

LOCUST CRISIS



MADAGASCAR

**Response to the locust plague in
Madagascar
Campaign 2014/15**

INTERIM REPORT N. 1

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**Food and Agriculture
Organization of the
United Nations**



Title:

Emergency support to the Locust Campaign 2014/15 in response to the locust plague in Madagascar

Background and donor response

The current Malagasy Migratory Locust plague began in April 2012. Rice, other crops and pasture resources for livestock were at risk of considerable damage by the locust plague, which could have had a significant negative impact on domestic supply and grain prices. In view of the scale of the plague, it was estimated that the food security of 13 million people (60 percent of the population) could be affected without large-scale locust control operations. To tackle this catastrophic situation, the Ministry of Agriculture (MoA) of Madagascar declared a national state of emergency on 27 November 2012. The following month, it requested technical and financial assistance from the Food and Agriculture Organization of the United Nations (FAO) to address the locust plague, ensure the mobilization of resources and coordinate and implement an emergency response.

A Three-year emergency Programme in response to the locust plague was jointly prepared by FAO and the MoA in December 2012. The budget for this Programme (2013–2016) was planned to be revised each year to reflect the development of the locust situation, the requirements of each locust control campaign and the market prices of inputs and services. It was thus revised in December 2014 to take into account the actual cost of the first campaign and the anticipated cost of the second campaign, and amounted to USD 39.4 million on 28 February 2015.

The Three-year Programme consists of five components and numerous activities.

Components and activities of the Three-year Programme	
Component	Activity
1 Strengthening of national capacities for the monitoring and analysis of the locust situation	1.1. Strengthening of human capacities in data collection , analysis, and information management 1.2. Support to survey operations
2 Strengthening of national locust control capacities	2.1. Human capacity building for locust control 2.2. Support to locust control operations
3 Preservation of human health and protection of the environment	3.1. Strengthening of human capacity for human health preservation and protection of the environment 3.2. Support impact monitoring (of treatments) on human health and the environment 3.3. Construction of a pesticide storage facility (Toliara)
4 Implementation and coordination of the Programme	4.1. Implementation of the National Locust Emergency Plan 4.2. Coordination of the Programme
5 Assessment of the effectiveness of locust campaigns and the impact of the locust crisis on crops and pastures	5.1. Assessment of the effectiveness of the locust control campaign 5.2. Assessment of the impact of the locust crisis on crops and pastures

The first locust campaign of the Three-year Programme was a success: more than 30 million ha were surveyed, allowing the control of locust populations over more than 1.2 million ha while respecting human health and the environment. The specific objective of this campaign, which aimed to stem the dynamics of the plague whilst protecting crops and pastures, was thus achieved.

For the second locust campaign, which began in September 2014 and will end in August 2015, it was planned to treat locust infestations over an area of 500 000 to 800 000 ha to support the decline of the plague and protect crops and pastures. This would contribute to reducing the threat to the livelihoods of rural populations already affected by the plague and other factors such as cyclones, drought, political instability, etc.

Donor response to resource mobilization efforts made by FAO for the Three-year Programme has been positive. As of 28 February 2015, USD 29.4 million had been provided by the Central Emergency Response Fund of the United Nations Office for the Coordination of Humanitarian Affairs, the European Union, and the Governments of Austria, Belgium, France, Italy, Japan, Madagascar (through a World Bank and International Fund for Agricultural

Development loan), Norway and the United States of America.

On 28 February 2015, USD 10 million still needed to be secured to complete the Three-year Programme and enable its objectives to be reached; otherwise, all efforts made so far would have been futile. If the second and third control campaigns are not implemented in full and in a timely manner, a recession situation cannot be guaranteed in 2016. A chronic locust upsurge could occur (as occurred from 2010 to 2012), developing into a new locust plague.

Objectives and beneficiaries of the Three-year Programme

The overall objective of the Programme is to contribute to safeguarding the food security of the most vulnerable rural populations in Madagascar.

The specific objective of the 2014/15 campaign is to support the decline of the Malagasy Migratory Locust plague and thus limit damage to crops and pastures.

Achieving this objective will reduce the geographical scope and size of the areas infested and contaminated by the Malagasy Migratory Locust outside the Outbreak Area, as well as the number and size of grouped locust populations (hopper bands and swarms), and trigger the degregarization of these populations.

The implemented strategy includes identifying locust population hotspots, regularly monitoring their dynamics (mostly by aerial surveys to establish forecasts that are as accurate as possible) and deploying and making the best use of available control means in accordance with best practices in agriculture, human health and the environment.

Beneficiaries:

1. The Plant Protection Directorate (PPD) of the MoA, through the establishment of a Locust Watch Unit to improve the capacity to monitor and analyse the locust and anti-locust situations in the country.
2. The National Anti-Locust Centre (*Centre national antiacridien* [CNA]) and, since October 2014, the Support Unit for Ground Anti-Locust Control (*Cellule d'appui à la lutte antiacridienne terrestre* [CALAT]), whose capacities to respond to the locust threat will be strengthened.
3. Approximately 13 million people in Madagascar whose livelihoods are threatened by the locust plague.

Progress on Programme implementation

After the first anti-locust campaign (2013/14), which halted the Malagasy Migratory Locust plague, the second campaign, as described in its [Programme document](#), is designed to support the decline of this plague. It focuses on:

- improving the monitoring and analysis of the locust situations;
- strengthening large-scale aerial control operations; and
- monitoring and mitigating the impact of anti-locust control operations on human health and the environment.

The survey and control activities of the second campaign began on 9 October 2014, one day after the first helicopter was received. This early start of the second campaign was possible as related preparatory activities were carried out from June to October 2014, together the field operations of the winter period. This period was mainly characterized by:

- the procurement of goods and services crucial for survey and control operations (aerial services/flying hours and equipment for survey, control, camping, communication and personal protection); and
- the identification, recruitment and deployment of staff key to coordinating and implementing the anti locust campaign.

The 2014/15 campaign is in line with the strategy defined by the Three-year Programme. It incorporates crucial tactical adjustments that take into consideration the results obtained, recommendations made and lessons learned during the first campaign, as well as the development of the locust and anti-locust situations.

Details of activities carried out and results achieved as of 28 February 2015 are outlined below.

