

<b>Locust Geographic Information System (GIS) Workshop</b>
Tashkent, Uzbekistan, 6-8 November 2013
<b>Definition of the main features of the locust GIS in CCA</b>

*- Item 10 of the Provisional Agenda -*

**The Locust Geographical Information System (GIS) for Caucasus and Central Asia (CCA) will be developed at two levels, the national and the regional ones:**

**GIS at national level**

The first level - national - is to implement a national GIS into the National Plant Protection Services (NPPS). This is supported by the Automated system of data collection (ASDC) with Inspector and Operator Applications (See Working Paper for Items 4-5).

It is assumed that at the national level, local staff at all administrative levels are working with the GIS to manage data from field surveys. Locust data management involves data control, analysis of the locust situation and environmental information (including weather data and satellite images) as well as the report preparation (statistical tables at all levels of state administrative division). The name proposed for the local system of locust monitoring is RAMSCCAL (Reconnaissance and Management System of Caucasus and Central Asia Locusts). This system will be available in Russian and English.

Thus, each country in CCA should store its own data in its own RAMSCCAL GIS.

**GIS at regional level**

The second level - regional - will combine all GIS developed at national levels by the NPPS in CCA countries into an unified regional GIS. This unified GIS database will be maintained by periodic update of the database by transmission of information on surveys and control of pests from the CCA countries. These data will be analyzed in combination with data from other sources.

The name proposed for the regional system of locust monitoring is CCAL-WARMS (Caucasus and Central Asia Locusts Warning and Management System). This system will be also available in Russian and English.

With the help of the CCAL-WARMS, FAO will publish more accurate and documented regional monthly bulletins on the three locust species in the

Russian and English languages, including the results of the analysis of the current situation of locusts and more precise medium-term forecasts for the CCA region. Thus, each CCA country should support the CCAL-WARMS through periodic transmission of ground surveys and locust control data and by the use of common materials as following: the analysis of the current situation in the region, remote sensing products, meteorological fields and model predictions.

**Regardless of the level the locust, the GIS includes five key components: hardware, data, specialists, software and methods.**

**Hardware.** This is a computer with the GIS installation. Currently GIS operate on different types of computer platforms. The regional GIS will be deployed on a centralized server. The national GIS in NPPS will need a series of tablets and a server connected to a network of other computers of the local employees. The number of tablets is determined by the number of subordinate administrative organizations conducting field surveys. Minimum requirements for tablets and server computer are listed in item 1 of the Annex.

**Data.** Geographic data and related tabular data will be collected and prepared in NPPS. It is basically the data from the field surveys, which will include the information in accordance with the standard forms of FAO.

The database structure of the RAMSCCAL will also be developed in accordance with the content of the standard forms of FAO (See Annex 2-a). In the FAO/CCA "Locust Survey Form", there is no field that identifies the locust species, except different types of habitat that are encoded for CIT as steppe, fallow, crops, for DMA (plain, hill, crops) and for LMI (short dry reeds, tall wet reeds, other). In this regard, it is proposed to introduce the locust species at the first level of identification fields in the database (DB) to introduce the type of locust.

For information on locust control, it will be connected via the field of «name of the area» (information from Google Earth) and the geographic coordinates to the corresponding records in the database and to provide information in accordance with the content of FAO/CCA "Spray Monitoring Form" (See Annex 2-b).

The database of the CCAL-WARMS will include all information pieces from the national RAMSCCALs. In addition to these data, cartographic materials for all CCA countries will be loaded in the regional GIS: administrative and topographic maps, soil, land use and vegetation maps, digital elevation model. After determining the sources of forecast meteorological fields on a regular grid (temperature, precipitation, wind), these data will also be loaded periodically in the regional database. It is also planned to replenish the regional GIS database with remote sensing products for locust habitat and flood zones mapping, determination of the characteristics of soil moisture, rainfall distribution, assessment and productivity of vegetation through different vegetation indices.

**Specialists.** The following specialists are necessary for efficient operation of GIS:

- Field teams, which need to be dedicated, well trained in collecting, recording and transmitting data; they also need to be well equipped and be given the tools to do the work appropriately (GPS, vehicles, mobile phones, tablets);
- Technical specialists supporting the GIS system and advising local staff on how to use the national GIS and to solve problems and tasks;
- The expert(s) with professional knowledge of database management and GIS programming to support the operation of the regional GIS.

**Software and methods.** The main principle of choosing the software to create national and regional GIS is to find them from open sources, for examples QGIS or OpenJump, using programming language JAVA.

Basic requirements for the selection of the Software will be guided by the need to service the four compulsory subsystems:

- (1) Data Entry, which provides control of input materials and/or processing of raster or vector data from maps, remote sensing data, etc.;
- (2) Data Storage and Retrieval, which allows to access data to analyze, update and correct them;
- (3) Data Processing and Analysis, which enables to solve numerical and analytical tasks; and
- (4) Data Delivery using various supports (charts, tables, images, block-diagrams, three-dimensional model representations, etc.).

