude (E or W)	29°28'51.00"N	29°28'27.00"N	29°25'21.00"N	28°59'35.00"N	29°56'58.00"N
ECOLOGY					
Area of survey(ha)	100	100	150	100	100
Habitat(wadi,plains,dunes,crops)	wadi	dunes	plains	plains	plains
Date of last rain	29/03/2009	29/03/2009	29/03/2009	24/03/2009	24/03/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	dry	drying	drying	drying	drying
Vegetation density(LMD)	low	low	medium	low	medium
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	6	7	8	9	10
date	02/04/2009	02/04/2009	03/04/2009	03/04/2009	03/04/2009
time	12:59:00	14:00:00	09:06:00	09:40:00	10:47:00
name					
Longitude (N)	065°00'39.00"E	064°24'04.00"E	065°57'30.00"E	065°08'09.00"E	065°45'04.00"E
Latitude (E or W)	28°54'32.00"N	28°53'04.00"N	29°17'51.00"N	29°08'10.00"N	29°01'09.00"N
ECOLOGY					
Area of survey(ha)	100	100	40	60	80
Habitat(wadi,plains,dunes,crops)	plains	plains	crops	dunes	plains
Date of last rain	24/03/2009	24/03/2009		28/03/2009	24/03/2009
Rain estimate (LMH)	low	low		moderate	low
Vegetation(dry,drying,green,greening)	drying	drying	green	greening	drying
Vegetation density(LMD)	low	medium	dense	medium	low
Soil moisture(wet,dry)	dry	dry	wet	wet	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	11	12	13	14	15
date	03/04/2009	03/04/2009	03/04/2009	04/04/2009	04/04/2009
time	11:46:00	12:14:00	18:28:00	09:07:00	12:54:00
name					
Longitude (N)	065°33'02.00"E	065°28'09.00"E	065°31'49.00"E	065°32'47.00"E	065°11'17.00"E
Latitude (E or W)	28°43'07.00"N	28°36'56.00"N	28°23'53.00"N	28°32'31.00"N	27°52'07.00"N
ECOLOGY					
Area of survey(ha)	50	100	100	90	99
Habitat(wadi,plains,dunes,crops)	dunes	plains	dunes	plains	plains
Date of last rain	27/03/2009	27/03/2009	28/03/2009	26/03/2009	
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	green	dry	green	drying
Vegetation density(LMD)	low	low	low	low	low
Soil moisture(wet,dry)	wet	wet	dry	wet	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	16	17	18	19	20
date	04/04/2009	04/04/2009	04/04/2009	05/04/2009	05/04/2009
time	13:38:00	14:44:00	15:14:00	09:02:00	09:38:00
name					
Longitude (N)	065°18'04.00"E	065°26'49.00"E	065°32'29.00"E	065°15'21.00"E	065°08'44.00"E
Latitude (E or W)	27°55'00.00"N	27°59'12.00"N	28°05'04.00"N	28°33'13.00"N	28°31'41.00"N
ECOLOGY					
Area of survey(ha)	60	40	80	100	40
Habitat(wadi,plains,dunes,crops)	dunes	crops	wadi	plains	plains
Date of last rain		20/03/2009		04/04/2009	04/04/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	dry	drying	green	drying	green
Vegetation density(LMD)	low	low	medium	low	medium
Soil moisture(wet,dry)	dry	dry	wet	wet	wet
LOCUST					
Present or Absent	A	A	A	P	P
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)				I	I
appearance (STG)				S	S
behaviour (ISG)				I	I
Adult density (/transect or /ha)				25.00 /ha	50.00 /ha
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	21	22	23	24	25
date	05/04/2009	05/04/2009	06/04/2009	06/04/2009	06/04/2009
time	10:10:00	11:09:00	10:06:00	10:22:00	10:55:00
name					
Longitude (N)	065°06'40.00"E	065°32'29.00"E	065°45'35.00"E	065°45'52.00"E	065°48'46.00"E
Latitude (E or W)	27°33'02.00"N	28°05'04.00"N	28°06'12.00"N	28°05'23.00"N	27°52'28.00"N
ECOLOGY					
Area of survey(ha)	50	80	30	80	100
Habitat(wadi,plains,dunes,crops)	plains	wadi	wadi	crops	plains
Date of last rain	04/04/2009				
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	green	drying	green	drying
Vegetation density(LMD)	low	medium	medium	dense	low
Soil moisture(wet,dry)	dry	wet	wet	wet	wet
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	26	27	28	29	30
date	06/04/2009	07/04/2009	07/04/2009	07/04/2009	07/04/2009
time	12:52:00	09:04:00	09:41:00	11:19:00	12:15:00
name					
Longitude (N)	065°06'38.00"E	063°54'14.00"E	063°49'29.00"E	063°27'26.00"E	063°19'39.00"E
Latitude (E or W)	27°24'32.00"N	26°49'44.00"N	26°46'30.00"N	26°42'29.00"N	26°38'47.00"N
ECOLOGY					
Area of survey(ha)	90	40	90	100	100
Habitat(wadi,plains,dunes,crops)	plains	dunes	plains	plains	plains
Date of last rain		23/03/2009	23/03/2009	23/03/2009	23/03/2009
Rain estimate (LMH)	low	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	drying	drying	drying	green	dry
Vegetation density(LMD)	medium	low	low	medium	medium
Soil moisture(wet,dry)	wet	dry	dry	dry	wet
LOCUST					
Present or Absent	A	A	A	A	P
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					I
appearance (STG)					S
behaviour (ISG)					I
Adult density (/transect or /ha)					25.00 /ha
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	31	32	33	34	35
date	07/04/2009	08/04/2009	08/04/2009	09/04/2009	09/04/2009
time	15:14:00	11:49:00	15:15:00	09:10:00	09:35:00
name					
Longitude (N)	063°31'28.00"E	063°56'58.00"E	063°42'31.00"E	062°44'29.00"E	062°42'05.00"E
Latitude (E or W)	26°38'00.00"N	26°18'21.00"N	26°01'44.00"N	25°52'58.00"N	25°50'50.00"N
ECOLOGY					
Area of survey(ha)	100	70	70	80	90
Habitat(wadi,plains,dunes,crops)	plains	wadi	wadi	plains	crops
Date of last rain	23/03/2009			01/04/2009	01/04/2009
Rain estimate (LMH)	moderate	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	drying	drying	greening	green
Vegetation density(LMD)	medium	medium	medium	low	dense
Soil moisture(wet,dry)	wet	dry	dry	wet	wet
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	36	37	38	39	40
date	09/04/2009	09/04/2009	09/04/2009	10/04/2009	10/04/2009
time	10:02:00	10:26:00	12:31:00	09:11:00	09:41:00
name					
Longitude (N)	062°37'07.00"E	062°38'52.00"E	062°43'33.00"E	062°20'41.00"E	062°13'28.00"E
Latitude (E or W)	25°44'28.00"N	25°40'58.00"N	25°55'23.00"N	25°40'34.00"N	25°37'24.00"N
ECOLOGY					
Area of survey(ha)	100	40	100	30	90
Habitat(wadi,plains,dunes,crops)	plains	wadi	plains	wadi	crops
Date of last rain	01/04/2009		01/04/2009	01/04/2009	01/04/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	drying	drying	drying	green
Vegetation density(LMD)	medium	low	low	low	dense
Soil moisture(wet,dry)	dry	dry	dry	wet	wet
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	41	42	43	44	45
date	10/04/2009	10/04/2009	10/04/2009	10/04/2009	10/04/2009
time	09:50:00	10:45:00	11:52:00	12:24:00	13:02:00
name					
Longitude (N)	062°12'03.00"E	061°58'31.00"E	061°54'18.00"E	061°55'31.00"E	061°55'32.00"E
Latitude (E or W)	25°37'34.00"N	25°29'41.00"N	25°26'33.00"N	25°23'38.00"N	25°18'33.00"N
ECOLOGY					
Area of survey(ha)	70	30	100	100	90
Habitat(wadi,plains,dunes,crops)	plains	wadi	plains	plains	plains
Date of last rain	01/04/2009				
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	dry	green	drying	drying	drying
Vegetation density(LMD)	low	low	low	medium	low
Soil moisture(wet,dry)	dry	wet	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	46	47	48	49	50
date	10/04/2009	10/04/2009	11/04/2009	11/04/2009	11/04/2009
time	13:54:00	15:51:00	09:27:00	09:45:00	10:18:00
name					
Longitude (N)	061°47'34.00"E	062°44'53.00"E	063°11'20.00"E	063°09'22.00"E	063°06'29.00"E
Latitude (E or W)	25°06'51.00"N	25°19'14.00"N	25°25'22.00"N	25°26'23.00"N	25°27'13.00"N
ECOLOGY					
Area of survey(ha)	60	90	80	100	100
Habitat(wadi,plains,dunes,crops)	plains	crops	wadi	wadi	plains
Date of last rain			01/04/2009		01/04/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	green	green	drying	drying	drying
Vegetation density(LMD)	low	dense	medium	dense	dense
Soil moisture(wet,dry)	wet	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	51	52	53	54	55
date	11/04/2009	11/04/2009	11/04/2009	11/04/2009	13/04/2009
time	10:36:00	11:43:00	11:58:00	12:58:00	10:03:00
name					
Longitude (N)	063°05'01.00"E	063°07'44.00"E	063°09'20.00"E	063°11'25.00"E	063°23'32.00"E
Latitude (E or W)	25°27'20.90"N	25°23'37.00"N	25°19'39.00"N	25°19'05.00"N	25°16'18.00"N
ECOLOGY					
Area of survey(ha)	100	30	60	90	100
Habitat(wadi,plains,dunes,crops)	plains	dunes	plains	plains	dunes
Date of last rain	01/04/2009	01/04/2009	01/04/2009	01/04/2009	
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	drying	drying	drying	drying
Vegetation density(LMD)	dense	low	medium	low	low
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	56	57	58	59	60
date	13/04/2009	13/04/2009	13/04/2009	13/04/2009	13/04/2009
time	10:31:00	10:55:00	11:12:00	11:47:00	12:47:00
name					
Longitude (N)	063°19'27.00"E	063°16'44.00"E	063°19'53.00"E	063°24'10.00"E	063°29'12.00"E
Latitude (E or W)	25°16'11.00"N	25°15'06.00"N	25°15'34.00"N	25°14'39.00"N	25°13'47.00"N
ECOLOGY					
Area of survey(ha)	100	100	90	100	100
Habitat(wadi,plains,dunes,crops)	dunes	dunes	dunes	dunes	plains
Date of last rain					
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	green	drying	drying	green
Vegetation density(LMD)	low	low	low	medium	low
Soil moisture(wet,dry)	dry	wet	dry	dry	wet
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	61	62	63	64	65
date	14/04/2009	14/04/2009	14/04/2009	14/04/2009	14/04/2009
time	08:11:00	08:57:00	09:21:00	10:08:00	12:01:00
name					
Longitude (N)	063°42'17.00"E	064°05'44.00"E	064°17'22.00"E	064°37'41.00"E	065°29'02.00"E
Latitude (E or W)	25°23'26.00"N	25°30'44.00"N	25°29'33.00"N	25°16'43.00"N	25°24'33.00"N
ECOLOGY					
Area of survey(ha)	100	80	100	100	30
Habitat(wadi,plains,dunes,crops)	plains	wadi	plains	dunes	crops
Date of last rain					
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	dry	dry	dry	drying	green
Vegetation density(LMD)	medium	low	medium	dense	dense
Soil moisture(wet,dry)	wet	dry	dry	dry	wet
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	66				
date	14/04/2009				
time	13:31:00				
name					
Longitude (N)	066°36'38.00"E				
Latitude (E or W)	25°40'44.00"N				
ECOLOGY					
Area of survey(ha)	100				
Habitat(wadi,plains,dunes,crops)	plains				
Date of last rain					
Rain estimate (LMH)	low				
Vegetation(dry,drying,green,greening)	drying				
Vegetation density(LMD)	dense				
Soil moisture(wet,dry)	dry				
LOCUST					
Present or Absent	A				
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