Component 1: Strengthening of national capacities for the monitoring and analysis of the locust situation

Expected outcome: Capacity to monitor and analyse the locust situations is strengthened, making it possible to follow and understand the dynamics of locust populations, implement the locust control strategy, make the necessary tactical adjustments during the campaign and identify targets for large-scale control operations.

Results as of 28 February 2015: From 9 October 2014 to 28 February 2015, the two helicopters performed just over 406 flying hours. These aerial surveys, supplemented by ground surveys, allowed the most infested areas to be identified and targets for control operations to be defined.

The Locust Watch Unit continues to prepare ten-day bulletins on the locust and anti-locust situations, as well as continually updated analyses.

Activity 1.1: Strengthening of human capacities in data collection, analysis and information management

Locust Watch Unit

- The Locust Watch Unit (*Cellule de veille acridienne* [LWU]), established in February 2013, continues to manage and analyse data related to weather and ecology, the locust and anti-locust situations, and agriculture and socio-economics. In September 2014, it was decided to restructure the composition of the LWU in order to improve its impact. Since the quality of the work of the Agricultural/Socio-economic Data Expert did not meet FAO standards, the tasks for which he was responsible were divided between two entomologists. Therefore, the LWU is now composed of three members: two entomologists – one responsible for locust and agricultural/socioeconomic data, the other responsible for ecological and meteorological as well as anti-locust data – and a national expert in Geographical Information Systems (GIS). The national GIS expert, under the technical supervision of the Three-year Programme Coordinator, continues to improve the mapping and visual representation of meteorological conditions and of survey and control operations for the ten-day bulletins as well as for printed and online press. Before its move to the PPD of the MoA, the LWU has been temporarily operating on the premises of the FAO Representation in Madagascar.
- Since the start of the second campaign, the three experts have benefited from refresher trainings delivered by the Three-year Programme Coordinator during her missions in Madagascar in September 2014 and February 2015, and by the Campaign Coordinator during his three missions carried out from September 2014 to February 2015. Moreover, the team benefits from day-to-day distant support from the Coordinator (based in Rome) and a Senior Locust Expert (based in France). In addition to these technical refresher trainings, the three members of the LWU also had private lessons to improve their French reporting and writing skills between July 2014 and January 2015.
- In January 2015, the international GIS expert carried out a one-month mission to Madagascar (the third since the Programme began) with the aim of: (i) reinforcing the knowledge gained during the two previous training courses; (ii) improving and developing the geo-referenced database in view of the growing volume of data on ecological and meteorological conditions, locust population dynamics and control operations; (iii) assisting in the development of GIS tools; and (iv) creating diagnostic maps in order to produce forecasts on the development trends of locust situations in correlation with available rainfall data, weather forecasts and vegetation maps to further strengthen the LWU's capacities in mapping and forecasting. When not on mission in Madagascar, the international GIS expert continues to provide the LWU with long-distance support (online) for data management, analysis and mapping.
- Since June 2014, an international agronomist has been directly supervising the work of the LWU. She provides support on a daily basis to the production of ten-day and monthly bulletins and the collection, management and analysis of data. She also carried out a field mission in October 2014 to Base 1, during which she presented bulletins drawn up by the LWU to base staff and helicopter crew in order to demonstrate the importance of transmitting timely and high quality data.
- From September 2014 to February 2015, nine ten-day bulletins and two monthly bulletins were produced by the LWU, presenting: the spatio-temporal developments of the locust populations and of the ecological and meteorological conditions; the means implemented to monitor situations; details on survey and control operations; information related to crop losses; difficulties encountered; and field trips made by experts on mission in Madagascar. These bulletins were published on the [FAO Web site](#) devoted to the locust crisis in Madagascar. A total of 40 ten-day bulletins and 20 monthly bulletins have been produced by the LWU since its establishment in February 2013.

- For its analyses during the second anti-locust campaign, the LWU used data from aerial survey operations, which was supplemented by reports from ground scouts working with the bases and those of the team of scouts on motorcycles (set up from October 2014 in strategic geographical areas for monitoring locust population dynamics). Furthermore, in October 2014, with support from the Deputy Campaign Coordinator, the Locust Data Expert carried out a field mission to train motorcycle scouts on the use of the new survey/reporting form and the control form on locust mortality. More specifically, this training focused on: survey objectives; planning and implementing ground survey operations; assessment methods (identity, behaviour, appearance, developmental stage, phase status and locust density; nature and development of the vegetation; soil humidity and density; and damage to crops); and completing and submitting survey forms.

Activity 1.2: Support to survey operations

Aerial bases and flying hours for survey operations

- Following a competitive tender process, FAO signed a contract with an aircraft company to provide two helicopters, skilled pilots and related logistics services for aerial survey and control operations in Madagascar. The first helicopter arrived on 8 October 2014. Extensive aerial survey operations began the next day in western Madagascar, from Mahajunga to Toliara. The aim of these surveys was to locate locust populations that had survived the winter period, assess their size and determine their characteristics in order to specify the deployment sites of the two airbases. The first base was thus established in Tsiroanomandidy on 13 October and the second in Ihosy on 20 October after the arrival of the second helicopter on 18 October. Each base has three teams: one responsible for running the base; one for collecting locust and environmental data; and a third team responsible for control operations. On 28 February 2015, the two airbases were located in the Invasion Area (Midwest) in Miandrivazo, and in the Outbreak Area (southwest of the island) in Sakaraha. These two airbases are mobile and can be redeployed as the locust and anti-locust situation evolves. The map in Annex 1 shows the successive deployment sites of the two airbases from 13 October 2014 to 28 February 2015.
- Over the course of the campaign, aerial surveys provide a comprehensive overview of the locust situation, making it possible to identify the most infested areas and those requiring control operations, and to decide for airbase redeployment. From 9 October 2014 to 28 February 2015, the two helicopters had flown over 406 hours to survey infested areas (or areas likely to become infested). As of 28 February 2015, aerial surveys had identified more than 310 000 ha requiring treatment with pesticides. The map in Annex 2 presents a summary of the aerial surveys carried out from 9 October 2014 to 28 February 2015.
- To confirm that the helicopters and their equipment complied with the contract requirements and ensure safety and efficiency of aerial operations, an aircraft logistician was recruited. The logistician was responsible for managing the delivery of the helicopters, monitoring aerial operations and providing staff involved in aerial operations with refresher trainings on the safety procedures to be respected.