Methods of analysis will be based on the common approaches used in CCA and the output products will correspond to established forms of reporting and cartographic representation.

## **Annex 1- Minimum requirements for tablets and server computer for the national GIS in NPPS**

The minimum configuration of a tablet is defined by the following technical parameters: a dual-core processor with a frequency of at least 1.0 GHz; RAM at less than 512MB , display 7 " ; link WCDMA: 850/2100 MHz; rear camera is not less than 5 megapixels; built-in GPS; Android operating system version 4.0 or later; the battery lasts for over -time (not less than 2500 mAh).

Minimum request to a server is defined by the following technical means: quad processor with a frequency of 2.0 GHz and above; RAM 2048 MB; monitor 1024 x 768 , motherboard with Intel 965 and better , 2 hard drives of at least 100 GB; adapter for SIM card with WCDMA communication channel: 850/2100MHz; Internet connection with speed of more than 56 kbit/s.

## **Annex 2- List of data to be included in the RAMSCCAL database**

The source, the unit of measurement of a parameter in a numerical format, or actual values of the parameter in the text format are indicated between parenthesis. Coding is identified by the capital letters.

### **a- From locust survey operations:**

- Identification of the country, region, district;
- Description of survey stop - the name of the observer, date (day/month/year) & time, name of the village or site (information from Google Earth), geographic coordinates;
- Ecological information – surface of surveyed area (ha), the type of habitat, vegetation (dry, greening, green, drying), vegetation cover (Low Medium Dense), weather: air temperature (°C) and wind (m/s);
- Locust information:
  - o present or absent, locust species (CIT, DMA, LMI, other), area infested (ha);
  - o for eggs: egg-bed (surface in m<sup>2</sup>), egg-pods (density/m<sup>2</sup>), eggs (average number/egg-pod), eggs (% viable), natural enemies present (list);
  - o for hoppers: hatching (% beginning & mass), hopper stages (Young Medium Large), appearance (solitary, *transiens*, gregarious), behaviour (isolated, scattered, groups), hopper density (/m<sup>2</sup>);
  - o for bands: band stage (Small Medium Large), band density (/m<sup>2</sup> or Low Medium High), band sizes (m<sup>2</sup> or ha), number of bands, behavior (Marching, Eating, Roosting);
  - o for adults: fledging (% beginning & mass), maturity (immature, maturing, mature), appearance (solitary, *transiens*, gregarious), behaviour (isolated, scattered, groups), adult density (transect size or /ha), breeding (copulating, laying), flying (yes or no);
  - o for swarms: swarm density (/m<sup>2</sup> or Low Medium High), swarm size (km<sup>2</sup> or ha), number of swarms, breeding (copulating, laying), flying (direction, time passing), flyingheight (Low Medium High);
- Comments.

**b- From locust control operations:**

- Control location - date, name of the village or site (information from Google Earth), geographic coordinates, area infested (ha), area treated (ha);
- Vegetation data: type (vegetation, crop), height (m), vegetation cover (%), crop name and damage (%);
- Insecticide data: trade name, concentration (g a.i./l or %), formulation (EC, ULV, other), dose rate (l/ha), rate of working solution (l/ha), expiry date, is insecticide mixed with water or solvent (yes or no); if yes, what solvent and mixing ratio;
- Weather condition at the start: time, temperature (°C), relative humidity (%), wind speed (m/s), wind direction (N, N-E, E, S-E, S, S-W, W, N-W), spray direction (N, N-E, E, S-E, S, S-W, W, N-W);
- Weather condition at the end: time, temperature (°C), relative humidity (%), wind speed (m/s), wind direction (N, N-E, E, S-E, S, S-W, W, N-W), spray direction (N, N-E, E, S-E, S, S-W, W, N-W);
- Locust information: type (CIT, DMA, LMI and other), hoppers stages (S, M, L) or Adult, density ( per m<sup>2</sup> or ha); hopper bands, swarms or scattered;
- Spray application: spray platform (Aerial, Vehicle, Person), aerial (Plane, Helicopter, Deltaplane), ground (Tractor, Vehicle, Aerosol G), hand (Knapsack, Hand-held), sprayer operator (Pilot, Driver, Other), name of operator, sprayer manufacturer, sprayer model, date of last calibration, atomizer height above ground (m), treated swath width (m), track spacing (m), Barriers only: width and spacing (m), forward speed (km/h), aerial: DGPS used (Yes or No), ground marking (GPS, Flag, Vehicle, No);
- Control efficacy: locust mortality (%), time after treatment (hours), method of mortality estimation;
- Safety and environment: protective clothing: what did the operator wear (G=glasses, M=mask, L=gloves, O=overalls, B=boots), who was informed of spraying (Farmer, Villager, Official, Beekeeper), effect on non-target organisms (Yes or No), if Yes, what (description), details of anyone who felt unwell or if other problems were encountered (description).