Appendix 4b. Desert Locust Survey Results (I.R. Iran)

SURVEY STOP	1	2	3	4	5
date	19/04/2009	19/04/2009	19/04/2009	19/04/2009	20/04/2009
time	11:00:00	12:00:00	15:00:00	16:00:00	09:00:00
name	Nilgon	Granchin	Charshahi	Shamsabad	Gavadeh
Longitude (N)	059°54'32.00"E	061°28'45.00"E	062°08'21.00"E	062°11'20.00"E	062°00'46.00"E
Latitude (E or W)	25°24'24.00"N	28°14'15.00"N	27°31'20.00"N	27°28'45.00"N	27°30'39.00"N
ECOLOGY					
Area of survey(ha)	100	100	200	90	200
Habitat(wadi,plains,dunes,crops)	wadi	plains	plains	plains	plains
Date of last rain	14/04/2009	14/04/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	low	low	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	drying	dry	green	drying	green
Vegetation density(LMD)	low	low	medium	medium	medium
Soil moisture(wet,dry)	dry	dry	wet	dry	wet
LOCUST					
Present or Absent	A	A	A	A	P
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					M
appearance (STG)					S
behaviour (ISG)					IS
Adult density (/transect or /ha)					15.00 /ha low
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	6	7	8	9	10
date	20/04/2009	20/04/2009	20/04/2009	20/04/2009	20/04/2009
time	09:30:00	10:00:00	11:00:00	11:30:00	13:00:00
name	Dolatabad	Shandan	Folad	Garpaskoh	Khoshab
Longitude (N)	061°55'05.00"E	061°54'14.00"E	062°11'23.00"E	061°42'49.00"E	061°46'41.00"E
Latitude (E or W)	27°19'58.00"N	27°22'57.00"N	27°24'56.00"N	27°29'22.00"N	27°10'12.00"N
ECOLOGY					
Area of survey(ha)	50	100	150	300	100
Habitat(wadi,plains,dunes,crops)	crops	dunes	plains	plains	plains
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	green	green	green	greening	drying
Vegetation density(LMD)	dense	medium	medium	medium	medium
Soil moisture(wet,dry)	wet	wet	wet	wet	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	11	12	13	14	15
date	20/04/2009	20/04/2009	21/04/2009	21/04/2009	21/04/2009
time	15:00:00	17:00:00	09:00:00	10:00:00	11:00:00
name	Koramemari	Sarkahora	Chah hossaini	Chah hossainak	Bagh Nil
Longitude (N)	060°42'11.00"E	060°43'48.00"E	060°11'28.00"E	059°39'10.00"E	059°28'38.00"E
Latitude (E or W)	27°06'17.00"N	27°06'55.00"N	27°11'12.00"N	27°06'05.00"N	27°07'09.00"N
ECOLOGY					
Area of survey(ha)	100	100	100	100	100
Habitat(wadi,plains,dunes,crops)	dunes	dunes	dunes	dunes	dunes
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	green	green	green	green	green
Vegetation density(LMD)	low	low	medium	medium	medium
Soil moisture(wet,dry)	wet	wet	wet	wet	wet
LOCUST					
Present or Absent	P	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)	I				
appearance (STG)	S				
behaviour (ISG)	I				
Adult density (/transect or /ha)	20.00 /ha low				
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	16	17	18	19	20
date	21/04/2009	21/04/2009	21/04/2009	21/04/2009	22/04/2009
time	13:00:00	15:00:00	16:00:00	17:00:00	09:00:00
name	Garon	Baleshti	Chaheshagh	Rigmorig	Khair abad
Longitude (N)	059°19'21.00"E	058°57'23.00"E	058°51'45.00"E	058°52'41.00"E	060°38'51.00"E
Latitude (E or W)	29°01'02.00"N	27°08'09.00"N	27°04'07.00"N	27°06'26.00"N	27°04'21.00"N
ECOLOGY					
Area of survey(ha)	100	100	100	100	100
Habitat(wadi,plains,dunes,crops)	dunes	dunes	dunes	dunes	dunes
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	green	green	green	green	drying
Vegetation density(LMD)	medium	medium	medium	medium	medium
Soil moisture(wet,dry)	wet	wet	wet	wet	dry
LOCUST					
Present or Absent	A	P	A	A	P
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)		M			M
appearance (STG)		S			S
behaviour (ISG)		I			I
Adult density (/transect or /ha)		15.00 /ha low			15.00 /ha low
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	21	22	23	24	25
date	22/04/2009	22/04/2009	22/04/2009	22/04/2009	23/04/2009
time	10:00:00	11:00:00	13:00:00	15:00:00	09:00:00
name	Espake	Tangeh sarhad	Nikshahr	Sorkamp	Ramin
Longitude (N)	060°10'22.00"E	059°57'11.00"E	060°15'07.00"E	060°28'15.00"E	060°28'15.00"E
Latitude (E or W)	26°44'50.00"N	26°33'22.00"N	25°47'29.00"N	25°34'52.00"N	25°16'11.00"N
ECOLOGY					
Area of survey(ha)	60	80	100	100	50
Habitat(wadi,plains,dunes,crops)	wadi	wadi	plains	plains	plains
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	26/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	green	green	drying	dry	dry
Vegetation density(LMD)	medium	medium	low	low	low
Soil moisture(wet,dry)	wet	wet	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	26	27	28	29	30
date	23/04/2009	23/04/2009	23/04/2009	23/04/2009	24/04/2009
time	10:00:00	10:30:00	11:00:00	13:00:00	09:00:00
name	Bris 1	Bris 2	Poshat	Govatr	Washnom 1
Longitude (N)	060°56'04.00"E	061°12'39.00"E	061°20'48.00"E	061°29'33.00"E	060°52'17.00"E
Latitude (E or W)	25°13'48.00"N	25°07'59.00"N	25°04'54.00"N	25°09'50.00"N	25°25'29.00"N
ECOLOGY					
Area of survey(ha)	50	100	50	20	100
Habitat(wadi,plains,dunes,crops)	plains	plains	crops	crops	plains
Date of last rain	26/03/2009	26/03/2009	26/03/2009	26/03/2009	26/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	low
Vegetation(dry,drying,green,greening)	dry	drying	dry	green	drying