Procurement and delivery of vehicles and equipment required for survey operations

- With the exception of expendables, equipment procured during the 2013/14 campaign such as trucks, vehicles, radios, etc. (listed in the [interim](#) and [final](#) reports of the first campaign) was made available by FAO for use by survey and control teams during field activities for the second campaign.
- Following competitive procurement processes, FAO procured and delivered all additional equipment and material necessary for smooth implementation of field activities. As of 28 February 2015, the following additional equipment purchased for the second campaign had been delivered to equip airbases with the necessary material for survey and control operations: survey equipment (entomological/scientific equipment); camping equipment (tents, sleeping bags, camping beds, tables, etc.); 20 VHF radios; ten motorcycles; and two four-wheel drive vehicles, including one double-cabin pickup (to replace the vehicle damaged during the 2013/14 campaign) and one single-cabin pickup, on the deck of which was installed the second AU 8115 sprayer.

Logistics expertise ensured

- Since October 2013, two national logisticians have been working to facilitate the delivery of equipment at various delivery points (airports and ports), complete custom formalities and distribute equipment to final reception sites (storage facilities, field bases, etc.). They provide support to campaign activities depending on the requirements identified by the Campaign Coordinator, in collaboration with the team responsible for managing the Programme from the FAO Representation in Antananarivo and the Programme Coordinator based in Rome.
- In view of the numerous purchases made, the size of the vehicle fleet and the mobility of the bases,

two additional national logisticians were recruited during the first campaign to strengthen the logistics team based in Madagascar. One is responsible for supervising the maintenance and management of vehicles with regard to safety and consumption; the second has been helping build capacities to monitor imports and deliveries, distributing equipment in the field and paying the field teams, among other tasks.

- A logistics assistant was recruited in December 2014 to help the logistics team with: (i) collecting, entering and classifying information regarding vehicles and their position in Madagascar in order to facilitate monitoring; (ii) administrative procedures for all missions carried out by drivers and specialists (United Nations security visas, mission instructions, etc.); and (iii) managing the storage facility and maintaining stock records for each item and entry and exit coupons.
- An international logistician was recruited at the end of August 2014 to supervise, support and provide on-the-spot training to the logistics team on the procedures and tools to be used for logistics activities.

Locust expertise ensured

- National and international technical assistance has been provided since the beginning of the 2014/15 campaign. The National Locust Expert (Deputy Campaign Coordinator) has been working closely with the Campaign Coordinator and the Programme Coordinator to assist with supervising the day-to-day activities of the locust control campaign.
- During the first campaign, it became clear that FAO experts should be present at all times at each airbase to ensure that operations run smoothly, incidents are reported immediately and all information about the locust situation and control operations is sent on a daily basis. Four Junior Locust Experts – made available by Morocco's National Centre for Locust Control and Chad's National Agency for Locust Control – were recruited for different periods and durations from October 2014. Their knowledge in locust bio-ecology, writing skills, and their understanding of new technologies enabled them to provide effective support to scouts and base managers. Base managers possess in-depth knowledge of the field, but had been experiencing difficulties transmitting locust and anti-locust data accurately, concisely and in real time. Since the beginning of the second campaign, each base has been receiving support from a locust expert, who facilitates the organization and implementation of survey activities and provides base members with training on a daily basis.

Ground surveys to support aerial surveillance

- Ground surveys may be necessary to complete aerial surveys, especially in areas close to bases or in view of ground control operations. Ground surveys are carried out by the CNA staff of the ground teams working at the aerial bases. Their operating costs (fuel, vehicle maintenance, daily subsistence allowances for team members mobilized, etc.) are funded by the Programme.
- The CNA has permanent decentralized bases, known as "locust posts", located throughout the Outbreak Area. Each head-of-post carries out ground surveys and transmits information on the locust situation to the CNA Technical Centre and the LWU. However, during the first campaign, this information was transmitted in a late, irregular, imprecise and often incomplete manner. To overcome this risk, a team of five scouts equipped with motorcycles was established in the Outbreak Area in November 2014.
- After a survey, whether by land or air (extensive or intensive), the scout is required to complete the survey/reporting form with the following information: date and place (name of the closest village and exact geographic coordinates provided by a GPS); locust species; developmental stage (hopper instar, state of maturity, number of egg-pods laid, etc.); phase status of locust populations; type of population (scattered or grouped); main features of the soil and vegetation; and nature of any damage.

Component 2: Strengthening of national locust control capacities

Expected Outcome:

National capacity for locust control is strengthened and locust populations are reduced over the course of the 2014/15 campaign in all infested areas. As a result, damage to crops and pastures due to the locust plague is limited.

Result as of 28 February 2015: *Since the launch of Campaign 2 until 28 February, a total area of 262 473 ha have been treated and protected, of which 98.5 percent have been treated by air (Annex 3). Two weeks after treatment, mortality rates assessed on the ground averaged 85 percent using Insect Growth Regulators (206 120 ha protected), 95 percent using conventional pesticides (56 353 ha treated) and 80 percent using biopesticides (880 ha treated).*

Activity 2.1: Human capacity building for locust control

Training in airbase management and in ground and aerial spraying techniques

- In September/October 2014, an international logistician with expertise in aircraft was recruited to assist with the preparation of extensive surveys. The logistician was additionally responsible for undertaking a compliance check of the two helicopters when they were delivered on 8 and 18 October 2014, respectively. From October 2014 to January 2015, the logistical supervision of aerial survey and control operations at the two airbases was ensured by an additional logistician (aircraft expert). Since late January 2015, an international expert in spraying systems, made available by Morocco's National Centre for Locust Control, has been responsible for aircraft logistics.
- After managing delivery of the helicopters, the expert in spraying systems provided the airbase teams with refresher training on the calibration of helicopter-mounted Micronair sprayers. With support from the Campaign Coordinator and the aircraft expert, on-the-spot refresher training sessions continued to be delivered. Technical support was provided to teams assigned to the air base for the duration of control operations.
- With regard to ground control operations, and after mounting and calibrating the second vehicle-mounted sprayer, the expert in spraying systems also provided refresher training sessions to the two ground control teams to ensure compliance with procedures during field operations. Additional training was delivered to personnel to enable them to carry out barrier treatments against hopper patches and bands using Insect Growth Regulators (IGR).
- In October 2014, training on the calibration and use of backpack sprayers was organized and delivered by the expert in spraying systems to the ten team leaders of CALAT. This training covered: the basics of ultra-low volume (ULV) spraying; the operation and maintenance of control equipment; control of spray quality and compliance with technical parameters (e.g. speed of the spraying platform, swath width, dose, height of droplet release); suitable weather conditions; and protection of locust control staff and the environment (respecting exclusion and buffer zones). These team leaders then trained locust control staff from the ten Regional Directorates for Rural Development, all of whom are involved in CALAT activities.

Risk awareness and risk prevention/mitigation

- Since the start of the 2014/15 campaign, under the supervision of the Campaign Coordinator and with support from locust experts, international consultants, the logistician and aircraft expert have been responsible for monitoring the procedures implemented to minimize risks linked to operations at airbases, emphasizing safe movement around helicopters and the importance of wearing personal protective equipment (overalls, gloves, boots, masks and aprons) while handling pesticides, among others. They also provided refresher training to staff in the event of non-compliance with safety measures. The team in charge of monitoring the impact of the locust control operations on human health and the environment double-checks that all preventive measures are respected (see below).

Inputs/supplies management

- Since the beginning of the second campaign in September 2014, the international expert logistician has been supporting CNA staff in the use of input management software (implemented in the first campaign), and regularly conducts refresher sessions for users. He also works with the teams responsible for logistics on a daily basis to implement and improve the system in order to manage and monitor supplies.

Activity 2.2: Support to locust control operations

Procurement and delivery of equipment

- The equipment listed under Activity 1.2 (vehicles, radios, camping equipment, etc.) was procured for use during survey and control operations. As of 28 February 2015, in addition to the above-mentioned equipment, personal protective equipment such as gloves, goggles, boots and masks and one vehicle-mounted sprayer were delivered for use by control teams during the 2014/15 campaign.
- Equipment procured during the 2013/14 campaign, such as pumps, sprayers, etc. (listed in the [interim](#) and [final](#) reports of Campaign 1), is still being used by control teams to implement field locust control operations.

Procurement and 'triangulation' of pesticides

- Locust control operations involve the use of various types of pesticides, which are selected following advice from the Pesticide Referee Group brought together by FAO. Pesticides are selected according to their effectiveness and conditions of use, their registration in the country of intervention, the locust targets to be controlled and the locust habitats of control operations. The strategy adopted to tackle the locust plague includes the use of three types of pesticides: (i) rapid-action conventional chemical pesticides for full-cover treatments (against adult locusts and late instar hoppers when quick mortality is necessary); (ii) IGRs for barrier treatments, allowing rapid protection of large areas contaminated by hopper patches and bands¹, thus preventing new swarms from forming; and (iii) a biopesticide when control operations are required in environmentally sensitive areas. To meet the requirements of the 2014/15 campaign, and taking into account the stocks remaining from the 2013/14 campaign, FAO used competitive tender processes to commercially procure 30 000 litres of conventional pesticides (Chlorpyrifos 240 ULV) and 78 000 litres of IGRs (Teflubenzuron).
- The remaining quantity of conventional pesticides (126 000 litres) was supplied by the Governments of Algeria (30 000 litres) and Morocco (96 000 litres) from their pesticide stocks. By making use of pesticides immediately available elsewhere and whose effectiveness is regularly confirmed by *ad hoc* analyses in specialized laboratories, the triangulation process reduces global production of chemical pesticides, thus limiting the environmental risks associated with their prolonged storage (e.g. through leakage) and eventual disposal if not used before their expiration date. Programme funds allowed FAO to transport these pesticides by sea from northwestern Africa to Madagascar. The quantities of pesticides delivered and used as of 28 February 2015 are provided in Table 1.

Table 1: Pesticides required for Campaign 2 and pesticides procured/triangulated and used as of 28 February 2015

Pesticides (litres except where indicated)	Quantity required from Sept. 2014 to August 2015	Remaining stocks from Campaign 1	Quantity procured as of 28/02/2015	Quantity delivered as of 28/02/2015	Quantity used during Campaign 2
Conventional pesticides	230 000	41 337	*126 000	**78 000	55 764
Insect Growth Regulators	110 000	57 350	***48 000	****48 000	22 830
Biopesticides (kg)	1 000	1 403	0	0	44

* This figure includes pesticides to be triangulated from Morocco (96 000 litres) and those donated by Algeria (30 000 litres).

**This figure includes triangulated pesticides that have already been delivered (48 000 litres from Morocco and 30 000 litres from Algeria) as of 28 February 2015.

***This figure includes pesticides procured through an international tender (48 000 litres) as of 28 February 2015.

**** This figure includes pesticides procured and already delivered following an international tender (48 000 litres) as of 28 February 2015.

¹ A hopper, or nymph, is a wingless locust not yet able to fly or breed. Malagasy Migratory Locust hoppers develop in five successive hopper instars separated by moults, whose duration is of 30 days during the rainy season, and up to 60 days during the dry season (should breeding occur during that period). The final moult is the fledging that gives rise to the young "imago", i.e. immature adult locust.

Aerial and ground control operations

- Locust control operations started on 17 October 2014. As of 28 February 2015, the two helicopters had flown almost 204 hours² for treatments and almost 57 hours between the various airbases. These aerial operations were carried out from bases successively deployed as close as possible to locust “hotspots”³, depending on the findings of the extensive surveys and taking into consideration logistical and safety constraints⁴.
- Aerial control operations by the two aircraft were supplemented by localized ground treatments when needed. Each airbase is equipped with one helicopter, a mobile ground control team and other teams responsible for the management of empty pesticide drums. Each mobile ground control team is made up of a team leader and three field staff, consisting of one operator and two drivers, all of whom have all received training in spraying techniques from the international expert. Another mobile team, composed of three field staff responsible for spraying with a biopesticide (spores of the fungus *Metarhizium acridum*), additionally completes ground control for the second campaign. By 28 February 2015, the ground control teams had treated more than 3 850 ha with the three types of pesticides, which represents no more than 1.5 percent of the total area treated through air and ground operations to date (262 473 ha). Table 4 provides a breakdown of the area treated/protected during the second campaign.
- The passage of tropical storms Fundi and Chedza on the western side of Madagascar temporarily disrupted field operations (cumulative 11-day shutdown for the two helicopters). Moreover, the storms led to a redistribution of locust populations within the infested areas, making it necessary to carry out further survey operations to relocate them.