Vegetation density(LMD)	low	low	low	dense	medium
Soil moisture(wet,dry)	dry	dry	dry	wet	dry
LOCUST					
Present or Absent	P	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)	I				
appearance (STG)	S				
behaviour (ISG)	I				
Adult density (/transect or /ha)	25.00 /ha low				
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	31	32	33	34	35
date	24/04/2009	24/04/2009	24/04/2009	24/04/2009	24/04/2009
time	09:30:00	10:30:00	11:25:00	13:00:00	15:00:00
name	Koh Dayme	Rig Dayme	Dastyari	Dogim Dog	Negur
Longitude (N)	060°52'08.00"E	060°53'39.00"E	060°53'13.00"E	060°56'27.00"E	061°09'32.00"E
Latitude (E or W)	26°27'45.00"N	26°27'53.00"N	25°27'35.00"N	25°28'37.00"N	25°22'54.00"N
ECOLOGY					
Area of survey(ha)	100	50	100	30	100
Habitat(wadi,plains,dunes,crops)	plains	crops	plains	crops	crops
Date of last rain	26/03/2009	26/03/2009	26/03/2009	26/03/2009	26/03/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	green	drying	green	green
Vegetation density(LMD)	medium	medium	medium	medium	medium
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	36	37	38	39	40
date	24/04/2009	25/04/2009	25/04/2009	25/04/2009	25/04/2009
time	17:00:00	09:10:00	10:20:00	11:14:00	12:11:00
name	negur 2	Cheshi	Tangi	Taran	Taran 2
Longitude (N)	061°11'14.00"E	060°19'33.00"E	059°54'34.00"E	059°33'00.00"E	059°55'13.00"E
Latitude (E or W)	25°19'49.00"N	25°29'09.00"N	25°24'14.00"N	25°31'15.00"N	25°34'02.00"N
ECOLOGY					
Area of survey(ha)	100	100	100	100	100
Habitat(wadi,plains,dunes,crops)	crops	plains	wadi	plains	wadi
Date of last rain	26/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	low	moderate	moderate	low	low
Vegetation(dry,drying,green,greening)	green	drying	drying	dry	dry
Vegetation density(LMD)	medium	medium	medium	low	low
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	41	42	43	44	45
date	25/04/2009	25/04/2009	25/04/2009	25/04/2009	26/04/2009
time	12:55:00	16:24:00	17:10:00	17:45:00	09:25:00
name	Bir	Lir	Sirish	Ghabrik	Agosht
Longitude (N)	059°49'51.00"E	059°08'08.00"E	058°40'37.00"E	058°25'19.00"E	057°14'49.00"E
Latitude (E or W)	25°27'52.00"N	25°40'59.00"N	25°43'08.00"N	25°46'02.00"N	26°10'54.00"N
ECOLOGY					
Area of survey(ha)	200	100	100	100	100
Habitat(wadi,plains,dunes,crops)	plains	plains	plains	plains	crops
Date of last rain	31/03/2009	04/04/2009	04/04/2009	04/04/2009	04/04/2009
Rain estimate (LMH)	low	low	low	low	low
Vegetation(dry,drying,green,greening)	drying	drying	dry	dry	drying
Vegetation density(LMD)	medium	medium	medium	medium	low
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	46	47	48	49	50
date	26/04/2009	26/04/2009	26/04/2009	26/04/2009	28/04/2009
time	10:43:00	11:40:00	14:50:00	16:00:00	10:35:00
name	Sirik	Sirik 2	Hassan langi	Dehno	Manojan
Longitude (N)	058°34'27.00"E	057°08'22.00"E	056°46'49.00"E	056°31'55.00"E	057°34'11.00"E
Latitude (E or W)	26°33'34.00"N	26°43'36.00"N	27°22'03.00"N	27°21'01.00"N	27°32'25.00"N
ECOLOGY					
Area of survey(ha)	100	100	100	100	100
Habitat(wadi,plains,dunes,crops)	plains	wadi	plains	plains	plains
Date of last rain	04/04/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	low	high	moderate	moderate	low
Vegetation(dry,drying,green,greening)	green	drying	drying	drying	dry
Vegetation density(LMD)	dense	medium	medium	medium	low
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	51	52	53	54	55
date	28/04/2009	28/04/2009	28/04/2009	28/04/2009	28/04/2009
time	14:20:00	14:47:00	15:08:00	15:58:00	16:43:00
name	Barder	Chahchambeli	Khargoshki	Rigmoteen	Riggorgi
Longitude (N)	058°59'52.00"E	058°01'38.00"E	058°04'39.00"E	058°07'15.00"E	058°02'04.00"E
Latitude (E or W)	27°34'44.00"N	27°34'38.00"N	27°35'09.00"N	27°36'57.00"N	27°37'30.00"N
ECOLOGY					
Area of survey(ha)	200	200	200	200	200
Habitat(wadi,plains,dunes,crops)	plains	plains	plains	plains	plains
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	drying	green	drying	drying	dry
Vegetation density(LMD)	medium	medium	medium	medium	medium
Soil moisture(wet,dry)	dry	wet	dry	dry	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

SURVEY STOP	56	57	58	59	60
date	28/04/2009	28/04/2009	29/04/2009	29/04/2009	29/04/2009
time	19:15:00	19:45:00	10:48:00	11:20:00	11:45:00
name	Chahzardal	Solan	Charag	Eeat jaz 1	East jaz 2
Longitude (N)	057°27'31.00"E	058°32'11.00"E	058°33'41.00"E	058°33'47.00"E	058°34'07.00"E
Latitude (E or W)	27°10'53.00"N	27°10'58.00"N	27°38'12.00"N	27°35'28.00"N	27°34'36.00"N
ECOLOGY					
Area of survey(ha)	100	100	200	200	200
Habitat(wadi,plains,dunes,crops)	crops	dunes	plains	plains	plains
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	high	high	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	green	green	drying	green	green
Vegetation density(LMD)	dense	medium	medium	medium	medium
Soil moisture(wet,dry)	wet	dry	dry	wet	dry
LOCUST					
Present or Absent	A	A	A	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)					
appearance (STG)					
behaviour (ISG)					
Adult density (/transect or /ha)					
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