Pesticides/type of treatment	Ha to be treated/protected from Sep. 2014 to August 2015	Ha treated/protected (Base 1)	Ha treated/protected (Base 2)	TOTAL ha treated/protected
Conventional pesticides / Full cover treatment	230 000	15 111	40 342	55 453
Insect Growth Regulators / Barrier treatment	550 000	121 850	84 270	206 120
Biopesticide / Full cover treatment	20 000	900	0	900
Total	800 000	137 861	124 612	262 473

² This includes the time spent on application, time required to fill the helicopter’s hopper and return to the block to be treated (setting up), as well as time required for cleaning the helicopter spraying equipment.

³ The locations of locust population hotspots change throughout the rainy season, including during exceptional events such as cyclones, which may have a significant impact on the distribution or dynamics of locust populations. During Campaign 2, these included the passage of tropical storms Fundi and Chedza in January and February 2015, which led to the redistribution of locust populations due to heavy rains and violent winds. In April 2014, high winds associated with Cyclone Hellen swept swarms present in the Mid-West to the Highlands. In February 2013, Cyclone Haruna created prolonged optimal conditions for the development of Malagasy Migratory Locusts.

⁴ Security constraints have sometimes necessitated the establishment of temporary filling stations (for pesticides and fuel), and therefore, approach flights, which were not survey or treatment flights in the strictest sense. In order to operate, helicopters and airbases need the support of motorized vehicles on the ground (e.g. all-terrain vehicles for staff movements and for ground survey and control operations, trucks for refuelling with kerosene and pesticides). Due to Madagascar’s complex topography, impracticality of certain tracks during the rainy season, the lack of tracks in some areas and insecurity, these vehicles can get closer to locust hotspots.

Component 3: Preservation of human health and protection of the environment

Expected outcome: No incidents affecting human health are reported during the aerial control operations or the handling of pesticides. The impact on the environment from the control operations is limited.

Result as of February 2015: Human health and environmental monitoring is carried out on a regular basis and the findings are included in the monthly reports.

As of 28 February 2015, no incidents affecting the health of workers directly involved in locust control operations or the population within intervention areas, or affecting the environment, were reported.

Activity 3.1: Strengthening of human capacity for human health preservation and protection of the environment

Pesticide management

- The Pesticide Stock Management System (PSMS) database was developed by FAO in 2004/05 at the end of the last major Desert Locust upsurge in West Africa. The database was created to help countries better manage their pesticide stocks and ensure the traceability of drums, thus reducing the risk of pesticide expiration and the delicate and laborious task of disposing of expired stocks. It allows instant and up-to-date inventory-keeping of pesticide stocks from acquisition to disposal of empty containers through an automated and simplified management system, which uses labels with unique bar codes for each pesticide drum. Following his mission in November 2013, an international PSMS expert conducted a second mission in November/December 2014 to deliver refresher courses to four CNA agents. The courses covered topics such as the rational use of the PSMS database and labelling and inventory techniques. The mission also gave the expert an opportunity to assist CNA and PPD staff in updating PSMS data on available pesticide stocks and empty pesticide containers.

Human health and environmental management

- An international environmentalist undertook a mission to Madagascar in October/November 2014 to consolidate the achievements of the missions carried out during the 2013/14 campaign. During this mission, he provided CNA staff with refresher training on assessing the environmental impact of locust control operations. This training, which was both theoretical and practical (held in areas where locust operations were carried out), focused on: standard operating procedures; monitoring and assessing the impact of treatments on non-target terrestrial and aquatic fauna; the collection and preparation of soil, vegetation and water samples for pesticide residue analysis; the assessment of environmental accidents caused by locust control; and improved drafting of mission reports and minutes.
- The measures described in the Human Health and Environmental Management Plan were applied even before the first control operations were carried out (analysis of acetylcholinesterase levels in control staff's blood) to reduce the negative impact of locust control operations on human health and the environment. During his mission in October/November 2014, the international environmentalist also conducted an assessment of the Human Health and Environmental Management Plan's implementation. In his end-of-mission report, he noted that the implementation of the various requirements since the start of the Three-year Programme had been satisfactory overall due to the following: the direct impact of locust control operations on human health and the environment is regularly monitored to avoid incidents; safety precautions when using pesticides are applied at airbases and in the field; pesticides are transported according to the Human Health and Environmental Management Plan's guidelines; and spraying and protection equipment are adequate and properly used. Among his recommendations, he emphasized that the Human Health and Environmental Management Plan should be validated at national level to be applied even after the Three-year Programme has been completed.

Risk awareness and risk prevention/mitigation

- The team responsible for communication at the FAO Representation in Madagascar designed leaflets and posters illustrating precautionary measures to be observed to the benefit of people living close to areas of anti-locust operations. This awareness material is available at each airbase and is distributed to rural populations during survey operations. When handing out the material to villagers, scouts explain the importance of following the preventive measures described and illustrated in the documents. Furthermore, messages are regularly broadcast on local radio stations to raise awareness about precautions to be taken during operations involving helicopters.

Activity 3.2 : Support impact monitoring (of treatments) of on human health and the environment

Provision of equipment

- Monitoring equipment such as cholinesterase kits were delivered in Madagascar in September 2013. Stocks available at the end of the first campaign were sufficient to cover the requirements of the second campaign; therefore, no additional purchases had to be made. Cholinesterase is a blood enzyme that is essential for the functioning of the nervous system; however, it can be inhibited by chemicals such as pesticides, leading to severe consequences for the person concerned. The kits were supplied to measure the blood cholinesterase levels of personnel involved in control operations. These levels were then compared with reference levels, particularly each staff member's personal levels before the start of the campaign. The use of kits is supervised by a qualified CNA technician responsible for monitoring human health and the environment. In case of cholinesterase inhibition, atropine is provided as an antidote; therefore, 50 atropine kits (injection) were delivered to Madagascar.

Teams for health/environmental monitoring and pesticide-drum management

- During the 2014/15 campaign (as during the first campaign), two teams were established: one to monitor the impact of locust control operations on human health and the environment and the other to manage empty pesticide drums. Programme funds cover the teams' operating costs (fuel, vehicle maintenance and repairs if necessary, daily subsistence allowance for team members mobilized by CNA, drivers' salaries, etc.).
- The team responsible for the medical monitoring of workers involved in the handling of pesticides and spraying conducts regular blood tests to monitor the staff's exposure to pesticides.
- Since the start of the second campaign until 28 February 2015, 70 tests have been carried out on personnel involved in control operations and handling of pesticide drums to determine their base cholinesterase levels. A total of 61 tests have been conducted to identify variations after contact with pesticides.
- This team is also responsible for verifying the impact of incidents that can occur during locust control operations. After each incident leading to a loss or overdose of pesticide, the team assesses the impact on human health and the environment and, if necessary, applies remedial actions. Over the course of the 2014/15 campaign until 28 February 2015, out of a total of nearly 464 pesticide drums handled and used during the campaign to treat 2 262 473 ha, some were damaged during transport to bases and filling stations due to poor road conditions, causing leakage. Pesticides were immediately transferred to empty drums and special precautions were taken to ensure that drums were attached, loaded and unloaded with the greatest care. Furthermore, during aerial control operations, occasional pesticide losses occurred due to the poor calibration of Micronairs or random incidents such as breakage of the coupling connecting the solenoid valve to the filter, in addition to the pilot's non-compliance with procedures. In all cases, the health and environmental impacts of these incidents were assessed by the teams responsible, and no impacts on either human health or the environment were identified. Of the 78 594 litres of pesticides used for control operations, 570 litres (0.7 percent) were lost due to leaking drums or breakages in helicopter spraying systems.
- Following the recommendations of the Evaluation Report, which assessed alignment with the World Bank's safeguard policies published in January 2015, it was decided to recruit a toxicologist. The toxicologist's responsibilities include monitoring the impact of locust control activities on human health and the environment in order to ensure that field staff receive medical assistance in the event of an incident.
- The pesticide drum management team was responsible for monitoring and coordinating drum movements and updating inventory using the Human Health and Environment database and the internal monitoring system. All empty pesticide drums have been recovered and stored in the CNA central storage facility in Toliara or in decentralized CNA or Regional Rural Development branches' storage facilities until they can be gathered in the new central pesticide storage facility to be built in Toliara. Once the drum crusher has been installed in the new facility and CNA staff have been trained on its use, the empty drums will be rinsed and crushed to reduce their volume and avoid any further risk to human health and the environment.

Activity 3.3: Construction of a pesticide storage facility (Toliara)

- The procurement process for the construction of a pesticide storage facility in Toliara began in October 2013. A contract was signed with a firm of architects based in Rome, who were assisted by a national engineer in Madagascar (recruited by the FAO Representation under the technical supervision of the Infrastructure and Facilities Management Branch of FAO). A tender was launched in March 2014 after the preparation, review, financial evaluation and technical validation of the documentation required. It was closed in April 2014 and four valid offers were received. The supplier that submitted an offer that met technical specifications at the lowest price was identified in May 2014. However, the signing of the contract was suspended from July 2014 to February 2015, pending the signature of an amendment for a no-cost extension of the project funding construction. The contract with the construction company was signed by FAO on 20 February 2015, and construction of the pesticide storage facility is expected to begin in the second half of 2015. Once completed, the warehouse will be able to store 56 000 litres of pesticides (280 drums of 200 litres each), making it the largest pesticide warehouse facility in Madagascar that meets national standards adopted by the Government and international standards set by FAO. Currently, none of Madagascar's nine larger pesticide warehouses – with capacities ranging from 14 000 to 150 000 litres – meet the international standards required for these facilities.

Training on the use of the drum crusher

- Training on the use of the drum crusher will be carried out once Toliara's central pesticide storage facility has been built and the drum crusher installed. An international expert has been identified to provide training when the acquired skills can be immediately applied. This will prevent the need for refresher training, which would have been inevitable had the training taken place before the construction of the pesticide warehouse.

Component 4: Implementation and coordination of the Programme

Expected outcome: The supervision and technical and operational coordination of the Programme as well as those of field operations are performed and the expected outcomes are achieved.

Result as of 28 February 2015: *The FAO Plant Production and Protection Division (AGP) and the Emergency and Rehabilitation Division (TCE) (based in Rome), in close collaboration with the FAO Representation in Madagascar (based in Antananarivo), ensure the supervision, coordination and implementation of the Programme.*

To coordinate and implement the Three-year Programme, FAO has established teams in Rome and Madagascar. The main objectives of this arrangement are to:

- procure inputs and services and ensure their rapid availability;
- ensure the deployment of specialized expertise to Madagascar;
- train technical partners (CNA, PPD, CALAT) and field teams and provide them with technical support;
- ensure that data collection and analysis related to locust and anti-locust situations, pesticides, flying hour usage and health and environmental concerns are appropriately carried out;
- supervise the analysis of field data and dissemination of related results;
- maintain the smooth operation of survey and control activities; and
- manage funds received to support the Three-year Programme.

The supervision as well as the coordination and technical monitoring of the Three-year Programme are handled by AGP in Rome and, more specifically, by the Locusts and Transboundary Plant Pests and Diseases team (AGPMM). This team is responsible for the following: necessary adjustments to the previously established anti-locust strategy depending on the outcome of the previous campaign and the developments of the current campaign; the preparation of technical specifications for the inputs to be procured, their relevance to the context and their appropriate use; the analysis and technical validation of tenders; the establishment of profiles and terms of reference for international consultants and their identification, their direct supervision and the technical review and approval of their reports; the monitoring of all technical activities; and support to the preparation of ten-day and monthly bulletins, briefing notes, press releases, interim or final reports for the campaign and for donors, campaign balance sheets and all instructive documents and the technical validation of all these documents.

The implementation of the Programme, including procurement of inputs and contracts, pesticide 'triangulation', operational and budgetary management, staff management and the monitoring of activities and expenditures is undertaken by FAO's Emergency and Rehabilitation Division (TCE).

AGPMM and TCE work closely with the FAO Representation in Madagascar based in Antananarivo. At the FAO Representation in Madagascar, the Deputy Representative and the Emergency Coordinator are responsible for supervising the Programme's administrative, financial and operational activities. In addition to operations carried out directly at headquarters in Rome and at international level, they pursue resource mobilization efforts at national level and ensure close liaison with all stakeholders involved in managing the locust plague (ministries, technical and financial partners in Madagascar, experts in the field, etc.), with support from the Programme Officer. An Operations Officer is responsible for monitoring operations, working closely with FAO headquarters and field-based consultants (pre-positioning of all inputs, support for international technical experts, etc.). National experts provide support for the operational, administrative, logistical and financial management of field operations.