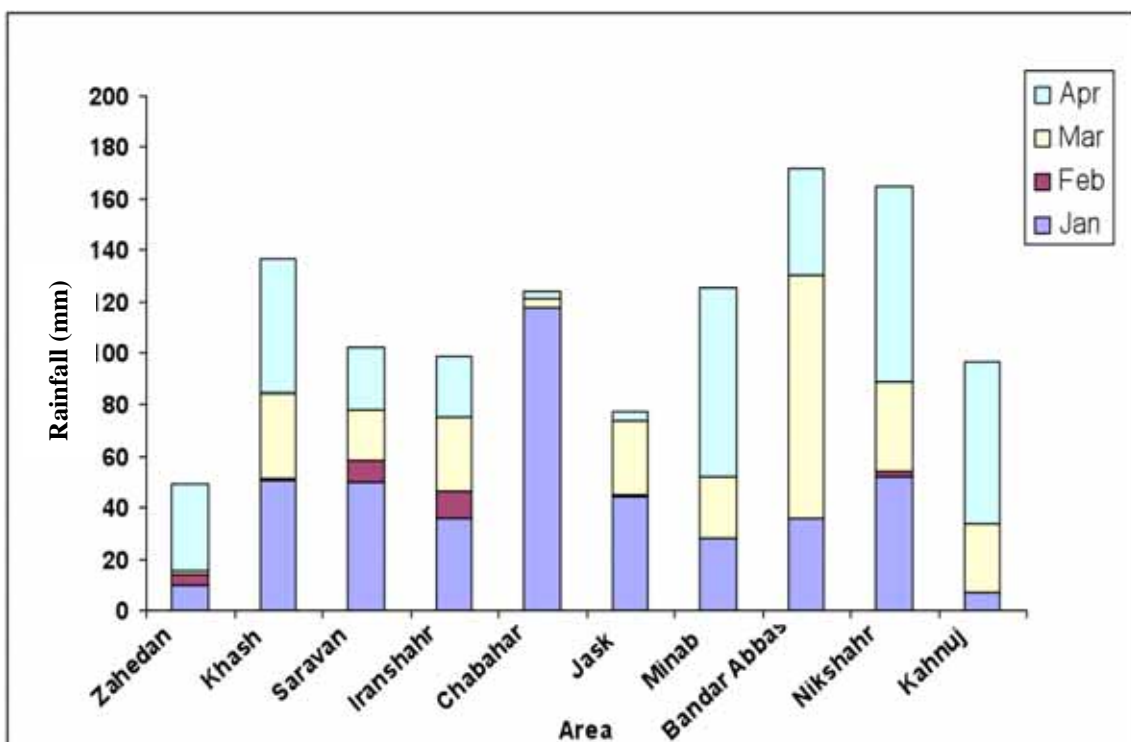
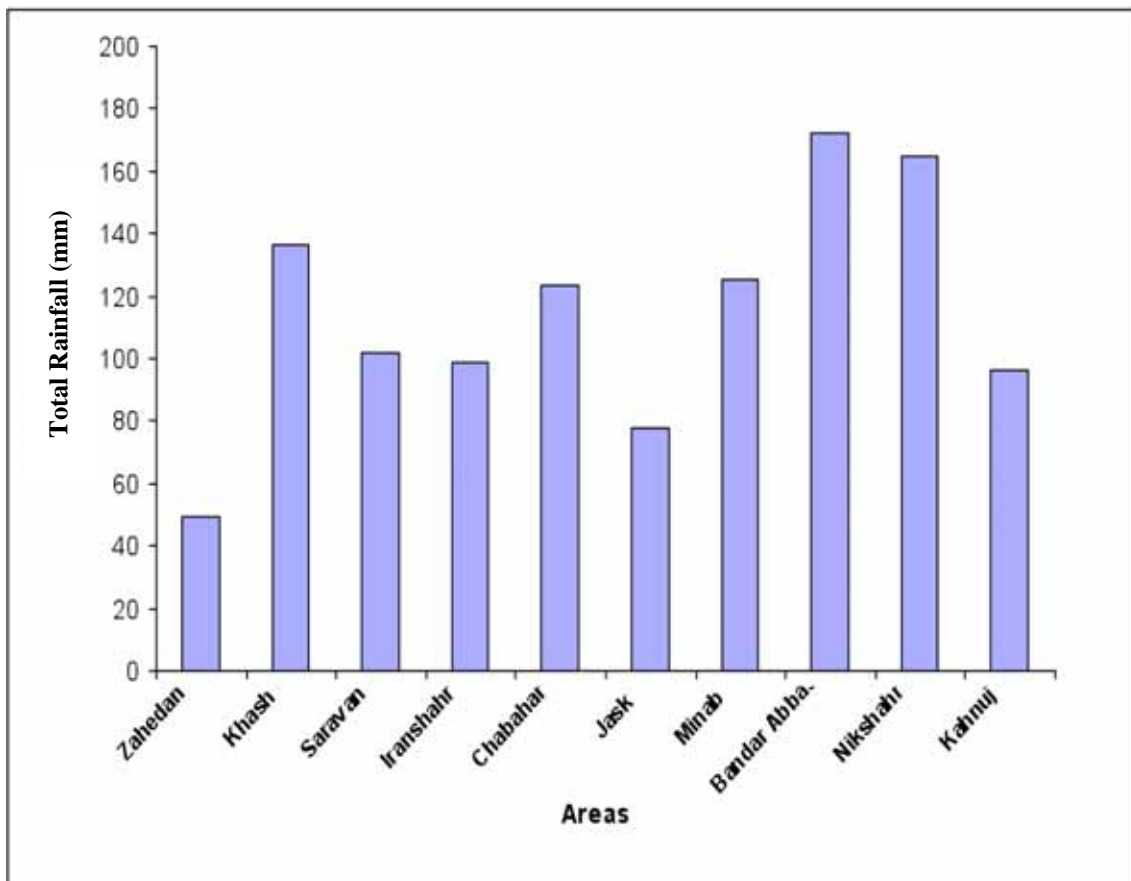
SURVEY STOP	61	62	63	64	65
date	29/04/2009	29/04/2009	30/04/2009	30/04/2009	30/04/2009
time	12:14:00	12:44:00	10:00:00	12:15:00	12:40:00
name	East jaz 3	Eastjaz 4	Penik	Sagan 1	Sagan 2
Longitude (N)	058°33'04.00"E	058°33'34.00"E	058°51'03.00"E	060°10'31.00"E	060°12'47.00"E
Latitude (E or W)	27°34'54.00"N	27°41'03.00"N	27°44'11.00"N	27°21'20.00"N	27°19'43.00"N
ECOLOGY					
Area of survey(ha)	200	250	100	100	100
Habitat(wadi,plains,dunes,crops)	plains	plains	plains	plains	plains
Date of last rain	31/03/2009	31/03/2009	31/03/2009	31/03/2009	31/03/2009
Rain estimate (LMH)	moderate	moderate	moderate	moderate	moderate
Vegetation(dry,drying,green,greening)	drying	drying	green	green	green
Vegetation density(LMD)	medium	low	medium	dense	dense
Soil moisture(wet,dry)	dry	dry	dry	dry	dry
LOCUST					
Present or Absent	A	A	P	A	A
Area infested (ha)					
HOPPERS					
Hopper stage (H123456F)					
Appearance (STG)					
Behaviour (ISG)					
Hopper density (/site or /m2)					
BANDS					
Band stage (H12345F)					
Band density (/m2 or LMH)					
Band density (/m2 or LMH)					
number of bands					
ADULTS					
maturity (Immature, Mature)			M		
appearance (STG)			S		
behaviour (ISG)			I		
Adult density (/transect or /ha)			25.00 /ha low		
Breeding (Copulating, Laying)					
SWARMS					
Maturity (Immature, Mature)					
Swarm density (/m2 or LMH)					
Swarm size (km2 or ha)					
Number of swarms					
Breeding (Copulating, Laying)					
SwarmFlyingDirection					
SwarmFlyingTimePassing					
SwarmFlyingHeight					
CONTROL					
PesticideName					
Application rate (l/ha or kg/ha)					
Quantity					
AreaTreated					
ControlType					
Estimated % kill					
Comments					

Appendix 5. Rainfall data

(a) monthly (January – May 2009)

2009	JAN	FEB	MAR	APR	MAY	TOTAL
Pakistan						
Quetta			22	37		59
Nushki	33	12	2	6	0	53
Kharan			18.4			18.4
Panjkur				3		3
Gwadar				3.9		3.9
Pasni			1			1
Uthal			1.7			1.7
I.R. Iran						
Zahedan	10	3.8	1.4	33.9	0	49.1
Khash	50.4	0.8	33.1	52	0	136.3
Saravan	49.7	8.4	20	24	0	102.1
Iranshahr	35.9	10.8	29	22.9	0	98.6
Chabahar	117.5	0	3.9	2.2	0	123.6
Jask	44.1	0.7	29.1	3.9	0	77.8
Minab	28.1	0.4	23.9	73.2	0	125.6
Bandar Abbas	36.2	0.2	94.3	41.5	0	172.2
Nikshahr	52.4	1.6	35	75.8	0	164.8
Kahnuj	7.2	0	26.6	62.4	0	96.2

N.B. There may be discrepancies between the monthly and daily data



(b) daily for Pakistan (April 2008 – April 2009)