Resource mobilization and preparation of related documents (drafting, revision and approval) are undertaken jointly by the three teams.

In Madagascar, the implementation of the first and second anti-locust campaigns (in the capital and at field bases) and daily activities are overseen by an international Campaign Coordinator with the support of his deputy, a National Locust Expert.

Weekly and *ad hoc* teleconferences are held between the two teams based in Rome and the FAO Representation in Madagascar to discuss the activities that took place during the week, find solutions to problems arising during the implementation of the campaign and to provide an update on the latest resource mobilization efforts; technical and operational support missions are also organized.

A Web site dedicated to the locust crisis in Madagascar (available in both [English](#) and [French](#)) has been created, with direct access from the homepage of the [FAO in emergencies Web site](#). This site contains the following documents related to the locust crisis in Madagascar: all Programme reference documents; situation updates; ten-day and monthly bulletins prepared by the Locust Watch Unit; international press releases at key moments or during the Programme's major events and events organized by the Office of Communication of the FAO Representation in Madagascar; interim and final reports of locust campaigns; and photo galleries and audio-visual materials documenting field activities.

With regard to the media, in addition to answers given by FAO upon specific requests from journalists, many articles have been published in the national media, national press releases were issued and field trips were organized for journalists. Meetings with journalists – called "press brunches" – were also held at the FAO Representation to provide more details on issues related to the Programme's implementation. These events served to improve journalists' understanding of anti-locust control, thereby improving the general public's understanding. Moreover, from April to December 2014, a Q&A session was published weekly in the national press to address the most common questions regarding the Three-year locust control Programme in Madagascar. Since January 2015, the FAO Representation, via the LWU and its communication department, has transmitted a "news feed" every ten days to partners, media and donors, providing them with an almost real-time overview of field activities and the locust situation.

In June 2014, the FAO Representation began publishing newsletters to the attention of donors to provide them with further information about the Three-year Programme. To date, four newsletters have been published.

At national level, during significant events of the Programme and at the end of each mission carried out by the Campaign Coordinator or the Three-year Programme Coordinator, debriefing meetings were held with financial partners, donors and national institutions and authorities. Moreover, since the beginning of the second campaign, meetings are held regularly with the Group of Donors for Rural Development (*Groupe des Bailleurs de Fonds pour le Développement Rural*) to inform donors and financial partners of the progress of the Three-year Programme's activities. Numerous bilateral meetings have been held with each donor to discuss the specifics of established agreements and provide precise information on the anti-locust campaigns.

Component 5: Assessment of the effectiveness of the locust control campaign and of the impact of the locust crisis on crops and pastures

Expected outcome: The results of the assessment of the anti-locust campaign's effectiveness and of the impact of the locust crisis on crops and pastures are available to all stakeholders.

Result as of 28 February 2015: *An assessment of the effectiveness of the anti-locust campaign and of the impact of the locust crisis on crops and pastures will be made at the end of the 2014/15 campaign.*

Activity 5.1: Assessment of the effectiveness of the locust control campaign

- In June/July 2015, at the end of the 2014/15 campaign, and as was the case at the end of the first campaign, an assessment of the anti-locust campaign's implementation and its effectiveness will be carried out. The findings of this assessment will be taken into account when preparing the 2015/16 campaign.

Activity 5.2 : Assessment of the impact of the locust crisis on crops and pastures

- In June/July 2015, at the end of the 2014/15 campaign, and as was the case at the end of the first campaign, an assessment of harvests and food security will be jointly carried out by FAO, the World Food Programme and the MoA. This Crop and Food Security Assessment Mission will pay special attention to the assessment of damage caused by locusts to crops and pastures.

Difficulties encountered

As of 28 February 2015, the difficulties encountered and actions taken to resolve them included the following:

- Lack of information on the locust situation in the southwestern part of the country, which corresponds to the Migratory Locust Outbreak Area: The efforts made to improve the exchange of information between national stakeholders (CNA, PCN and Regional Rural Development branches) should improve this situation. Furthermore, during the 2014/15 campaign, FAO established motorcycle survey teams in locust "hotspots" within the Outbreak Area to obtain reliable and timely information about the locust situation and its development.
- Control operations in remote or difficult to access areas: Early on in the second campaign, small depots of pesticides and kerosene were established in areas that are inaccessible during the rainy season. This helped offset the relatively limited range of the helicopter when loaded with kerosene and pesticides (compared with that of fixed-wing aircraft).
- Delays in the procurement of inputs: In September 2014, limited funding prevented FAO from making all the purchases planned for the second campaign sufficiently in advance; this led to delays in the procurement of certain inputs, particularly pesticides, and difficulties in contract management of helicopters with the selected subcontractor. FAO has engaged in constant communication with potential donors at national and international levels in order to raise funds for the 2014/15 Campaign and Three-year Programme as soon as possible, thus enabling the continuation and completion of the second Campaign and of the Programme.
- Delays in the delivery of equipment attributable to suppliers: Penalties were applied on a case-by-case basis. FAO's Procurement Service is currently contacting alternative suppliers likely to be able to guarantee the delivery of products on time.
- The passage of tropical storms Fundi and Chedza on the western side of Madagascar momentarily disrupted the implementation of field operations. These storms also resulted in a redistribution of locust populations within infested areas, requiring them to be relocated.
- Non-compliance of spraying equipments mounted on the second helicopter, received on 18 October 2014. FAO has immediately asked the service provider to replace the spraying kit (Micronair nozzles and hopper) in order to use this helicopter for survey and control operations as stated in the contract. In the meantime, FAO conditionally received the helicopter. On 24 November 2014, the company replaced the Micronair nozzles. FAO also requested the company to install a Simplex hopper so that the helicopter could be fully compliant with the Terms of Service. This change was made by the company end of January 2015. From 08 February 2015, date of full-compliance of spraying equipments, both helicopters were simultaneously operating for survey and control activities.

Conclusions and recommendations

From the beginning of the second anti-locust campaign until 28 February 2015, the concerted and well-coordinated efforts of the FAO teams in Madagascar and Rome, supported by specialist teams in the field, enabled almost 20 million ha of land to be surveyed, of which 310 000 ha were identified as being infested and in need of control operations. Nearly 263 000 ha were thus treated in a manner that respected human health and the environment (i.e. approximately 80 percent of the zones identified).