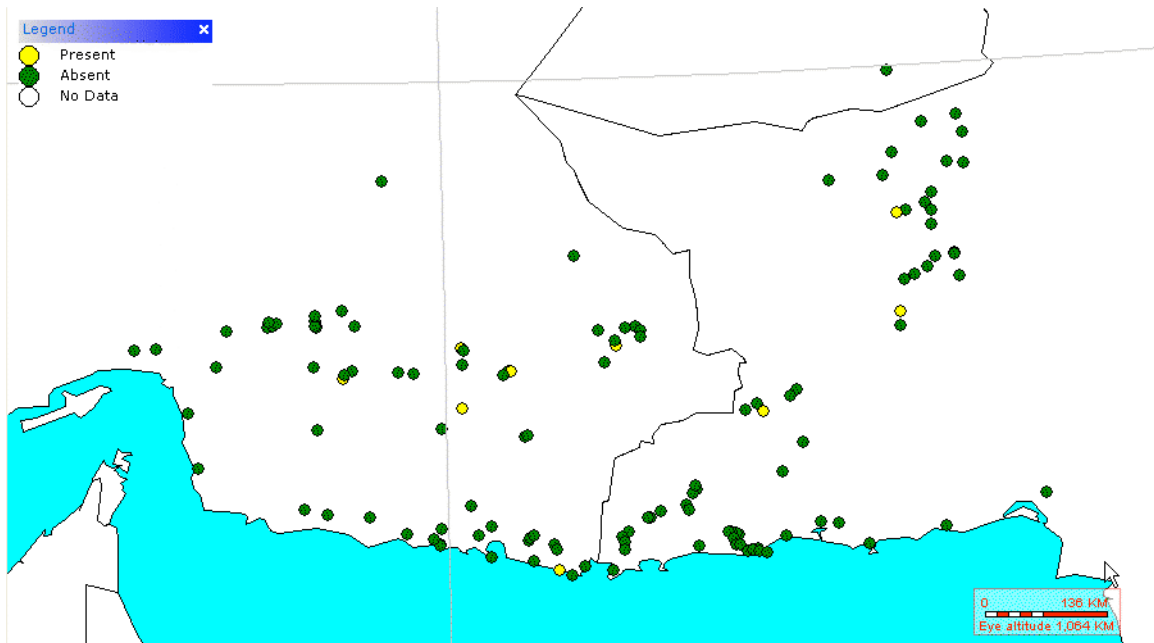
Date	UTHAL	NUSHKI	KHUZDAR	QUETTA	TURBAT	PASNI	GWADAR	PANJGUR	DALBANDIN
11-04-08				1					
21-04-08				4					
08-05-08	1.6		3.4						
15-05-08			2.2						
11-07-08			2.2	8					
18-07-08			10						
29-07-08	10								
04-08-08					17	12.7			
05-08-08							16		
06-08-08			2						
31-08-08			1.4						
07-09-08									
07-12-08	54.4			6					
08-12-08	53.3		37.2						
15-12-08		12							
17-12-08					27	7	27	4	
18-12-08				4	11	36.2			
20-12-08	13.7		11						1.1
21-12-08									1
22-03-09	1.7		14.4						
23-03-09		2		22	1	1			
27-03-09			4						
01-04-09					7		3.9		2
06-04-09		6						3	
08-04-09									5
14-04-09				37					1.5
TOTAL	160.7	20	87.8	82	63	56.9	46.9	7	10.6

N.B. There may be discrepancies between the monthly and daily data

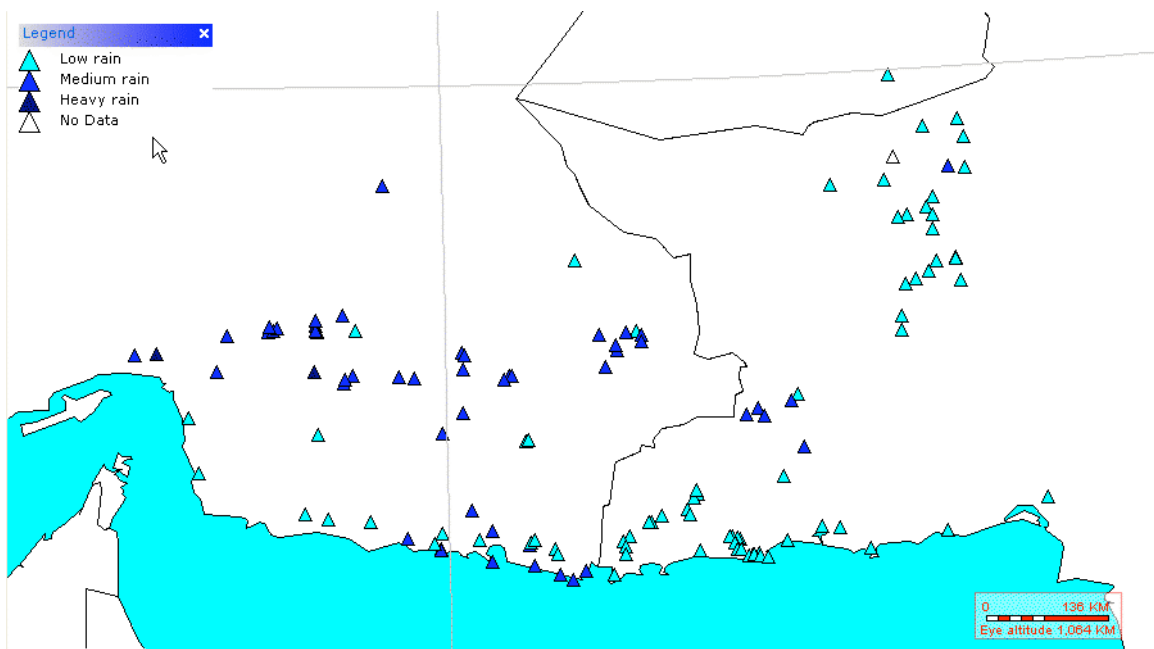
(c) daily for I.R. Iran (May 2008 – April 2009)

Date	KHASH	SARAVAN	IRANSHAHR	CHABAHAR	JASK	KAHNUJ
07-05-08	T					3
14-05-08	T					
01-06-08	T	T				
10-06-08		T				
11-06-08						
05-07-08		2				
06-07-08		T				
19-07-08	T					
04-08-08				1		
05-08-08			T	8		
06-08-08					T	
07-08-08	3		22			
07-09-08	1					
01-11-08					6.4	
02-11-08			12.6	5.2		
28-11-08	8					
02-12-08						0.5
05-12-08	1.4					2.4
06-12-08	1.2					1
07-12-08	9		7.2	0.3		
16-12-08			0.8	12.5	0.6	
17-12-08	17	2	0.4	0.4		
18-12-08					0.6	
19-12-08	2.2					
08-01-09		3	0.7	17.9		
09-01-09		8.9	0.5			
10-01-09				1.1		
12-01-09						1.3
13-01-09	21.8	0.5	2.4		1.6	1.3
14-01-09	13.4	7.3	3.7	19.6	3.7	
15-01-09	3.6	20.3	6.4	13.1	7.5	
16-01-09	2.7		0.6			
20-01-09	1.8	1	6.2	3.5	1.2	
21-01-09	3.4	6.2	3.6			
24-01-09	2.7		11.8	62	30	4.4
25-01-09	2.8	2.5		0.3		0.2
01-02-09	0.2	4.1				
08-02-09					0.7	
09-02-09	0.6	4.3	10			
03-03-09	0.2		0.8			
20-03-09	0.3					
23-03-09	0.5	0.4	5.8			7.9
24-03-09	25	7	2.6	0.6		2
26-03-09			0.5	3.2	14	
27-03-09					3.4	
28-03-09	0.6	7.4	14			0.7
29-03-09		1			2.8	
30-03-09	6.3		3.4		6.6	16
31-03-09	5.1	4.2	21		2.3	52
01-04-09	11					
04-04-09					2.2	
05-04-09	11					
07-04-09	17					
14-04-09	4.1					
TOTAL	176.9	82.1	137	148.7	83.6	92.7

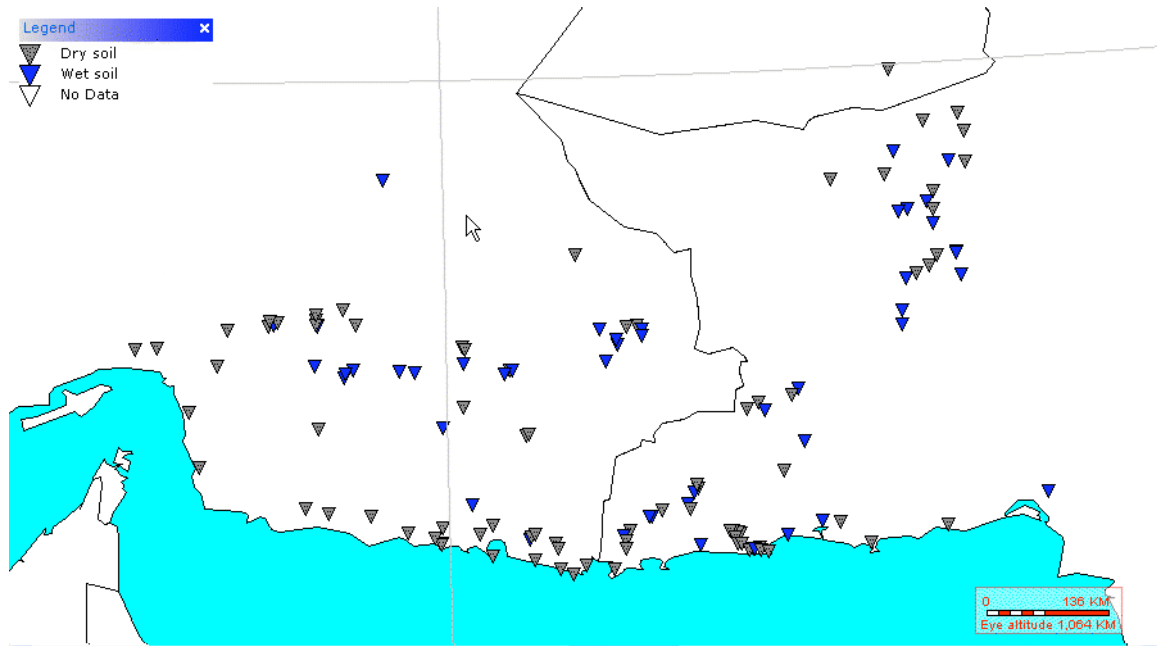
Appendix 6. Survey maps



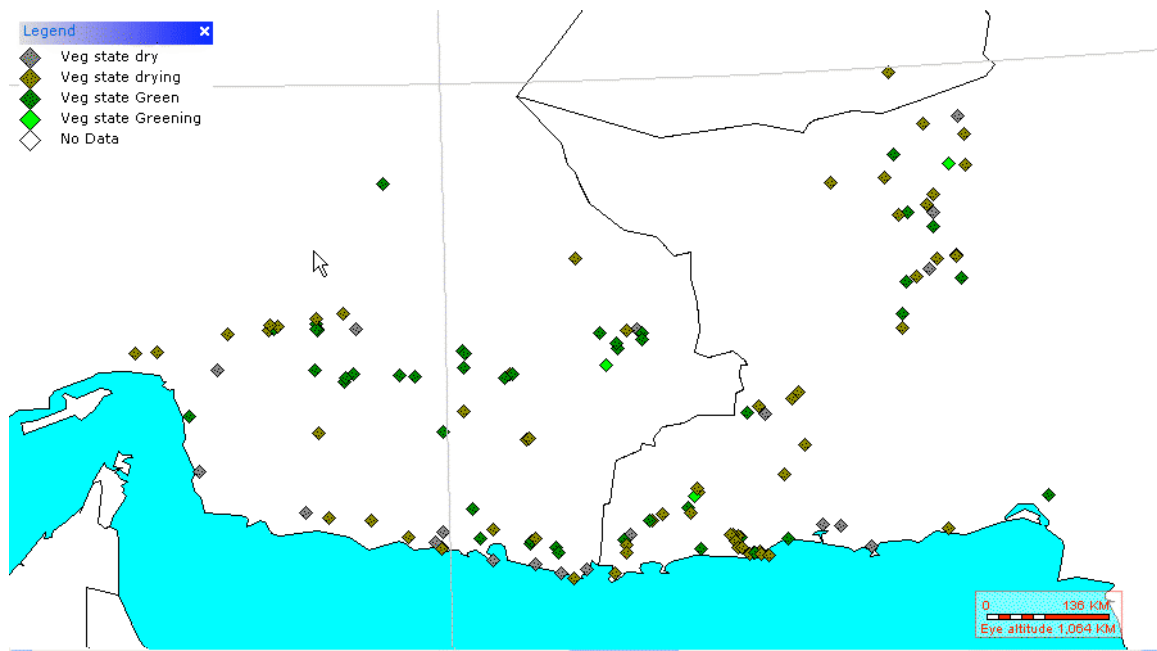
Desert Locust presence



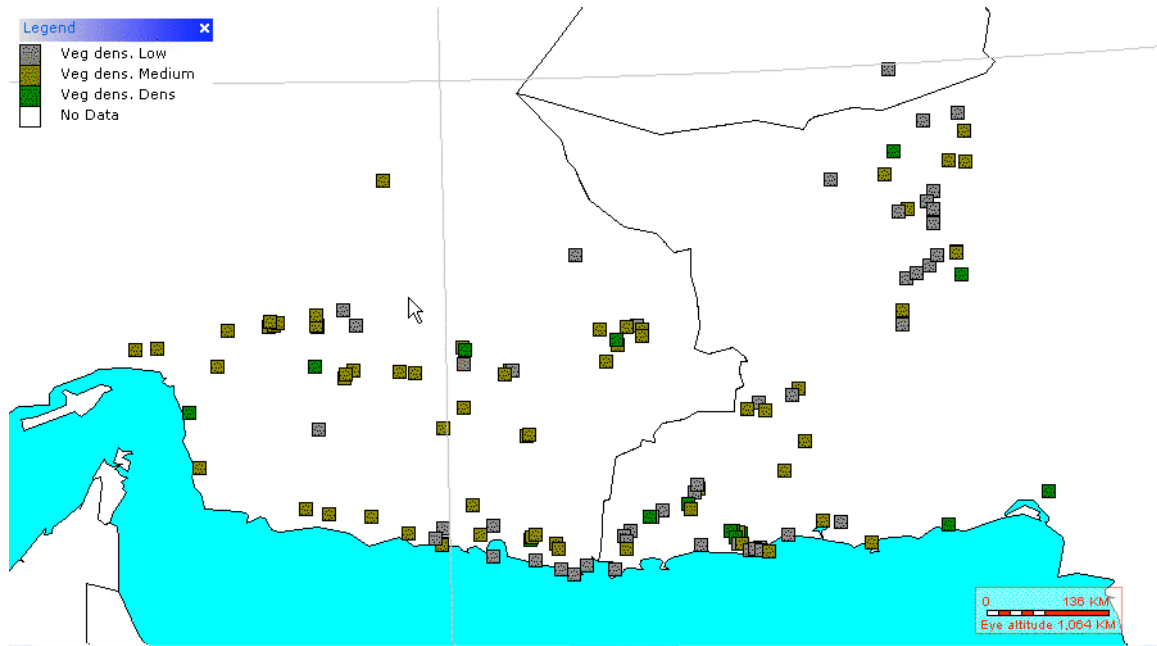
Rainfall



Soil situation



Vegetation state



Vegetation density

Appendix 7. Joint Survey Database (JSDB)

Introduction

One of the most activities of FAO Commission for Controlling the Desert Locust in Southwest Asia (SWAC) is the annual Desert Locust Joint Survey in the spring breeding areas of Pakistan and I.R. Iran. This activity started in 1995 and has continued every year since then. During these 15 years, good data were collected which are a good source of information.

A customized software, called the Joint Survey Database (JSDB), was developed by the Locust Head in I.R. Iran. The purpose of this program is to store joint survey results in digital format so that data are easily accessible. This should help the Joint Survey team to have better judgment of Desert Locust infestations and to submit the final report faster to FAO. It was agreed in the 26th Session of SWAC to work on such a database.

Methodology

The JSDB has 2 main sections:

- GIS section that is responsible for achieving and displaying spatial data on a custom map
- Database section which keeps Desert Locust survey and control data for analysis