To achieve this result, almost 667 flying hours⁵ were carried out by the two helicopters as of 28 February 2015. In total, almost 56 000 litres of conventional pesticides (Chlorpyrifos 240 ULV), almost 23 000 litres of IGRs (Teflubenzuron 50 UL) and 44 kg of biopesticides (Green Muscle®) were used.

Of the 667 flying hours used up to 28 February 2015, 31 percent (204 hours) were devoted to spraying, 60 percent (406 hours) to surveys and 9 percent (57 hours) to movements (deployment/redeployment and conveyance).

The remaining financial resources from Campaign 1 – along with funding received between September 2014 and February 2015 – enabled the implementation of aerial survey and control operations, all field activities and training courses programmed until 28 February 2015.

On 28 February 2015, the financial gap to complete the Three-year Programme still amounted to USD 10 million.

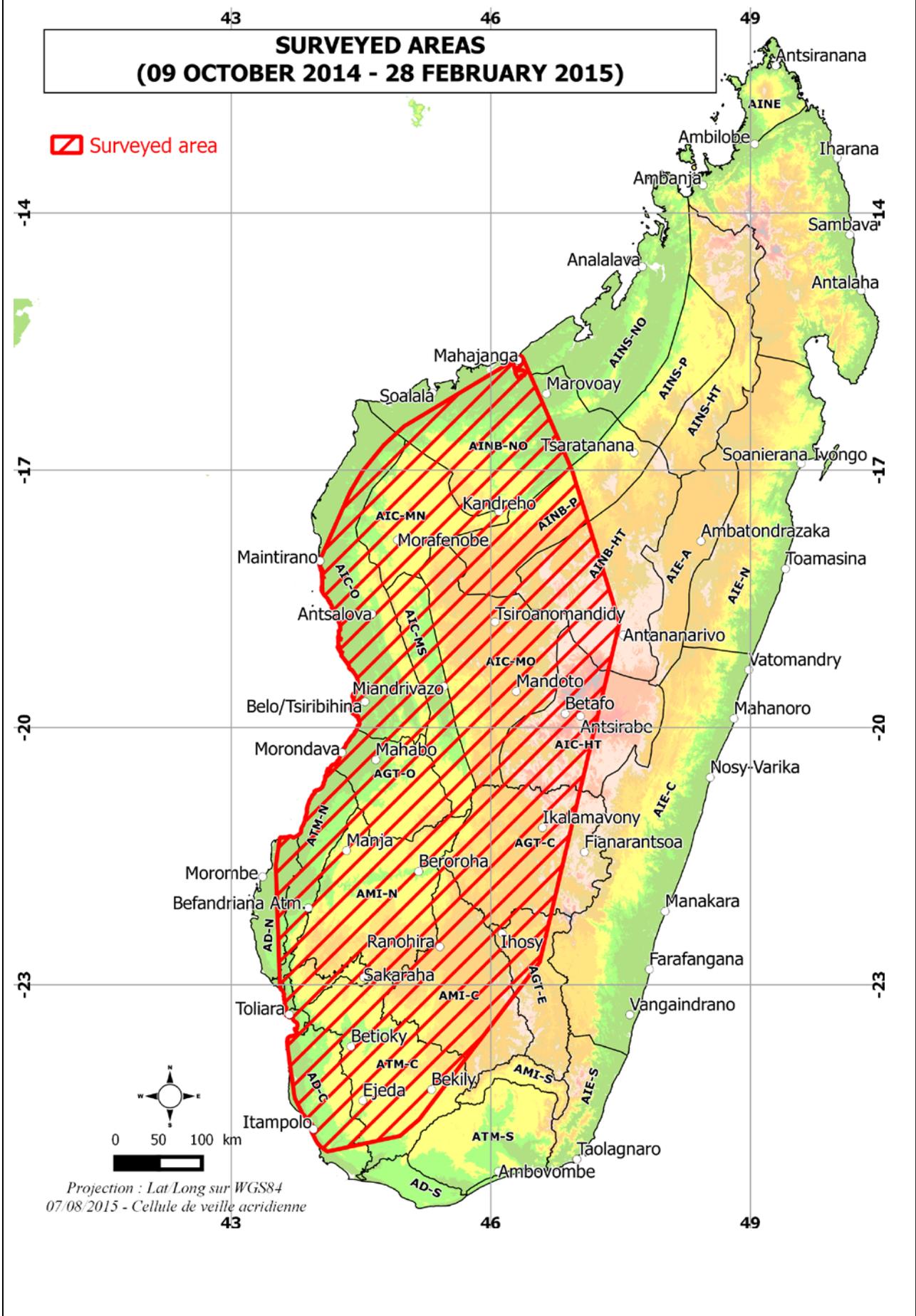
Three successive and uninterrupted locust campaigns are required to halt the plague, return to a locust recession situation⁶ and safeguard the food and nutrition security of the 13 million people affected by the locust plague in Madagascar. It is therefore essential that all the required funds be made available on time to implement the second anti-locust campaign. If the second and third anti-locust campaigns cannot be carried out in their entirety and in a timely manner, the return to a locust recession situation cannot be guaranteed in 2016; a chronic locust upsurge would likely to prevail and persist (as occurred from 2010 to 2012), potentially developing into a new locust plague.

In order to ensure the pre-positioning of inputs and services in a timely manner and thus the continuity of activities in the field, FAO should launch purchase requests as soon as possible for the third campaign, which will take place from September 2015 to June 2016. However, this will depend on the availability of funds for the current campaign as well as the availability of funds for the 2015/16 campaign.

⁵ The 667 flying hours correspond to 406 survey hours, 204 hours of spraying and 57 hours to deploy the helicopters to and between airbases.

⁶ Period of deep recession marked by the complete absence of gregarious locust populations.

Annex 2. Surveyed areas



Annex 3. Areas treated or protected by air and ground

**AREAS TREATED OR PROTECTED BY AIR AND GROUND
(17 OCTOBER 2014 - 28 FEBRUARY 2015)**

Campaign 2 as at 28 February 2015 : 262 473 ha

Block :

- protected (206 120 ha)
- treated (56 353 ha)