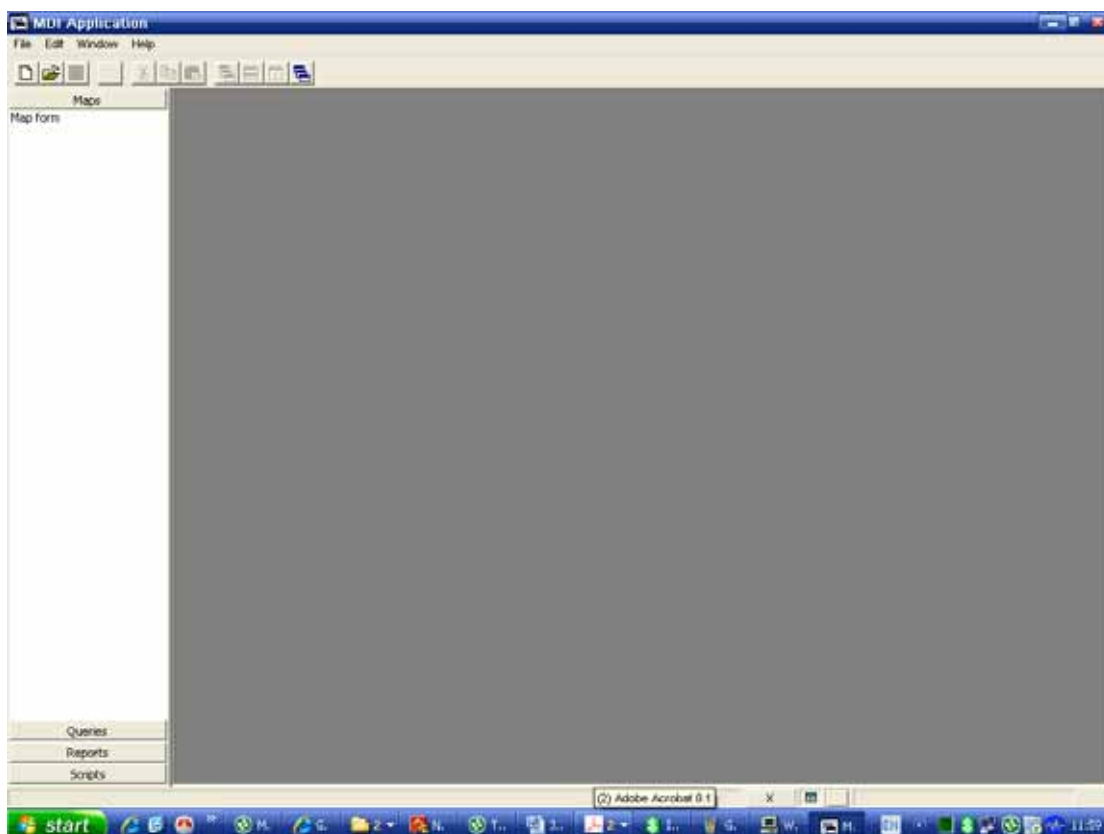


Figure 1. General view of JSDB.

GIS section

The main body of this section is a custom map. MODIS images and digital maps can be displayed as a layer on this map. As for nearly all GIS software, the user can control each layer easily. This section connects and works closely with another subsection that is responsible to get current spatial data. The user's current position and course can be displayed on the map.

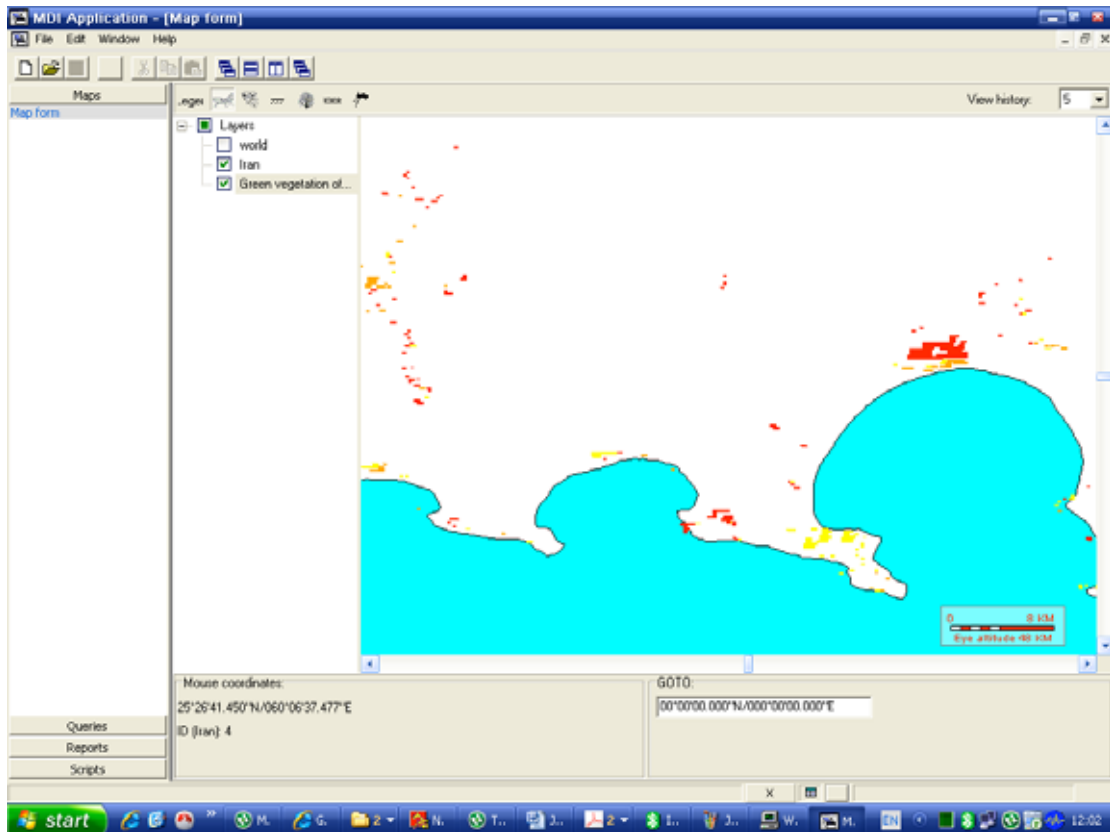


Figure 2. Map view.

The GPS subsection looks like a handheld GPS and obtains location data from a Bluetooth-enabled GPS. It has 3 pages:

- Position – shows current date and time (GMT), altitude, and latitude/longitude position
- Satellite – shows current position of GPS satellites and their signal strength
- Navigation – shows current speed and course

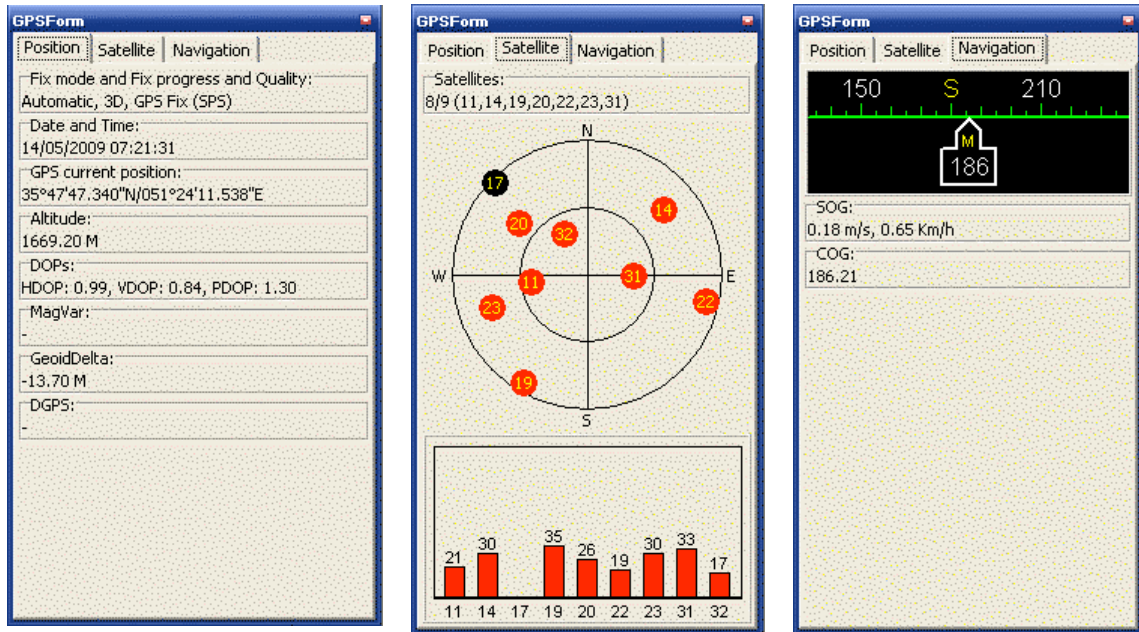


Figure 3. A bluetooth-enabled GPS is necessary for sending data to JSDB.

Database Section

The JSDB has a database that keeps Desert Locust survey and control data from previous years. Moreover, it can save new Desert Locust data easily and in a very short amount of time.

All possible values can be selected from a popup menu. Coordinates, date and time can be retrieved from a Bluetooth-enabled GPS with just one button click. Testing by the 2009 Joint Survey team demonstrated that entering data into JSDB is easier and faster than filling out the *FAO Desert Locust Survey and Control Form*.

The database section of JSDB has a subsection named Results that is driven by Standard Query Language (SQL). By using pre-defined SQL queries, the Joint Survey team can check their route on the map at the end of a user-specified period and check how much area they surveyed and so on. At the end of the Joint Survey, they can easily have a Excel formatted file of all the survey stops that can be copied into their final report.

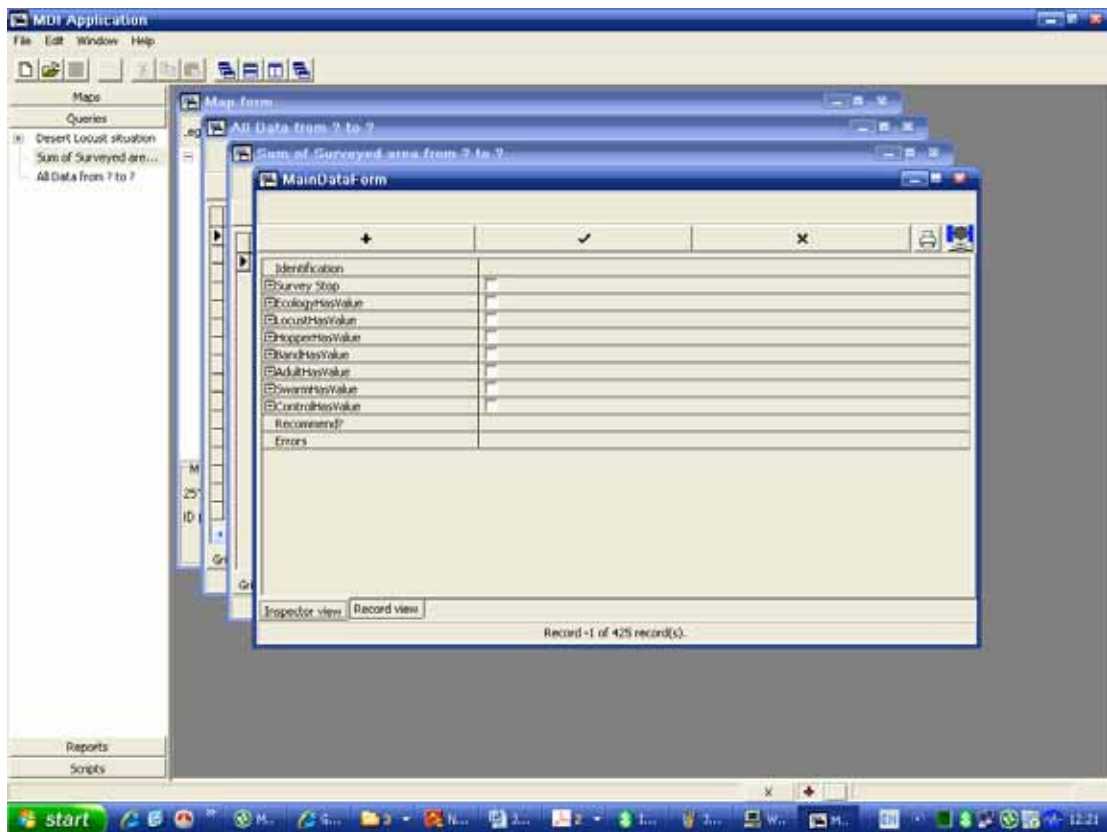


Figure 4. Digital Survey and Control Form for adding new data

Conclusion

The JSDB has been developed and programmed to help joint survey team in the following ways:

1. Easy access to previous data of Desert Locust activity in the spring breeding areas.
2. The team's current position is displayed so they can see where they are on the map.
3. Help in determining the team's location and deciding where to go to find suitable Desert Locust habitats. This is facilitated by easy access to MODIS images, roads, previous Desert Locust observations and the current position.
4. JSDB is a safe and secure means of storing Joint Survey data.
5. Data analysis is facilitated by the built-in SQL support and functionality.
6. As data will be input in the field, no additional time is needed to type data into the *FAO Desert Locust Survey and Control Form*. The Joint Survey team can view and discuss the day's results each evening. The results can easily be printed out when a printer is available.
7. Although JSDB is useful tool, it is not a substitution for using eLocust2.
8. The Joint Survey team must input data into both eLocust2 and JSDB but for different reasons: eLocust2 as the primary tool for sending survey data to the national locust centre in the country where the survey is being conducted, and JSDB as a tool to store and manage data for analysis.
9. In 2009, a demo version of JSDB was tested as proof of concept that a database in the field can be a useful tool for use by the Joint Survey team. Both team leaders agreed that indeed this was the case.

Appendix 8. Itinerary for 2010 Joint Survey

Day	Date	Route	Night
1	01/04/2010	I.R. Iran team cross into Pakistan at Mirjaveh	Taftan
2	02/04/2010	Taftan, Dalbandin, Chagai Hills, Nushki	Nushki
3	03/04/2010	Nushki, Kharan, Kharan area (Naroo)	Kharan
4	04/04/2010	Kharan area (Shamsi)	Kharan
5	05/04/2010	Kharan area (Ormage and Borko areas)	Kharan
6	06/04/2010	Kharan, Basima, Nag, Panjgur	Panjgur
7	07/04/2010	Panjgur, Prome, Panjgur	Panjgur
8	08/04/2010	Panjgur, Hoshab, Turbat	Turbat
9	09/04/2010	Turbat, Solaika, Turbat	Turbat
10	10/04/2010	Turbat, Suntsar, Jiwani	Jiwani
11	11/04/2010	Jiwani, Gwadar	Gwadar
12	12/04/2010	Gwadar, Kulanch, Pasni	Pasni
13	13/04/2010	Pasni area	Pasni
14	14/04/2010	Pasni, Ormara, Uthal	Uthal
15	15/04/2010	Uthal, Quetta	Quetta
16	16/04/2010	<i>Report day, prepare 1st half joint survey results</i>	Quetta
17	17/04/2010	Quetta, Nushki, Taftan	Taftan
18	18/04/2010	Pakistan team cross border point Taftan/Mirjaveh	Zahedan
1	19/04/2010	Zahedan, Khash, Gosht, Saravan	Saravan
2	20/04/2010	Saravan, Souran, Zaboli, Iranshahr	Iranshahr
3	21/04/2010	Iranshahr, Jolgeh Chah Hashem, Iranshahr	Iranshahr
4	22/04/2010	Iranshahr, Espakeh, Nikshahr, Chabahar	Chabahar
5	23/04/2010	Chabahar, Beris, Sham, Govater, Chabahar	Chabahar
6	24/04/2010	Chabahar, Vashnam, Dashtiari, Negur, Chabahar	Chabahar
7	25/04/2010	Chabahar, Zaribad, Jask, Jask area	Jask
8	26/04/2010	Jask, Minab, Bandar Abbas	B. Abbas
9	27/04/2010	Report day, prepare 2 nd half joint survey results	B. Abbas
10	28/04/2010	Bandar Abbas, Ghale Ganj, Sowlan, Kahnuj	Kahnuj
11	29/04/2010	East Jaz Murian, Kahnuj	Kahnuj
12	30/04/2010	Zeh Kalout, Dalgan, Bampour, Sardegah, Iranshahr	Iranshahr
13	01/05/2010	Iranshahr, Zahedan; <i>sent 2nd half results</i>	Zahedan
14	02/05/2010	<i>Locust Heads / JS team meeting, prepare JS report</i>	Zahedan
15	03/05/2010	<i>Locust Heads / JS team meeting, prepare JS report</i>	Zahedan
16	04/05/2010	Zahedan, Mirjaveh; <i>Pakistani team cross the border</i>	

Appendix 9. Photos



1. 273509N/580439E, Khargoshki (I.R. Iran)



2. 273120N/620821E, Charshahi (I.R. Iran)



3. 272845N/621120E, Shamsabad (I.R. Iran)



4. 272039N/620046E, Gavadeh (I.R. Iran) with locusts



5. 272039N/620046E, Gavadeh (I.R. Iran) with locusts



6. 270617N/604211E, Kora memari (I.R. Iran) with locusts



7. 271958N/615505E, Souran (I.R. Iran)



8. 270617N/604211E, Kora memari (I.R. Iran) with locusts



9. 264450N/600982E, Espakeh (I.R. Iran)



10. 271943N/601247E, Sagan (I.R. Iran)



11. 251348N/605604E, Bris (I.R. Iran) with locusts



12. 251112N/601128E, Golgeh Chah Hashem, (I.R. Iran)



13. Espakeh to Chabahar (I.R. Iran)



14. 270407N 586145E, Chaheshagh (I.R. Iran)



15. Team participants (left to right): back - Arash Rostami Por (Environmental Asst., I.R. Iran), Javad Ravandeh (Locust Officer, I.R. Iran), Babali Fashki (Team Leader, I.R. Iran), Nazar Hussain Malik (Team Leader, Pakistan), Ghulam Qadir Lund (Locust Officer, Pakistan), Bahador Khan (Maintenance Asst., Pakistan); front - I.R. Iran drivers: Ahmad Rodbari, Eshagh Darzi, Hagh Talab, Muhammad Gholami.